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Future Utility Analysis Research: Continue, but Expand the Cognitive and Strategic Focus

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Abstract
[Excerpt] Does utility analysis research have a future? I believe the answer depends on how we contemplate the nature of such research. The distinction between two potential paths has never been more apparent. On the one hand, as researchers, industrial psychologists and others have accumulated decades of utility analysis applications and proposals for new utility approaches and estimation methods. Numerous utility applications exist, especially in selection. Spirited debates have occurred in the scholarly journals on such topics as the value of capital budgeting (Hunter, Schmidt & Coggin, 1988), the appropriate underlying conceptual utility model for scaling performance differences into dollars (Raju, Burke & Normand, 1990), and the appropriate measure of dollar-valued performance variability (SDy) (see Boudreau, 1991 for a review). One would think that after such a long and public history, we would have a set of accepted principles that might guide utility analysis applications, measurement and theory. Unfortunately, we do not. The title of this symposium testifies to the ongoing consternation faced by the scientific community about utility analysis.

Keywords
utility, analysis, research human resource, human, resource, turnover, performance, salary, employee, model, pay, perform, cost

Comments

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Future Utility Analysis Research: Continue, but Expand the Cognitive and Strategic Focus

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Does utility analysis research have a future? I believe the answer depends on how we contemplate the nature of such research. The distinction between two potential paths has never been more apparent. On the one hand, as researchers, industrial psychologists and others have accumulated decades of utility analysis applications and proposals for new utility approaches and estimation methods. Numerous utility applications exist, especially in selection. Spirited debates have occurred in the scholarly journals on such topics as the value of capital budgeting (Hunter, Schmidt & Coggin, 1988), the appropriate underlying conceptual utility model for scaling performance differences into dollars (Raju, Burke & Normand, 1990), and the appropriate measure of dollar-valued performance variability (SDy) (see Boudreau, 1991 for a review). One would think that after such a long and public history, we would have a set of accepted principles that might guide utility analysis applications, measurement and theory. Unfortunately, we do not. The title of this symposium testifies to the ongoing consternation faced by the scientific community about utility analysis.

At the same time, there is unprecedented recognition among top managers throughout the world that people make the difference. Reading the professional business press, one would think that the battle for measuring the impact of human resources has already been won. Emerging "flexible organizations" are seen as requiring increased attention to vision, style, cooperation and teamwork (Ghoshal & Mintzberg, 1994; Halal, 1993). Business writers tout the essential role of "world-class training" that values "people skills" and fosters "entrepreneurship" (Dumaine, 1995; Rau, 1994). We even see the latest pair of best-selling authors, Michael Hammer and James Champy chiding managers that "the biggest lie told by most organizations is that 'people are our most important assets'", and calling for dramatically "increased investments in people" (Lancaster, 1995). It is also apparent that some of the most admired managers say managing people as their most important role. Jack Welch, of General Electric Corporation is quoted as saying "Anybody who gets this [CEO] job has got to believe in the gut that people are the key to everything" (Tichy, 1993). There is also growing evidence that organizational success is correlated with the existence of combinations of "high-performance" work designs and "high-performance" human resource practices (MacDuffie, 1995; Arthur, 1994; Huselid, in press).

Yet, for managers who must consider investments in particular arrays of human resource programs, such evidence is not much help. The quotes from the CEO provide little guidance in determining whether it makes sense to invest in more expensive selection, training or compensation programs. Evidence at the firm level that the existence of certain human resource practices in combination with certain work designs does not always provide the basis for deciding if a given organization should invest in those practices. In a sense, such evidence works from the "top" downward, by suggesting how broad human resource patterns do affect broad organizational outcomes. In contrast, most HR investment decisions are "bottom-up". That is, they require a decision maker to choose between alternative practices applied to a particular group of employees. The observable results of such programs will occur largely at the employee level, not at the organizational level.

Thus, there remains a need for frameworks and models that can help managers to enhance their ability to identify, communicate and make decisions based on the impact of human resources on groups of employees, and to show how those employee-level effects translate into broader organizational outcomes. Presumably, utility analysis should contribute to the development of those frameworks. However, the vast majority of utility analysis research and application has not been directed at this outcome. The impact of utility analysis on decision makers is often not even observed, let alone studied. The link between positive utility analysis results and subsequent unit or organizational performance has not been examined. More typically, utility analysis research has been content to develop internally logical models applied to somewhat hypothetical decision situations. The scientific debate has only rarely touched on the effects on decision making. Instead, debate and analysis has focused on the logical consistency of assumptions, and the possibility that one estimation approach might produce different results from another. It seems unlikely that such activity can contribute to understanding the linkage between investments in human resource management programs, and organizational outcomes. We might well ask whether there is any "construct" underlying utility measurements, whether the numbers generated by utility models have any psychometric validity, reliability or generalizability, and whether further embellishments to utility models advance any fundamental theory.

Answers to these questions may well depend on the link noted above. This requires that we focus on how managers conceive of human resource management, how they determine whether human resource activities are worthwhile, and how we can better help them use the available information to improve their decisions. This position is not new. It was a central premise behind the original development of selection utility models (Cronbach & Gleser, 1965). However, by refocusing our attention on the receivers of utility analysis information, we can see a future purpose for utility analysis theory and research. Utility analysis offers a framework for studying and for enhancing managers' decisions about human resource management investments.

Basic Premises of Utility Analysis

If we begin with the receiver of utility information as the focus, we must take a different perspective from the traditional utility approach. Receivers may include not only HR managers and line managers, but stockholders, employees, government officers, and others. This suggests a more varied and complex domain for utility analysis research, but it also presents promising opportunities for contributions beyond simply measurement. Focusing on the receiver suggests some basic premises:

Utility is multivariate and multiattribute

The variety of receivers of utility information suggests that the concept must be multivariate and multiattribute. Utility analysis typically includes costs and dollar-valued performance benefits. Undoubtedly the process of estimating dollar-valued performance encompasses multiple dimensions (Burke, 1985), and some have used cognitive decision theory to examine SDy estimation processes (Bobko, Shetzer, & Russell, 1991).. Moreover, extensions of the traditional utility model demonstrate how the model can encompass employee movement patterns as well. However, utility analysis generally does not encompass such dimensions as employee attitudes, political considerations, power relationships or cultural inertia which may well be the key to many decisions. There is no reason that an extended utility framework cannot be developed to account for more of the key decision-making dimensions. However, the current direction of utility analysis research is not typically concerned with these issues. Yet, once utility analysis estimates have been obtained, it may often be these factors that significantly affect the decision. An example of this is discussed by Boudreau & Berman (1991). After calculating the utility of gainsharing options, it appeared that gainsharing could pay off handsomely for the directly-affected work force. Yet, in the end, managers decided not to implement gainsharing, in part due to equity considerations related to employees in other units of the organization. Such examples are not a repudiation of the utility construct, but rather an indication of new research directions. We need to know more about the unmeasured utility dimensions that are not reflected in the dollar values typically calculated. The question is not whether such dollar values are accurate or construct valid, but what is their effect relative to other dimensions? Usefulness Derives from Observed Changes in Behaviors

Typical utility analysis applications end after estimating the utility values. Such values are based on managerial estimates of performance variability, but are often not related to specific behavioral outcomes of the human resource program. When estimating training utility, researchers often rely on an effect size measure that reflects training outcomes (in-training knowledge or behaviors), but an SDy measure that reflects overall performance value. Similarly, selection validity coefficients are often based on behaviors such as learning or turnover. Yet, selection utility estimates are often based on SDy values that reflect an overall performance measure. Utility analysis studies often lack a connection between the behaviors that are the direct basis for the effect size or validity coefficient, and the dollar-valued estimates. The traditional assumption is that the criterion measure used in the effect size, and the underlying dollar-valued SDy scale are linearly related, with a correlation near unity. If so, multiplying the effect size by SDy makes conceptual sense. However, it seems plausible that managers faced with high utility values may well ask, "What behaviors will I observe that will support the high utility values you obtained?". This is an especially relevant question when the projected utility values are extremely high, such that their credibility may be questioned (Hunter, Schmidt & Coggin, 1988). The interesting issue may not be whether the utility values are precisely correct, but rather what linkages between behaviors and outcomes need to be understood to believe them. Future research might investigate the outcomes that managers actually use to estimate the effects of HR programs.

For example, when Florin-Thuma and Boudreau (1987) examined the utility of performance feedback in a fast-food restaurant, they discovered that managers focused on yogurt serving sizes, and their relationship to inventory costs per revenue. It was not even possible to derive an estimate of SDy because individual performance levels could not be observably linked to these important outcomes. Instead, the study focused the size of each serving, regardless of the particular employee who served it, under different experimental conditions. The resulting utility values were calculated directly from the serving size effect to the amount and cost of inventory needed to support a particular level of serving revenue. A directly inventory cost saving could thus be calculated. Moreover, the link between the effect focus and the dollar-valued outcome was readily apparent. In this study, the value of the direct link could not be explored, though managers did report that the utility analysis changed their model for evaluating programs affecting their employees. Utility Analysis Should Focus on Decisions

Typical utility analysis research has focused on convincing scholarly reviewers and readers that the proposed changes in the utility model are logical and incrementally distinct from prior work. While potentially useful for extending the domain and precision of the utility models, this focus can exclude a fundamental cognitive process -- decision making. The real test of utility analysis is its effect on decisions. Only one published study (Latham & Whyte, 1994) has focused explicitly on the effects of different utility information on managerial decisions, and the results were not encouraging. However, this particular study took place in a laboratory setting, and varied only a few of many utility parameters. Clearly, further research is needed to determine the conditions under which evidence does and does not influence key decision makers, including not only managers, but also employees, government officials, and even customers and stockholders. There is some preliminary evidence that human resource "events" and "reputation" have some effect on financial indicators (Abowd, Milkovich & Hannon, 1990; Hannon & Milkovich, 1995). As yet, we have not seen research examine what linkages are perceived by financial analysts between such events and organizational performance. Ideally, utility analysis might provide a framework for examining the nature and magnitude of the linkages. For example, perhaps "reputation" is believed to positively affect performance because it allows organizations to compete in attracting and retaining the best applicants. Utility models exist to examine the effects of differential applicant quality on employee value (Boudreau & Rynes, 1985; Murphy, 1986), but we do not know if such models capture the linkages that managers and financial analysts believe exist between reputation and organizational performance. Utility Models Can Be Catalysts for Identifying Synergy

A fascinating implication of much of the "macro" research cited earlier is that human resource programs act in concert. Traditional utility analysis examines single HR programs, such as testing, training or recruitment. Some utility models have attempted to link the effects of HR programs to several related outcomes, such as internal and external employee movement. However, we have not yet seen applications of such integrated models. Moreover, we have seen very little linkage between utility models that focus on changing the existing "stock" of employees, and those that change the "flow" of employees into, through and out of the work force. Yet, managers and other constituents must consider these synergies in their own decisions. It would be interesting to know if utility models that can capture such synergies have greater influence on decisions. Or, as some have speculated, do such models become so complex that they are virtually unintelligible to any constituent?

A Modest Example of Synergy and Potential Decision Support:
Using Movement Utility to Analyze Compensation Strategy

A recent application of utility analysis to the question of pay growth policies for managers can illustrate some of the points made here. This application illustrates synergy because it applies the Boudreau & Berger (1985) employee movement model to the question of compensation strategy. Specifically, the question of whether to aggressively link pay growth to performance, or not. While the utility application did not provide the opportunity to test the model's persuasive power, it does provide the basis for suggesting how such persuasion effects might be examined. Curvilinear Relationship Between Pay Growth and Turnover

Gerhart, Boudreau & Trevor (1995) analyzed managerial separations and salary growth using a proportional hazard model, controlling for labor market conditions and year of hire, using over 5,000 observations gathered between 1983 and 1988. They discovered that the probability of remaining with the organization was curvilinear with performance rating, suggesting that both high and low performers were more likely to leave. Moreover, the separation of managers attaining the highest three performance ratings were significantly more sensitive to differences in their salary growth over time. Pay growth for high performers was not significantly greater than pay growth for moderate performers. The existence of a curvilinear relationship between performance and separations is theoretically interesting. However, this pattern of results also has practical implications. This organization could enhance its ability to retain high performers by more aggressively linking pay growth to performance. If the highest performers received much higher pay increases than moderate or low performers, evidence suggests that high-performer turnover would respond even more strongly than moderate performer turnover.

A Question of Compensation Strategy

Based on the findings noted above, compensation strategists face a dilemma. They could increase pay growth for high performers or they could continue providing roughly equal pay growth for moderate and high performers. Managers undoubtedly understand that increasing pay growth will increase payroll and related costs. Such costs are apparent in standard accounting statements, and would likely receive significant attention. They may also generally understand that the reduction in separations among high performers may create certain movement cost savings. However, such movement costs are not traditionally apparent in standard accounting statements. Still reducing turnover, especially among high performers, is frequently a defensible goal. Finally, the managers probably would generally agree that retaining more of the high performers should enhance the quality of the work force. It is likely that when high performers are replaced, the replacements are not as valuable as those who left (Boudreau & Rynes, 1985). However, this workforce-enhancement factor is very difficult to measure or to anticipate, and does not appear directly on any financial or accounting statement. Yet, it can be argued that retaining the best of this group of managers is key to the future of this organization. The best of these managers, if they stay, may take positions of leadership. If they leave, their talents will be used by other organizations, and those who replace them may not be as talented. Thus, the stakes are high, but not obvious. This is a classic opportunity for utility analysis to frame the decision, and help to educate managers about the relative advantages of different strategies. Applying Movement Utility to the Compensation Strategy Decision

Traditionally, utility analysis has been used to aggregate diverse effects into a common dollar-valued scale (Boudreau, 1991). Utility analysis applications exist for selection, training and performance feedback, but not for compensation (Boudreau, 1991; Gerhart & Milkovich, 1992). Yet, as we have seen, compensation strategy decisions also present similar challenges due to the diverse measurement scales for the different outcomes. The present study provided a unique opportunity to address the lack of utility models for compensation strategies by applying an existing utility analysis framework to the present results. Prior utility analysis research has produced models for estimating the value of separation and acquisition patterns (Boudreau & Berger, 1985; Boudreau, 1991). So, we can use the Boudreau & Berger (B&B) separation/acquisition utility model to illustrate the dollar value implications of alternative compensation policies, as they affect separations and acquisitions over time. Of course, we do not suggest that the resulting model is a definitive treatment of the utility of compensation strategies. However, the application provides a starting point that we hope will encourage others to build further.

Boudreau & Berger (1985) proposed a utility model that estimated three components in each time period: (1) The movement costs associated with separations and acquisitions; (2) The service costs (pay, benefits, and associated expenses) required to support the work force in each time period; and (3) the service value, or dollar value of the goods and services produced by the work force in each time period. The dollar-valued implications of different separation and acquisition patterns over time was estimated by summing the stream of service value levels, and then subtracting the stream of service cost and movement costs. Boudreau & Berger (1985) applied this model to examine effects of changes in selection validity and the correlation between separations and performance levels. In the present case, we consider alternative pay strategies, which are not likely to affect the validity of employee selection. Moreover, while Boudreau & Berger (1985) illustrated their model by assuming a linear relationship (correlation) between separations and performance, the present data provide a more complete description of this relationship, providing more precise estimates of its curvilinearity. Yet, the three fundamental components apply just as well to the present situation.

Our present data provide information about the four-year survival probabilities of these employees, between the years 1984 and 1988. Thus, to remain as close to the empirical data as possible, we will apply the B&B model to a four-year period. We model the investment decision as follows. In 1989, this organization might have chosen pay-growth strategies that would or would not link pay to performance. Each potential strategy would lead to a change in separation and retention patterns over the four years (1990 through 1993). In 1993, after the four-year effects, the organization would possess a work force reflecting the performance distribution caused by the previous pay strategies. Thus, by calculating the change in movement costs, service costs and service value between 1989 and 1993, and assuming that the intervening changes were linear, we can estimate the cumulative effects of a pay strategy over the four-year period. Of course, the B&B model in its purest form would calculate the work force value in each intervening year, apply a discount factor to equalize the time value of the dollar amounts. However, such embellishments would not have a significant effect in this case because the changes in dollar amounts are assumed to be linear, the time frame is relatively short, and our focus is on the relative (versus absolute) value of the different strategies. We also did not have information about the organizational tax rate, so we report our results in pre-tax dollars. After-tax effects could be easily calculated by multiplying the final results by an appropriate after-tax proportion, but the relative effects of the options would not be altered. Thus, we used the results from Table 3 to estimate the changes in the performance distribution over four years under different pay strategies. Then, we attached a dollar value to those changes by calculating the associated movement costs, service costs and service value, as described next.

The Pay Strategies

We chose three pay strategies to span a continuum from very conservative to very aggressive in linking pay to performance. There is little empirical data on the distribution of specific pay-growth policies across pay levels, so we constructed three hypothetical, but realistic, strategies. Each pay strategy was constructed from the actual empirical information in the sample. For each pay category, we calculated the mean and standard deviation of pay growth over the study period. Then, pay strategies were constructed as deviations from the mean. Specifically, Pay Strategy 1 was to give employees in all performance average pay increases over the four-year period. Pay Strategy 2 gave average pay to most employees, but those in the three highest performance categories (performance ratings 4, 4.5 and 5) were given yearly increases equal to one standard deviation above the mean for their respective performance category. Pay Strategy 3 was similar to Pay Strategy 2, except that we added a low-pay component, in which those in the lowest two performance categories (performance ratings I and 1.5) were given yearly pay increases equal to one standard deviation below the mean for their particular performance category.

Table 1
Three Pay Strategies Compared in the Utility Analysis

Performance	1	1.5	2	2.5	3	3.5	4	4.5	5
Employees (1989)	48	78	946	881	1,347	543	256	37	19
Sum	4,155								
1989	$28,490	$29,473	$32,194	$37,437	$39,864	$43,561	$46,385	$41,041	$43,058
Strategy 1	$30,124	$32,105	$37,882	$45,861	$48,404	$53,897	$57,677	$51,326	$54,462
Strategy 2	$30,124	$32,105	$37,882	$45,861	$48,404	$53,897	$64,393	$57,034	$62,982
Strategy 3	$23,476	$26,529	$37,882	$45,861	$48,404	$53,897	$64,393	$57,034	$62,982

Table 1 shows the estimated number of employees at the beginning of 1989. Our data contained only information on the first and final pay levels for employees who were hired between 1983 and 1988, a total sample of 5,143 observations. Thus, our simulated analysis applies to a hypothetical group of employees with six or less years of tenure in this job. To determine the quantity of such employees on the payroll at the beginning of 1989, we calculated the total number of employees on whom we had either first pay levels in 1983 or 1988. This approach removed those employees who did not have a full six-year history, and added those who were newly-hired in 1988, on the assumption that employees with less than a six-year history were probably hired as replacements for leavers, but those hired in 1988 filled existing vacancies. The resulting estimated 1989 work force level was 4,155. To estimate the distribution of this group across the performance categories, we first calculated the total number of sample observations in each performance category, and then multiplied the resulting quantities by the ratio 4,155/5143, or .808. The resulting employee performance distribution is shown in Table 1 and formed the basis of our simulation.

The second row of Table 1 shows the estimated average 1988 pay levels by performance category. These averages were calculated as the mean observed salary in each performance category, across the entire sample period (1983 to 1988), adjusted for inflation to 1989 dollars. The final three rows of Table 1 contain the estimated 1993 salary levels, under each of three pay strategies. For each performance category, "high pay growth" was defined as a series of four pay increases equal to one standard deviation higher than the average for the pay category, and vice versa for "low pay growth". Thus, for each performance category, four times the appropriate yearly pay growth level was added to the 1989 salary level. For example, to calculate the yearly salary level for those in performance category 5 under Strategy 2 or Strategy 3, we took the observed average yearly salary increase for category-5 performers

($2,851), and added the yearly salary increase value equal to one standard-deviation for category-5 performers ($2,130), multiplied the result by four, and added that to the estimated 1989 salary level.

Table 2
Estimated 4-Year Separation Patterns and Movement Cost Under Different Pay Strategies

Performance	1	1.5	2	2.5	3	3.5	4	4.5	5	Sum	Movement Cost
No. Emp. (1989)	48	78	946	881	1,347	543	256	37	19	4155	
Survival Probabilities											
Strategy 1	.11	.63	.58	.81	.79	.84	.77	.80	.34		
Strategy 2	.11	.63	.58	.81	.79	.84	.95	.98	.88		
Strategy 3	.03	.42	.58	.81	.79	.84	.95	.98	.88		
Retained Employees (1993)											
Strategy 1	5	49	549	714	1,064	456	197	30	6	3,070	
Strategy 2	5	49	549	714	1,064	456	243	36	17	3,133	
Strategy 3	1	33	549	714	1,064	456	243	36	17	3,113	
Replaced Employees (1990-1992)											
Strategy 1	43	29	397	167	283	87	59	7	13	1,085	$69.40M
Strategy 2	43	29	397	167	283	87	13	1	2	1,022	$65.37M
Strategy 3	47	45	492	204	350	108	13	1	2	1,042	$66.65M

NOTE: Average cost per movement for the four-year analysis estimated as $63,960, as discussed in the text.

Note that pay levels in both years, and under all pay strategies are generally increasing from the lowest performance rating to the highest, and this pattern is exaggerated in Strategy 2, where high performers receive salary increases one standard-deviation higher than the observed average, and in Strategy 3, where in addition the low performers receive salary increases one standard-deviation lower than the observed average. The one exception to this ordering occurs for those receiving a performance rating of 4.0, whose average pay level is higher than both of the two higher performance ratings in 1993 and in 1989. This was an anomaly in the actual pay data, probably due to past practices. Separation/Retention Patterns

From Table 3 we estimated a vector of four-year survival probabilities, under each pay strategy, for each performance category. These survival probabilities are shown in Table 2. For example, for those with performance ratings of 4.0, the four-year survival probability after 4 years of average pay growth was .77, under high pay growth, the probability was .95, and under low pay growth the probability was .27. To estimate the number of separations and retentions in each performance category, after four years of each pay strategy, the survival probability was multiplied by the starting number of employees in that performance category in 1989, shown in the second row of Table 2. For each pay strategy, The result was the number of employees in each performance category, expected to remain for four years. Multiplying the starting number of employees by one minus the survival probability produced the estimated number of separations over the four years. It was assumed that replacements would be hired for each separating employee (i.e., constant employment levels).

The different pay strategies significantly alter the retention and separation patterns for the affected performance categories, but these extreme performance categories contain relatively small numbers of employees compared to the middle performance categories. Thus, for Strategy 1 (average pay increases), the resulting 4-year separation rate is 26% (i.e., 1,085 separations out of a beginning work force of 4,155). For Strategy 2 the four-year separation rate is 25%. For Strategy 3 the resulting four-year separation rate is also 25%.

Movement Costs

Costs of accommodating separations and replacements were assumed to be a linear function of the number of separations/replacements. Because the number of separations and replacements is assumed to be equal for this analysis, we combined separation and replacement costs, and refer to them simply as "movement costs." An empirical estimate of movement costs for this particular organization was not available, so they were estimated to be 1.5 times the average salary of the workforce in the year of the movement (Cascio, 1991, p. 19). We also assumed that movement costs would not vary with pay strategy, so we estimated average salary assuming average pay growth for all performance categories (Strategy 1). Thus, average cost per movement in 1989 was estimated to be 1.5 times the average 1989 salary level of $38,187, and average cost per movement in 1993 was estimated to be 1.5 times the average salary of the employees retained between 1989 and 1993, assuming that salary increases were given for the four-year period. The 1993 salary levels corresponding to this assumption are shown in the "Strategy 1" row of Table 1, and the number of retained employees in shown in the Strategy 1 row of Table 2. The resulting 1993 average salary estimate was $47,092. We assumed that movement costs increased linearly between 1989 and 1993. Thus, movements in 1990 would cost 1.5 times the average 1990 salary, and so on through 1993. Therefore, over the four years, the average movement would cost 1.5 times the midpoint between the 1989 and 1993 average salary levels. The average cost per movement over the four year period was thus estimated to be $63,960. Total separation/acquisition costs for each pay strategy over the four-year period were calculated by multiplying the number of separations/retentions by this estimated movement cost. Thus, total separation costs for Strategy 1 were $69.40 million, $65.37 million, and $66.65 million for Strategies 1, 2 and 3 respectively, as shown in the last column of Table 2. This is a simplified version of the Boudreau & Berger (1989) cost calculation, which separated acquisition and separation costs, and allowed for variations over time and strategies. Because analyzing different selection or retention activities was not the object of this analysis, we combined the two costs and used an average level.

Service Costs

Service costs reflect the total ongoing costs required to retain and support the workforce, such as pay and benefits (Boudreau & Berger, 1985). Thus, service costs vary with pay strategies, because base pay varies, as do pay-related expenses. Therefore, we first calculated the service costs that would have existed in the 1989 and 1993 work force under each pay strategy, and then assumed linear increases in service costs between 1989 and 1993 to estimate the total service costs incurred under each strategy during the four-year period.

Our data provided little information about the costs of benefits, training or other service costs. Because we focus on differences across pay strategies, it seems likely that the main variance in service costs in this case would occur due to differences in pay policies, and the resulting differences in the performance distribution of the workforce. Therefore, we calculated service costs as salary cost plus benefits, which were assumed to average 35% of salary. This may underestimate total service costs, which would also include training costs and administrative costs supporting the employment relationship, but these latter costs are unlikely to vary with pay strategies, so comparisons between pay strategies are unlikely to be substantively affected.

Service costs were calculated differently for those who were retained versus those who are replaced (Boudreau & Berger, 198), because retained employees carry the effects of prior pay strategies, while the quality and salary of employees hired after 1988 was assumed to be equal to the average of the work force in the year they were hired.

Retained-employee service costs in 1993. For employees retained throughout the four-year analysis, we determined the 1993 salary level for each performance category at the end of the four-year period, under each pay strategy (Table 1). Then, we multiplied this salary level by 1.35 to reflect total service costs, and then multiplied each service cost estimate in each performance category by the projected number of retained employees in each performance category under each pay strategy (Table 2) to obtain the total 1993 service costs for retained employees in each performance category. These products were summed across performance categories to give an overall estimate of the 1993 service costs for those retained from the 1989 work force.

Replacement-employee service costs in 1993. To calculate 1993 service costs for the replacements, we assumed that under all pay strategies, replacements would have been of average quality, and paid the salary level that would have existed if average pay increases had been given over the four-year period (Strategy 1). This was calculated by multiplying the number of retained employees under Strategy 1 in each performance category (Table 2) by the corresponding 1993 salary level assuming average salary increases (Strategy 1 in Table 1), adding the products and dividing by the number of retained employees. The resulting average 1993 salary level was $47,092, as noted earlier. This value was multiplied by 1.35 to estimate the average 1993 annual service cost for each replacement as $63,575. To calculate the total 1993 service costs for replacements hired during the four-year analysis, we multiplied $63,575 by the number of replacements in the 1993 work force under each pay strategy.

Total service costs. 1993 and 1989. To estimate the 1989 service costs levels, we multiplied the 1989 salary level by 1.35, and multiplied this figure by the total number of employees in the work force in 1989 (see Tables 1 and 2), producing a total service cost value of $214.20 million in 1989, as shown in Table 3. To calculate the total 1993 service-cost level we added the service costs for stayers and replacements, using the performance distributions and salary levels from Tables 1 and 2 for the retained employees, and the average service cost for the replacements, under each pay strategy. Results are shown in Table 3.

Table 3
Estimated One-Year Service Costs

	Retained Employees (Cost X Employees = Total)	+	Hired Employees (Cost X Employees = Total)	= Total
1989	$51,552 X 4,155 = $214.20M	+	----------	= $214.20M
1993 Strategy 1	$63,575 X 3,070 = $195.17M	+	$63,575 X 1,085 = $68.98M	= $264.15M
1993 Strategy 2	$64,684 X 3,133 = $202.66M	+	$63,575 X 1,022 = $64.97M	= $267.63M
1993 Strategy 3	$64,472 X 3,113 = $201.54M	+	$63,575 X 1,042 = $66.24M	= 267.79M

Under all strategies there is at least a 23% increase in service costs over the four years, commensurate with increasing pay levels over time. However, Strategies 2 and 3 produce somewhat higher 1993 service cost levels because Strategy 2 retains more high performers, and Strategy 3 also replaces some low performers with average performers.

Four-year service costs. Table 3 shows the one-year service costs. To calculate the four-year stream of service costs, we assumed that service costs increased linearly between 1989 and 1993. Thus, one-quarter of the difference between the 1993 and 1989 service costs levels was assumed to have accrued in each intervening year. For example, for Strategy 1, the service costs levels in years 1989 through 1992 would be: $226.69 million, $239.18 million, $251.66 million, and $264.15 million, respectively. Thus, the total stream of service costs under Strategy 1 is the sum of these four values, or $981.68 million. The corresponding values for Strategies 2 and 3 were $990.37 million and $990.77 million. Comparison of Pay Strategies Based on Total Costs

Total service and movement costs are $1,051.08 million, $1,055.74 million and $1,057.42 million for Strategies 1, 2 and 3, respectively. This pattern of movement and service costs is intuitive. Compared to Strategy 1, which gives all employees average pay increases, Strategies 2 and 3 both pay high-performers more and reduce high-performer separations, increasing service cost. Strategy 3 has higher service costs because lowpaid performers are replaced with higher-paid average performers. As Table 2 shows, movement costs are highest for Strategy 1, lowest for Strategy 2, which retains more high performers, and somewhat higher for Strategy 3, which induces more low performers to leave. In most organizations, it is likely that separation rates or costs might be most visible, favoring Strategy 2. If both movement costs and service costs were apparent, the total cost figures favor Strategy 1 rather significantly (up to six million dollars in four-year cost savings). Service Value

While informative, the cost analysis is not complete. Just as changes in the performance distribution affect service costs, they cause commensurate changes in work force value. Work force value is related to movement patterns through the quality of the acquired and retained employees (Boudreau & Berger, 1985; Boudreau, 1991, Milkovich & Boudreau, 1994). Linking pay to performance increases retention of high performers and decreases retention of low performers, as shown in Table 1. However, the implications of this pattern on the value of the work force is not reflected in the cost calculations. We need to estimate the dollar value of changes in the performance distribution, in order to fully understand the implications of different pay strategies. By attaching dollar values to the different performance levels, we can calculate changes in work force value similarly to the calculations for service costs above.

Our data provide estimates of changes in the performance rating distribution, so a conversion method is required to estimate the dollar value of particular performance levels. This conversion method requires two components (Boudreau & Berger, 1985) -- The value of the average performance level, and the incremental value of deviations from that average performance level.

Dollar value of average performance. There is no single accepted method of estimating the dollar value of average performance among workers or applicants. Some research has suggested that average performance value can be estimated equal to the average compensation of the work group, as in the CREPID method, where an average rating across all dimensions will produce an dollar-valued performance estimate equal to the average wage (Boudreau, 1991, p. 654). Raju, Burke and Normand (1990, p. 9) propose a similar position. However, it seems unlikely that average-performing employees produce only enough value to offset their direct wage costs. Considering the other service costs that are incurred, and the need for organizations to obtain a positive return on costs, a higher level of average service value seems likely. Thus, Schmidt & Hunter (1983) proposed assuming that the ratio of average wage to average dollar value is approximately .57, based on an analysis of wage and productivity estimates in the national income accounts of the U.S. The reciprocal of .57 is 1.754, suggesting that the value of average performance would be 1.754 times the average wage.

Theory and evidence are quite sparse regarding this issue. Fortunately for our analysis, different assumptions about average service value affect the estimated total value of the work force, but the relative work force value under different pay strategies is not affected. These relative values are the key to comparing pay strategy decisions. Therefore, we will use the conservative estimate of average service value as 1.754 times average wage, following the logic of Schmidt & Hunter (1983). For the 1989 work force, we multiplied the average salary by 1.754 to obtain a value of $66,995 per person, per year. For the 1993 work force, consistent with the estimate of average service costs above, we estimated average salary as that which would have been produced by four years of average salary increases, beginning in 1989. Thus, as noted above, average 1993 salary was estimated to be $47,092 producing an average work force value estimate of 1.754 times $47,092, or $82,600 per person, per year.

Dollar value of performance rating categories. We required an estimate of the value of each of the nine performance levels, in both 1989 and 1993, so that as the distribution of employees across performance levels changes, the dollar implications can be assessed. This was different from prior utility analysis applications, which estimated the value of changes in average work force quality, such as the increased average value of a better-selected or better trained group (Boudreau, 1991). This did not require or produce estimates of the dollar value of particular performance levels, nor the distribution of employees among those levels.

Still, some SDy estimation methods can produce dollar-value estimates of different performance levels. For example, CREPID assigns dollar values to different performance dimensions according to their importance, rates each employee on a scale of 0 to 2 on each dimension, multiplies the resulting ratings by the dollar values, and adds the results to create a dollar-valued performance estimate for each employee (Boudreau, 1991; Cascio, 1994). Raju, Burke and Normand (1990, Appendix B) proposed an SDy estimation method that uses managerial judgements to determine the relative value of the highest and lowest performance rating level, estimates the dollar value of average performance, and then mathematically derives an SDy value based on the observed distribution of performance level. In this study, we had no direct estimates of the dollar value of particular performance levels, as is probably typical of many organizational situations. Thus, our estimation approach that can be used without such estimates, but it is consistent with both CREPID and RBN. The method consisted of three steps, each applied to the work force of 1989 and 1993.

First, we estimated the standard deviation of dollar-valued performance (service value), SDy, based on a percentage of salary. As Boudreau (1991) noted, across a large number of studies, 40% of salary proved to be a conservative estimate, compared to estimates derived using other methods. However, in actual situations, the value of SDy is unlikely to be estimated precisely, so we investigated three values: 20% of average salary, 40% of average salary, and 100% of average salary. For 1989, we estimated average salary as $38,187, producing SDy estimates of $7,637, $15,275 and $38,187 for the 20%, 40°/o and 100% levels, respectively. For 1993, estimated average salary was $47,092, producing three corresponding estimated SDy levels of $9,418, $18,837, and $47,092.

Second, we estimated the Z-score corresponding to each of the nine performance ratings, using the observed distribution of employees across performance categories. The average performance rating was 2.76, with a standard deviation of .66. We assumed that the Z-scores for the underlying performance distribution would be the same from 1989 to 1993, because the underlying value function changes only with the job activities, which we assumed were constant. Thus, although the distribution of workers across performance categories changes from 1989 to 1993, we assumed that the relative standardized value of different performance levels did not change. This produced the Z-scores corresponding to each performance rating as shown in Table 4. Multiplying these Z-scores by the appropriate dollar value of a one-standard-deviation performance difference in 1989 and 1993 produced the dollar values corresponding to each performance rating level, for each SDy assumption as shown in Table 4.

Table 4
Service Values Corresponding to Each Performance Level

Performance	1	1.	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Z-Score-2.64	-1.88	-1.12	-0.36	0.39	1.15	1.91	2.67	3.42	
				1989					
Performance	1	1.5	2	2.5	3	3.5	4	4.5	5
SDy=20%	$46,818	$52,622	$58,427	$64,231	$69,958	$75,763	$81,567	$87,371	$93,099
SDy=40%	$26,654	$38,263	$49,872	$61,481	$72,937	$84,546	$96,155	$107,764	$119,221
SDy=100%	-$33,834	-$4,812	$24,211	$53,233	$81,873	$110,895	$139,917	$168,939	$197,580
				1993					
Performance	1	1.5	2	2.5	3	3.5	4	4.5	5
SDy=20%	$57,734	$64,892	$72,051	$79,209	$86,273	$98,432	$100,590	$107,749	$114,813
SDy=40%	$32,870	$47,186	$61,503	$75,819	$89,946	$104,263	$118,579	$132,895	$147,023
SDy=100%	-$41,726	-$5,935	$29,856	$65,647	$100,966	$136,757	$172,548	$208,338	$243,658

The dollar values in Table 4 are more varied as SDy increases. Also, the 1993 values are larger and more varied than 1989 levels, due to the increased average work force value and average salary which, increases SDy levels. Note that under the largest SDy assumption, in both 1989 and 1993, the lowest two performance categories are estimated to actually produce negative service value, due to the large variability in performance value.

Service value of alternative pay policies. 1989 and 1993. For 1989, the total service value of the work force was calculated simply by multiplying the values in Table 4 by the corresponding quantities of employees in each performance category (see Table 1), and adding the products. The total service value of each performance category and the overall total for the work force are shown in Table 5. For 1993, the total service value of the work force was calculated separately for those employees retained over the four-year analysis, and for those hired during the four-year period, similarly to the service-cost calculation earlier. For the retained employees, the 1989 values in the rows of Table 4 labeled SDy=20%, SDy=40% or SDy=100% were multiplied by the quantity of retained employees from Table 2 for each performance category, and these products were summed. Employees hired during the four-year analysis were assumed to have an average value equal to the average work force value that would have been produced by giving average pay increases over the four years. This value was equal to the average 1993 salary times 1.754. This value was multiplied by the number of replaced employees from Table 2. The service value of the replacements and retained employees was added to produce the estimated total 1993 service value for each pay strategy, and each assumed SDy level, as shown in Table 5.

Table 5
Yearly Service Value (Millions of dollars)

Using 1989 Performance Distribution and Dollar Value

Performance	1	1.5	2	2.5	3	3.5	4	4.5	5
SDy=20%	$1.48	$2.84	$39.66	$41.90	$71.60	$31.94	$16.51	$2.61	$1.41
Total									$209.95
SDy=40%	$1.28	$2.98	$47.18	$54.16	$98.25	$45.91	$24.62	$3.99	$2.26
Total									$280.63
SDy=100%	-$1.62	-$0.38	$22.90	$46.90	$110.28	$60.22	$35.82	$6.25	$3.75
Total									$284.12

1993
Assuming that SDy is 20% of average salary, or $7,475

Performance	1	1.5	2	2.5	3	3.5	4	4.5	5
Strategy 1	$2.99	$4.18	$55.33	$54.52	$91.13	$40.16	$20.18	$3.17	$1.41
Total									$273.09
Strategy 2	$2.99	$4.18	$55.33	$54.52	$91.13	$40.16	$21.03	$3.34	$1.73
Total									$274.42
Strategy 3	$3.10	$4.47	$55.33	$54.52	$91.13	$40.16	$21.03	$3.34	$1.73
Total									$274.81

1993
Assuming that SDy is 40% of average salary, or $15,491

Performance	1	1.5	2	2.5	3	3.5	4	4.5	5
Strategy 1	$3.72	$4.71	$66.56	$67.93	$119.08	$54.73	$28.23	$4.56	$1.96
Total									$351.47
Strategy 2	$3.72	$4.71	$66.56	$67.93	$119.08	$54.73	$29.89	$4.87	$266
Total									$354.14
Strategy 3	$3.92	$5.27	$66.56	$67.93	$119.08	$54.73	$29.89	$4.87	$266
Total									$354.90

1993
Assuming that SDy is 100% of average salary, or $38,727

Performance	1	1.5	2	2.5	3	3.5	4	4.5	5
Strategy 1	$3.34	$2.10	$49.18	$60.67	$130.80	$69.55	$38.87	$6.83	$2.54
Total									$363.88
Strategy 2	$3.34	$2.10	$49.18	$60.67	$130.80	$69.55	$43.00	$7.58	$4.31
Total									$370.54
Strategy 3	$3.84	$3.52	$49.18	$60.67	$130.80	$69.55	$43.00	$7.58	$4.31
Total									$372.46

Notice that under all assumptions about SDy, the 1993 yearly service value is lowest when giving all employees average pay increases (Strategy 1), higher when giving high performers high pay increases and all others average increases (Strategy 2), and highest when giving high performers high pay increases, middle performers average pay increases and low performers low pay increases (Strategy 3). This is because, compared to giving all employees average pay increases, Strategy 2 causes more high-performing and highly-paid employees to stay, and their value enhances the work force. Strategy 3 has the same effect on high performers, but it also induces lower performers to leave more frequently, and they are replaced by average performers, producing an additional increment in low-performer service value. Greater SDy levels increase the magnitude of the differences. Yet, even with SDy estimated to be only 20% of average salary, the organization obtains a one year 1993 service value increase of over $1.7 million dollars by adopting the more aggressive pay-for-performance strategy, as opposed to the average growth policy.

Four-year service value. As with service costs, we calculated the four-year stream of service value levels under each pay strategy and each assumed SDy level by assuming that total service value (shown in the column of Table 5) rose linearly between 1989 and 1993, so that one-quarter of the change in service value accrued in each intervening year. Summing this stream of service value levels for each pay strategy and each assumed SDy level produced the values shown in Table 6.

Table 6
Total Four-Year Service Value Levels

(Values in Millions)

	SDy=20%	SDy=40%	SDy=100%
Strategy 1	$1,287.54	$1,299.63	$1,335.88
Strategy 2	$1,290.88	$1,306.29	$1,352.54
Strategy 3	$1,291.83	$1,308.21	$1,357.32

Table 6 reveals that the four-year stream of service value levels grows higher as pay growth is more strongly linked to performance. The difference in four-year service value ranges from $4.3 million when SDy is assumed equal to 20% of average salary, to $21.5 million when SDy is assumed equal to 100% of average salary. Combined Cost and Value: The Payoff from Performance-Linked Pay Growth

We have estimated the three components for this decision: (1) the four-year stream of movement costs, (2) the four-year stream of service costs, and (3) the four-year stream of service value. Now, we combine them to estimate the relative value of the three pay strategies, by taking the stream of service value and subtracting the stream of service costs and movement costs (Boudreau & Berger, 1985). The relevant figures are summarized in Table 7, for each strategy and SDy assumption.

Table 7
Four-Year Investment Value of 3 Pay Strategies
(Values in Millions)

Service Value - Service Costs - Movement Costs = Total Four-Year Value

	Service Value - Service Costs			Movement Costs	Total Four-Year Value		
	SDy=20%	SDy=40%	SDy=100%		SDy=20%	SDy=40%	SDy=100%
Strategy 1:	$305.865	$317.949	$354.201	$69.397	$236.468	$248.553	$284.805
Strategy 2:	$300.503	$315.920	$362.167	$65.367	$235.136	$250.553	$296.800
Strategy 3:	$301.065	$317.439	$366.557	$66.646	$234.419	$250.793	$299.911

These results suggest a different conclusion from the cost analysis presented earlier. Strategy 1, which appeared optimum based on costs, now appears optimal only if one assumes that performance differences are relatively low (SDy = 20% of average yearly salary). If SDy is moderate or high, at 40% or 100% of average salary, Strategy 3 produces a greater four-year value, with the difference potentially as high as $15.1 million when compared to Strategy 1, if SDy is 100% of average salary.

Lessons from The Application: A Future for Utility Analysis?

Synergy and Integration

This utility analysis combines data about compensation and staffing to use an "employee flow" utility model to address a compensation decision. Prior treatments of employee movement utility have often focused on the utility implications of different movement patterns without regard to the investment necessary to induce them. Or, they have treated employee movement as the result of "staffing" activities such as testing, career development or recruiting. This application shows how staffing utility models can be informed by data on the effects of compensation strategies. Such synergies seem typical of the real-world decisions that managers face, and future utility research can provide a framework for understanding them. However, the key is to search for the synergistic opportunities, rather than to compartmentalize utility models by HR functions.

Decision Frameworks, Not Utility Values

The application above also illustrates a key strength of utility analysis -- the ability to explicate and test assumptions. The derived utility values are undoubtedly estimates, and unlikely ever to be verified using objective data. Certainly, traditional accounting systems are ill-suited to recognize the relationships depicted here. Yet, the empirical data (Gerhart, et al., 1995) suggest the relationships are real. The proportional hazards model suggests a specific curvilinear relationship between salary growth and separations. Yet, for most managers, translating a proportional hazards model into compensation decisions is impossible. The utility framework provides a way to make that translation. Without it, managers might well be tempted to ignore the findings, or to base their decisions on the most obvious or immediate outcomes, such as salary or movement costs. As we have seen, if performance variability is moderately high, such decisions would lead to costly mistakes. Thus, it is the decision framework that is key, not the utility values. By explicating relationships that are intuitive but complex, and then incorporating data where possible to define the relationships, utility analysis can form the basis for enhanced understanding, better use of information, and better decisions. Whether the utility values or measures are precise is really secondary to this purpose.

Utility Analysis To Study Managerial Cognition and Learning

The second lesson brings up a third. If the utility framework is indeed useful in creating a bridge between scientific findings, organizational strategic choices, and managerial decisions, we need to know much more about the processes through which such links are formed. To date, no utility analysis research has systematically examined utility analysis models as stimuli for managers' cognitive learning. We simply do not know how utility analysis frameworks might change the way managers think about HR issues. Anecdotes suggest that managers who realize the costliness of employee turnover, or the potential dollar implications of performance variability may think very differently about HR investments. Utility models provide an explicit normative model against which to examine managerial decisions (Boudreau, 1991). There may be great potential in exploring their value as decision aids. To date, researchers have devoted attention to discussing utility models among themselves, and proposing enhancements in response to other researchers. Before we abandon utility analysis, it might be useful to listen to decision makers who receive such information, to determine if the models hold promise for informing us about HR decision processes.

Conclusion

Declaring a moratorium on utility analysis research seems premature at best. Questions of measurement and construct validity will persist, and examining them may offer significant improvements in the validity and accuracy of utility values. However, utility models will always be imperfect as any model of reality. I am suggesting that focusing only on questions of measurement and validity may overlook fundamental value in utility analysis. Such models represent one of the few attempts to explicitly link scientific findings and organizational outcomes. We need to know more about such links. Perhaps research should turn toward examining the value of utility analysis models for this purpose. Perhaps we'll learn how to make our models more accurate by listening to those who must apply them.

References

Abowd, J., Milkovich, G.T. & Hannon, J. (1990). Human Resource management decisions: Assessing their effects on shareholder value. Industrial and Labor Relations Review.

Arthur, J. B. (1994). Effects of Human Resource Systems on Manufacturing Performance and Turnover, Academy of Management Journal, 35, 670-687.

Bobko, P., Shetzer, L. & Russell, C. (1991). Estimating the standard deviation of professors' worth. Journal of Occupational Psychology, 64, 179-188.

Boudreau, J. W. (1991). Utility analysis for decisions inhuman resource management. Chapter 10 in M. Dunnette & L. Hough (Eds.) Handbook of industrial and organizational psychology, 2nd ed., vol. 2, 621-745.

Boudreau, J.W. & Berman, R. (1991). Using performance measurement to evaluate strategic human resource management decisions: Eastman Kodak's experience with profit sharing. Human Resource Management Journal, 30, 393-410.

Boudreau, J. W. & Berger, C. J. (1985). Decision-theoretic utility analysis applied to external employee movement [Monograph]. Journal of Applied Psychology, 70, 581-612.

Boudreau, J. W. & Milkovich, G.T. (1994). Human Resource Management (7th ed.). Homewood, IL: Richard D. Irwin.

Boudreau, J.W. & Rynes, S. L. (1986). The role of recruitment in staffing utility analysis. Journal of Applied Psychology, 70, 354-366.

Burke, M.J. (1985). An investigation of dimensions employed and percentile ordering effects in estimating performance standard deviations in dollars for clerical occupations. Unpublished manuscript.

Cascio, W. F. (1991). Costing human resources (3rd ed.) Boston: Kent.

Cronbach, L. J. & Gleser, G. C. (1965). Psychological tests and personnel decisions (2nd ed.). Urbana: University of Illinois Press.

Dumaine, B. (1995). Why great companies last, Fortune, January 16, 129.

Florin-Thuma, B. & Boudreau, J.W. (1987). Performance feedback utility in a small organization: Effects on organizational outcomes and managerial decision processes. Personnel Psychology, 40, 693-713.

Gerhart, B., Boudreau J.W. & Trevor C. O. (1995). Voluntary turnover performance, salary growth, and labor market conditions. Presented at the National Meeting of the Academy of Management, August, Vancouver.

Gerhart, B. & Milkovich, G. T. (1992). Compensation theory and practice. Chapter 9 in M. Dunnette & L. Hough (Eds.) Handbook of industrial and organizational psychology, 2nd ed., vol. 3, 481-570.

Ghoshal, S. & Mintzberg, H. (1994). Diversification and diversifact, California Management Review, 37, 8-27.

Halal, W. E. (1993). From hierarchy to enterprise: Internal markets are the new foundation of management". Academy of Management Executive, 8, 69-83.

Hannon, J. & Milkovich, G.T. (1995). Does HR reputation affect shareholder value? Unpublished manuscript.

Hunter, J.E., Schmidt, F.L. & Coggin, T. D. (1988). Problems and pitfalls in using capital budgeting and financial accounting techniques in assessing the utility of personnel programs. Journal of Applied Psychology, 73, 522-528.

Huselid, M.A. (in press). The impact of Human Resource management Practices on Turnover, Productivity and Corporate Financial Performance", Academy of Management Journal.

Lancaster, H. (1995). Re-engineering authors reconsider re-engineering, The Wall Street Journal, January 7, B1.

Latham G. & Whyte, (1994)

MacDuffie, J. P. (1995). Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry, Industrial and Labor Relations Review, 48, 197-221.

Murphy, K. (1986). When your top choice turns you down: The effect of rejected offers on the utility of selection tests. Psychological Bulletin, 99, 133-138.

Raju, N.S., Burke, M. J. & Normand, J. (1990). A new approach for utility analysis. Journal of Applied Psychology, 75, 3-12.

Rau, J. (1994). Nothing succeeds like training for success, The Wall Street Journal, September 12, A16.

Schmidt, F. L. & Hunter, J. E. (1993). Individual differences in productivity: An empirical test of estimates derived from studies of selection procedure utility. Journal of Applied Psychology, 68, 407-414.

Tichy, N. (1993). Control Your Destiny or Someone Else Wi11.Excerpted in "Jack Welch's Lessons for Success", Fortune, January 25, 1993, pp. 86-93.