Cornell University
ILR School

Cornell University ILR School
DigitalCommons@ILR

CAHRS Working Paper Series

Center for Advanced Human Resource Studies (CAHRS)

10-1-2002

Strategic I/O Psychology and the Role of Utility Analysis Models

John W. Boudreau
Cornell University

Peter M. Ramstad
Personnel Decisions International

Follow this and additional works at: http://digitalcommons.ilr.cornell.edu/cahrswp

Part of the Human Resources Management Commons

DigitalCommons@ILR is celebrating its 10th anniversary!
Please share your DigitalCommons@ILR story!

This Article is brought to you for free and open access by the Center for Advanced Human Resource Studies (CAHRS) at DigitalCommons@ILR. It has been accepted for inclusion in CAHRS Working Paper Series by an authorized administrator of DigitalCommons@ILR. For more information, please contact hlmdigital@cornell.edu.

Strategic I/O Psychology and the Role of Utility Analysis Models

Abstract
In the 1990's, the significance of human capital in organizations has been increasing,and measurement issues in human resource management have achieved significant prominence. Yet, I/O psychology research on utility analysis and measurement has actually declined. In this chapter we propose a decision-based framework to review developments in utility analysis research since 1991, and show that through lens of this framework there are many fertile avenues for research. We then show that both I/O psychology and strategic HRM research and practice can be enhanced by greater collaboration and integration, particularly regarding the link between human capital and organizational success. We present an integrative framework as the basis for that integration, and illustrate its implications for future research.

Keywords
measurement, performance, HR, work, talent, finance, market, customer, science, human capital, research

Disciplines
Human Resources Management

Comments
Suggested Citation
Boudreau, J. W. & Ramstad, P. M . (2002). *Strategic I/O psychology and the role of utility analysis models* (CAHRS Working Paper #02-16). Ithaca, NY: Cornell University, School of Industrial and Labor Relations, Center for Advanced Human Resource Studies.
http://digitalcommons.ilr.cornell.edu/cahrswp/57

This article is available at DigitalCommons@ILR: http://digitalcommons.ilr.cornell.edu/cahrswp/57

CAHRS

Center for Advanced Human Resource Studies

WORKING PAPER SERIES

CAHRS / Cornell University
187 Ives Hall
Ithaca, NY 14853-3901 USA
Tel. 607 255-9358
www.ilr.cornell.edu/CAHRS/

Strategic I/O Psychology and the Role of Utility Analysis Models

John W. Boudreau
Peter M. Ramstad

Working Paper 02 - 16

CORNELL ilr School of Industrial and Labor Relations

Strategic I/O Psychology and the Role of Utility Analysis Models

Professor John W. Boudreau
Department of Human Resource Studies, ILR School
Director, Center for Advanced Human Resource Studies (CAHRS)
Cornell University
187 Ives Hall
Ithaca, New York 14853-3901
http://www.ilr.cornell.edu/CAHRS/boudreau_john.html
P: 607-255-9358
Voice-mail: 607-255-7785
F: 607-255-4953
jwb6@cornell.edu

Peter M. Ramstad
Executive VP, Strategy and Finance
Personnel Decisions International
45 South 7th Street, Suite #2000
Minneapolis, MN 55402
Phone: (612) 373-3424
Fax: (612) 337-3695
Pete.Ramstad@personneldecisions.com

October 16, 2001

http://www.ilr.cornell.edu/cahrs

This paper has not undergone formal review or approval of the faculty of the ILR School. It is intended to make results of Center research available to others interested in preliminary form to encourage discussion and suggestions.

Abstract

In the 1990's, the significance of human capital in organizations has been increasing, and measurement issues in human resource management have achieved significant prominence. Yet, I/O psychology research on utility analysis and measurement has actually declined. In this chapter we propose a decision-based framework to review developments in utility analysis research since 1991, and show that through lens of this framework there are many fertile avenues for research. We then show that both I/O psychology and strategic HRM research and practice can be enhanced by greater collaboration and integration, particularly regarding the link between human capital and organizational success. We present an integrative framework as the basis for that integration, and illustrate its implications for future research.

Final Chapter to appear in the forthcoming:
Handbook of Industrial and Organizational Psychology,
Walter Borman, Richard Klimoski & Daniel Ilgen (eds.).
New York: John Wiley and Sons.

Copyright © 2001 John W. Boudreau and Peter M. Ramstad (PDI).
All rights reserved Version 10-16-01

Comments Welcome.

STATEMENT OF CONFIDENTIALITY

This manuscript is unpublished copyrighted work containing trade secret and other proprietary information of John W. Boudreau and Peter M. Ramstad. This copy has been provided on the basis of strict confidentiality and the express understanding that it may not be reproduced without express permission from Boudreau and Ramstad.

Strategic I/O Psychology and the Role of Utility Analysis Models

Introduction

The beginning of the 21st century poses an interesting paradox for I/O psychology and strategic HR management. Leading I/O psychology journals, especially in the U.S., have reduced attention to utility analysis at a time when the quantitative measurement of human capital is receiving unprecedented attention.

First the good news. The accounting and management professions recognize that traditional corporate measurement systems must be enhanced to account for intangibles in a knowledge-based economy (Brookings Institute 2000; Canibano, Garcia-Ayuso & Sanchez, 2000; Lev, 1997). Strategic human resource management writers have noted the importance of understanding the value of human capital (e.g., Boudreau & Ramstad, 1999; Lepak & Snell, 1999). Consulting firms increasingly offer products designed to measure or demonstrate the relationship between human resource programs and financial value (Fitz-enz, 2000; Grossman, 2000; Stamps, 2000). Yet, much of this focus is on developing new measures with relatively less attention to frameworks for decision support. As Boudreau (1998) noted, there is disturbing evidence that financial analysts face significant difficulties in using HR measures (Eccles & Mavrinac 1995; Low & Seisfeld 1998; Welbourne & Andrews, 1996). Who better than professionals in I/O psychology to offer solutions drawing on the long heritage of measurement development?

Now the bad news. I/O psychology has largely missed the opportunity to frame and inform this growing and important debate. The last decade has actually seen a decrease in attention to utility analysis, in contrast to the increasing research in the 1980's and early 1990's, that began with the resurgence of interest prompted by work by Cascio, Schmidt and their colleagues (Cascio & Silbey, 1979; Schmidt, Hunter, McKenzie & Muldrow, 1979). Boudreau's (1991) review identified more than 40 studies in the area, including 28 studies published

between 1979 and 1990 solely focusing on the issue of estimating *SDy*, the standard deviation of performance in dollars! Since 1991 there has been a noticeable decrease in attention to utility analysis. For this chapter, we searched for research since 1991, and identified 13 articles in Personnel Psychology and Journal of Applied Psychology. Certainly, articles on utility analysis have appeared in other outlets, and there has even emerged a journal entitled Human Resource Costing and Accounting, published by the Personnel Economics Institute in Stockholm, Sweden.

Perhaps this pattern reflects the irrelevance of utility analysis to the measurement of human capital and human resources. We will suggest a different conclusion based on the convergence between utility-analysis research issues and strategic human resource management issues. These issues are traditionally addressed by I/O psychology, and create an unprecedented opportunity for integrative research that draws on the best of these fields. However, such integration requires a new emphasis in utility analysis and I/O psychology research, as well as a perspective on human resource strategy that better encompasses the logic of utility analysis.

The original working title of this chapter was "Cost-Benefit Analysis for I/O Psychological Interventions." Typically, such chapters discuss how to estimate the payoff from I/O interventions, after the fact. We believe that integrating the tools and paradigms of I/O psychology with emerging models of strategic HR management, is much more fundamental than refining cost-benefit techniques. Such an integration actually suggests that utility analysis logic may be most valuable in identifying opportunities for strategic I/O psychology contributions *before* choosing interventions. It will draw heavily upon not only I-O psychology principles, but also elements of organizational strategy (Porter, 1985). Hence, the title of "strategic I/O psychology."

We will review developments in utility analysis research since 1991, but we will take as a departure point the fundamental idea of decision support. Decision support is also a familiar theme in utility analysis, and has been repeatedly emphasized (Boudreau, 1991; Boudreau,

Sturman & Judge, 1994; Boudreau & Ramstad, 1999; Skarlicki, Latham, & Whyte, 1996; Cascio, 1996; 1999; Arvey & Murphy, 1999). Here, we use the framework to highlight the key I/O and strategy linkages, and to suggest future integrative research.

Then, we will take a perspective that is more prescriptive, showing how the logic and methods of utility analysis actually provide the mechanisms for I/O psychology to become more strategic, and to assist strategic human resource management in becoming more operationally rigorous. As it turns out, the kernels of this integration existed in the utility analysis logic all along, but largely unrecognized. We will address the "criterion problem" in *SDy* research (Arvey & Murphy, 1999, p. 161) from a decision-based perspective, as an alternative to the traditional I/O focus on measurement and statistical assumptions, and show how the decision-based perspective reveals opportunities to capitalize on the links between human capital and organizational success. We will present a model, HC Bridge™, that links human capital and organizational performance, and show how it suggests new directions for I/O research on utility analysis estimation, acceptance, and decision-making. We will then address *SDy* measurement from the strategic perspective, to show how *SDy* addresses a fundamental gap in human resource strategy.

Utility Analysis as a Decision Process: A Review Since 1991

Several authors have described utility analysis research since 1991, each summarizing the basic utility analysis equation, the continuing debate regarding measurement, and recent enhancements to the utility model (e.g., Cabrera & Raju, 2001). The more fundamental impression, however, is that although each review took a different approach, they all arrived at a similar conclusion – a return to the fundamental process of decision-making is essential to advancing the field.

Boudreau (1991, 1996) proposed that utility analysis measurement was founded on two premises: (1) Measures will lead to more rational and productive choices about people; and (2) Measures will convince others to support and invest in human resource management programs. Landy (1989) noted that a significant gap was the lack of information on how managers actually

use information in making decisions. Boudreau, Sturman and Judge (1994) suggested that future selection research should focus on how recruiters, managers and employees make actual decisions throughout the selection process. Many have suggested that drawing on theories of decision-making and decision processes as key to enhancing the relevance of utility analysis research (Boudreau, 1991, 1996; Highhouse, 1996; Skarlicki, Latham, & Whyte, 1996). Boudreau & Ramstad (1997, p. 79) noted that "metrics are not neutral" because they convey values, priorities and an underlying strategic framework, suggesting that the strategic framework used to organize and articulate measurement linkages was key to understanding decisions.

The Importance of Decision Science -- "Talentship"

HR metrics are commonly evaluated by asking key decision makers if they like the HR measures, or if the HR measures seem "businesslike." Yet, it would seem rather ludicrous to assess the financial analysis framework by asking whether business leaders liked it (in fact, if they miss their numbers, they are likely to hate it!). Why do HR and I/O focus so strongly on client opinions about measures, while finance focuses on the outcomes of the measures? The finance profession has created a system that is so logically connected to key organizational outcomes, and so clearly able to improve important decisions about financial capital, that it is an accepted metaphor for the business organization, even when its message is unpleasant (Boudreau & Ramstad, 1997). Information is valuable if it improves important decisions in an uncertain world (Bazerman, 1998; Bierman, Bonnini, & Hausman, 1991). Similarly, the key outcome of any human capital information system is its ability to enhance decisions, in this case decisions about human capital (Boudreau, 1995). It is the logic, richness and relevance of our frameworks for understanding human capital that is the key. The professional practice of Accounting is essential for organizations, but it is the decision science of Finance that draws on accounting measurements to support decisions about financial capital. Similarly, the professional practice of human resource management is essential, but the decision science of human capital will integrate human resource management practices and measures to create a

decision framework for human capital. We have coined the term "Talentship" to refer to this emerging decision science (Boudreau & Ramstad, 2000). Thus, as Finance is to Accounting, so Talentship is to Human Resource Management. This chapter will not develop the decision science of talentship, but we propose to show how I/O psychology and utility analysis can play a significant role.

A Decision Process Lens

We will organize our review of the utility analysis literature according to a seven-step decision process: (1) Learn, Assess and Sense Patterns; (2) Identify and Gather Appropriate Data (3) Analyze and Identify Key Messages; (4) Design Summaries and Prescriptions; (5) Present Summaries and Prescriptions; (6) Influence Key Human Capital Decisions; and (7) Affect Execution and Behavior Change.

Learn, Assess and Sense Patterns

This stage reflects how individuals perceive talent issues and decide to attend to them. In the field, we encounter this as the "inklings" that certain talent issues are important: The HR manager who says, "We seem to be outsourcing all the work of our non-exempt employees to cut costs, but those folks are pretty important to our competitiveness, and we can do a better job of nurturing their contributions internally, than an outside company. The cost reductions of outsourcing are tangible, and I can't demonstrate with numbers, but I think we're throwing out the baby with the bath water." This is a fertile area for I/O psychology to play a key role in helping to understand how problems are identified in the first place, long before data are gathered and models are applied. How do decision makers learn which patterns to attend to?

There is little research in the utility analysis area *per se* on these issues. Research questions would include what cues are most salient to different organizational decision makers, and what factors contribute to their decisions to attend to them. This is important, because the lack of well-accepted paradigms for human capital decisions probably leads to a wide variety of attention patterns. For example, some may focus on cost reduction, whereas others focus on complaints from key managers; still others take their initial cues from news stories or reports of

best practices. These different starting points may significantly affect later stages of the process.

A frequently mentioned body of research in this area has to do with fads, fashions and the issue of "technical versus administrative" decisions. It has been noted (Boudreau, 1996; Skarlicki, et al., 1996) that the literature on diffusion of new practices may be useful in understanding the *impact* of utility analysis, and we will return to that later. The same literature may help understand the pre-impact stages of decision-making. Johns (1993) and Abrahamson (1991, 1996) questioned the assumption of rational cost-benefit analysis in adopting innovations, suggesting that such decisions are driven by fashions and fads. I/O research might fruitfully explore whether decision makers rely on the imitation of recognized industry leaders or "gurus" as their starting point for decisions, rather than on a rational examination of the decision issue. Johns' (1993) "technical" versus "administrative" distinction is also useful, because it suggests why decision makers may approach human capital through analysis or through opinion, and this significantly affects the information they attend to. Another rich source of ideas can be found in the persuasion literature. Boudreau (1996) noted that persuasion models (e.g., Petty & Cacioppo, 1984; Quinn, Hildebrandt, Rogers & Thompson, 1991; Reardon, 1991; Perloff, 1993) offer insights into factors affecting the reactions of utility analysis "receivers and senders." These theories suggest what variables may affect the cues that are relevant at the early stages of decisions, and how to predict and influence them.

A fascinating example of this phenomenon can be found in emerging research on the cognitive processes underlying the much-touted finding that objective financial measures are associated with managers' self-reports of their firm's number or pattern of human resource practices (e.g., Becker & Huselid, 1998; Huselid, 1995). Recent results indicate that when students and managers are told that hypothetical firms have strong financial performance, their subsequent estimates of the prevalence of HR practices are higher (Gardner, Wright & Gerhart, 2000). This tantalizing, if preliminary, data that suggests how mental maps may affect the prior

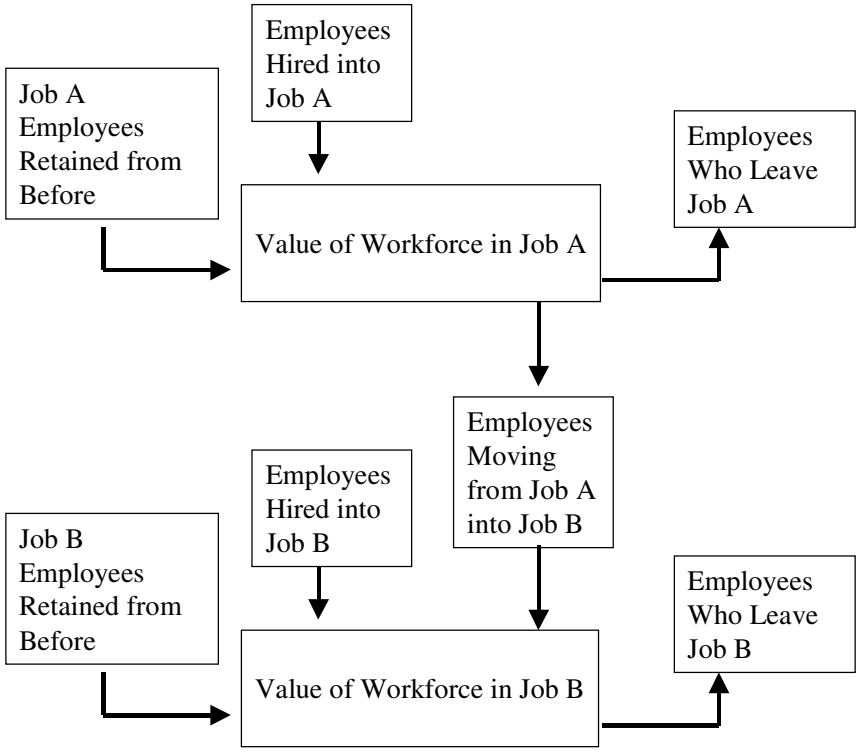
assumptions of decision makers, and it seems likely that such mental maps also affect how decision makers attend to cues that initially structure their data gathering.

Identify and Gather Appropriate Data – Extensions and New Applications of Utility Models

This stage includes deciding what model will guide data-gathering, and adoption of one model over another. Today, there are many models available, each implying a particular array of necessary data. Model design and choice has received a great deal of attention in the utility analysis literature. Prior to 1991, the selection utility framework evolved from a focus on variance explained, to calculating the expected standardized increase in criterion scores, given a certain validity and selection ratio, to translating those standardized values into dollar values, with offsetting costs (Boudreau, 1991; Schmidt & Hunter, 1998). The selection utility model was extended to encompass recruitment, employee flows, financial and economic considerations; labor market effects on offer acceptance patterns, etc. (e.g., Boudreau, 1983; Boudreau & Rynes, 1985). Each embellishment presented new implications for data gathering and analysis. Perhaps the resulting complexity is a drawback of utility analysis (Rauschenberger & Schmidt, 1987). We will return to this issue later. Here, we will summarize the extensions and data requirements of utility analysis model since 1991, and then examine the emerging research on the determinants of choices among decision models.

Extending utility models to downsizing and internal movement. Utility analysis models have been extended to encompass elements of employee retention and internal movement. Figure 1 depicts the underlying concepts. Traditional models focused primarily on the quality of employees hired into a job (the top box of Figure 1). Subsequently, the number of employees leaving the job was included. Boudreau & Berger (1987) introduced parameters reflecting the number and quality of employees who leave the organization, suggesting that the workforce at any time is a function of those retained from before, and those added. This is shown in the bottom half of Figure 1. Each arrow would represent a flow of employees, value and associated costs. See Boudreau and Berger (1985) and Boudreau (1991) for details. They also noted, that this concept could be extended by considering movement between jobs as simultaneous "internal turnover" from the source job, and "internal selection" by the destination job.

Figure 1
Acquisition, Separation and Internal Movement Utility



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

Mabon (1996, 1998) applied this logic to downsizing decisions. He showed that the true value of downsizing depends significantly on the correlation between pay, tenure and employee value. For example, if highly-paid employees are also the most valuable, layoffs designed to maximize cost reduction with minimum headcount reductions (laying off the highest-paid employees) may have unseen but devastating effects on overall value. Barrick & Alexander (1991) applied Markov movement and survival probabilities to account for employees who leave the work group that they are selected into, but do not leave the organization.

Extending the utility model to reflect probationary hiring. DeCorte (1994; 1997; 1998) applied the Boudreau-Berger retention model to a "probationary period," where acquired employees may later be dismissed if performance is not satisfactory. Applying this model requires that decision makers estimate the proportion of new hires expected to survive the probationary period, as well as the costs of training and maintaining new employees, and the average expected value of those who survive the probationary period. By assuming predictor scores and performance ratings have a linear bivariate-normal distribution, DeCorte derived the predicted success rate from the performance cutoff score, and the average value of the surviving group from the correlation between performance ratings and selection scores, along with an estimate of the average dollar value of the applicant population. Results suggest when unsatisfactory employees can be dismissed after probation; the overall attained workforce value can be enhanced. Paradoxically, the incremental utility of a more valid selection is *lower* with a probationary period, because the probationary period provides the opportunity to correct selection mistakes from less-valid, and presumably less-costly alternative predictors. This also means that traditional selection utility model will overestimate utility when selection mistakes can be systematically corrected through later dismissal.

DeCorte (1998) also noted that it is possible to estimate optimal criterion and test score cutoff levels, that can include both an optimal "immediate rejection" level and an optimal "immediate acceptance" level (for those whose initial qualifications are so high that additional screening is not optimal). The notion of optimizing, rather than simply evaluating results, is intriguing. Rather than using utility models merely to estimate the value of alternatives, decision makers might calculate optimal decision parameters, and then attempt to achieve them. For example, De Corte (1998 b) noted that one optimal solution required hiring 66 new employees to eventually end up with 17, which might at first have seemed an excessive probationary turnover rate. The utility model used (in this case choosing optimization rather than simple evaluation) determines the kind of data gathered, and the decision approach, again showing the importance of approaching utility analysis through a decision framework.

Updating the "classification" problem. The "classification" decision is where one is not merely selecting applicants for one position, but instead assigning applicants to one of several different positions. This issue has been discussed since the early days of utility analysis (Brogden, 1949), but since 1991 there have been some new developments. Alley & Darbyk (1995) and DeCorte (1998) provide methods to calculate the expected benefits of personnel classification decisions when it is assumed that selection criteria are equally correlated and equally valid, that equal numbers are to be assigned to each classification, and that the jobs are all equally important. DeCorte (2000) relaxed the assumptions of equal validities, equal correlations, and equal assignments, and added the assumption of an infinitely-large applicant set. Results suggest that the benefits of testing applied to classification may be significantly higher than using tests for more typical one-position selection. With enhanced computing power, one can envision optimally combining multiple predictors to assign applicants among multiple positions. Labor shortages and flexible roles may mean that classification better fits the reality of selection than the more studied situation in which applicants are selected for one job. For example, organizations might systematically consider each applicant's most appropriate role, rather than simply their fitness for a particular assignment. Again, the choice of the decision model fundamentally changes the entire process.

Utility analysis for pay decisions. The Boudreau & Berger (1985) acquisition-retention framework has been used to evaluate pay strategies through their effect on employee movement. Klass & McClendon (1996) examined the decision to lead, lag or match the market. Like Rich & Boudreau (1987) and Sturman (2000), they gathered parameter information from published studies, and simulated effects on employee separation and offer acceptance patterns. Results for bank tellers suggested that a lag policy produced higher payoffs, although "leading the market" (paying higher than the average) did enhance retention and attraction of top candidates. The authors noted that these results did not advocate for a particular pay policy, and showed how simulated reductions in citizenship behavior due to low pay might change the results. Boudreau, Sturman, Trevor and Gerhart (1999) also examined compensation utility

using the Boudreau & Berger (1985) model. Like Klass & McClendon (1996), they simulated effects on retention patterns, but focused on a different pay element -- performance-based pay. Their simulation, based on earlier results on compensation and turnover from a large private-sector organization (Trevor, Gerhart & Boudreau, 1997), suggested that the payoff from performance-based pay is significantly higher when performance variability has large dollar values, with payoff actually being negative when applied to low-variability employee populations. These applications suggest that choosing to examine pay decisions through the lens of a model of employee attraction and retention might yield very different conclusions from an analysis using simply market compensation comparisons or costs.

Utility analysis applied to training, quality circles, and employee day care. Applications of utility analysis to decisions other than employee selection, retention and pay suggest further embellishments of the utility framework. Morrow, Jarrett & Rupinski (1997) estimated the utility of a variety of training programs and populations in a single organization over a four-year period. They estimated traditional utility parameters (e.g., effect size, number trained, duration of effect and dollar value of variability in performance), along with a new parameter designed to reflect the proportion of relevant job skills affected by a particular training program. The study is unique in estimating the utility of many programs in one organization. Barrick & Alexander (1992) found a positive effect of a one-year quality-circle intervention at a large bank in the Midwest U.S., using utility calculated as the combined effects on turnover, absenteeism and overtime. Kossek & Grace (1990) estimated a positive utility effect for a day care center, using reduced turnover, absence and enhanced public relations.

Some “black boxes” in the utility model. Boudreau, Sturman & Judge (1994) summarized a number of factors that might alter selection utility values or explain decision maker reactions to utility analysis, including: (1) existing predictors that will be retained, when adding new ones (see also Burke & Frederick, 1986; Raju & Burke, 1993); (2) temporal changes in validity; (3) multidimensionality in criteria that may make performance ratings used alone less representative of all valued outcomes; (4) employee movement between positions; (5) multi-

attribute criterion definitions; and (6) unacknowledged costs, such as increased training, pay or bureaucracy (see also Jones & Wright, 1992). Russell, Colella & Bobko (1993) argued for a strategy-utility link, with examples showing that the timing of utility benefits may significantly affect their value. For example, if a start-up organization must show a profit within a year or go out of business, "projected" utility gains beyond one year have little strategic value. Such short time windows can also be accommodated by increasing the discount rate on future returns (Boudreau, 1983), but the more direct decision link suggested by Russell, et al. may be more understandable.

The confidence interval and potential variability in utility estimates. Sturman's (2000) computer simulation evidence indicated that applying suggested adjustments to the traditional utility model in combination can produce substantial reductions (sometime in excess of 90%). He noted the need to consider the situational context when estimating utility, and that if line managers or other constituents are aware of the potential effects of such adjustments, they may be understandably skeptical about unadjusted utility values. Variability in utility estimates had been examined prior to 1991 (e.g., Alexander & Barrick, 1987; Rich & Boudreau, 1987), but recently DeCorte (2000) returned to this issue, noting that the expected average standardized criterion score of those selected -- traditionally estimated using the selection ratio and validity coefficient -- is actually the limiting case that assumes infinitely many applicants are available. De Corte (1998 a, b; 2000) provided formulas to calculate a point estimate and confidence interval that reflects a finite number of applicants. Russell (1998) noted that the typical assumption that the validation criterion (usually performance ratings) and the dollar value of employees have a correlation of 1.0 is likely to be violated (e.g., DeNisi, 1996). Using a correction formula from McNemar (1962), he showed that even when observed sample correlations are high, the range of possible unobserved true correlations can be very large. For example, the true correlation between employee value and selection test scores can range between –0.02 to +1.00 even when the true correlation between the selection test scores and performance ratings is .70 and the true correlation between performance and employee dollar

value is also .70. Becker & Huselid (1992) derived a similar result for regression analysis, showing that a measured regression coefficient will overstate the true regression coefficient the higher the predictor correlations and the lower the reliabilities (p. 230). This suggests that decision makers and researchers should incorporate wider confidence intervals into their utility assessments, as they consider the risk and return to I/O intervention investments.

Summary. Recent years have seen new utility analysis applications, but also new cautions and adjustments. With the work prior to 1991, a wide array of models and parameters is available. In one way, this bodes well for future utility analysis applications. The enhanced computing power and mathematical logic of new models, and their application to a wider variety of HR interventions, suggests that more precise and sophisticated analysis is feasible for many more decision makers. On the other hand, the sheer volume of parameters and models can be daunting to even the most motivated and informed user. This highlights the importance of understanding the processes that do (and should) guide decision makers to choose one model or analytical approach versus another. Little research explains how to improve decision-makers' ability to understand and appropriately choose among this increasing set of options, nor when richer utility models are actually likely to enhance the ultimate human capital decision. We turn to this issue next.

Identify and Gather Appropriate Data – The Processes of Choosing an Analysis Approach

This stage of the process involves choosing which analysis approach will be used. Each new application, more precise model, or way to overcome limitations, implicitly or explicitly suggests that the prior absence of these embellishments may explain the failure to use or believe utility analysis results. This is a different question than the persuasive effect or acceptance of utility analysis *after* the model has been applied and results are presented, which has received much attention that we will discuss later. Here we focus on research examining why utility analysis is not more widely applied and reported as well as the potential effects at the point at which decision makers choose what frameworks they will use.

Macan & Highhouse (1994) surveyed American HR professionals and psychologists, who reported that their managers were seldom aware that HR activities could be justified in dollar terms, despite their interest in the impact of HR on the bottom line. Florin-Thuma & Boudreau (1987) provided an early study that actually examined the views of managers who had chosen not to implement performance feedback. They found that managers had underestimated how far employee performance fell below standards, and thus underestimated the potential insights from analyzing performance feedback. After receiving the utility analysis, these same managers reported finding the results compelling, in part because they corrected misconceptions about the impact of the performance problem. Several authors have noted the persuasive value of involving decision makers in the early stages of utility model development; advocates of multi-attribute utility (MAU) approaches derive key dimensions directly from the users (e.g., Roth & Bobko, 1997; Roth, 1994). How to induce or encourage that involvement remains relatively unexamined.

Roth, Segars & Wright (2000) provide one of the most explicit treatments of the decision to adopt utility models. They proposed that utility analysis "acceptance" is affected in part by processes in the "pre-use" stage, prior to conducting the utility analysis. They use Image Theory to suggest how decision makers may evaluate analysis approaches according to their "value image" (criteria for moral correctness), "trajectory image" (the goals of the decision), and "strategic image" (the tactics for achieving the goals). They note the possible effects of prior decision-maker experience or success with decision models, including whether the models match broad screening criteria, such as awareness, confidence, and political or emotional factors. Results from Macan & Highhouse (1994) support the premise that familiarity with utility analysis affects impressions of it. This stage of the process remains relatively unexplored, yet may provide fertile ground for understanding how to enhance decision quality, and explain the adoption patterns of analytical models.

Analyze the Data and Identify the Key Messages: The Array of Alternatives to Utility Analysis

This stage of the decision process involves applying the chosen model, analyzing the data as the model directs, and determining the implications or messages in the analysis. Certainly, the earlier review of emerging utility model embellishments is relevant here, because those models imply certain key messages. While attention to developments regarding utility analysis models is important, decision makers are now faced with an array of alternatives that goes well beyond utility analysis models. This growing array of choices presents an important context as decision makers interpret the data they gather, and provide a perspective on the advantages and limitations utility analysis models generally. In Table 1 we summarize the available measurement alternatives discussed in this section.

Table 1
HR Measurement Alternatives

Measurement Approach	Illustrative Measurements	References	Observations
Traditional Evaluation of HR Programs	New-hire skills, trainee knowledge, changes in attitudes, turnover levels	Textbooks on experimental design, as well as research reports of program effects	A rich source of information on program effects, but statistical results are not easily translated to reflect organizational goals. Statistical presentations may be daunting to many organizational constituents.
Utility Analysis for Specific Programs	Knowledge, skills, performance assessments, transformed to dollar values and offset with estimated costs	Boudreau (1991); Cascio (2000); Boudreau & Ramstad (2001, this chapter)	Wide array of approaches estimating the payoff from human resource program investments. Useful logic and rigor, but the complexity and assumptions may reduce credibility and usefulness.
Financial Efficiency Measures of HR Operations	Cost-per-hire, time-to-fill, training costs	Cascio (2000); Fitz-enz (1995; 1997)	Compelling explicit dollar-value calculations and comparisons, but may over-emphasize human capital cost relative to value.
HR Activity and "Best Practice" Indexes	"100 Best Companies to Work For," Human Capital Benchmarks	Becker & Huselid (1998); Delery & Doty (1996); Huselid, Jackson & Schuler (1997); Ichniowski et al. (1997)	Focus on specific HR activities provides a useful link to specific actions. Tantalizing results showing that HR practices correlate with financial outcome measures. Causal mechanisms and direction may be unclear, leading to incorrect conclusions and actions.

Measurement Approach	Illustrative Measurements	References	Observations
Multi-Attribute Utility (MAU)	ProMES applied to HR programs, specific MAU models built for particular organizations	Roth (1994); Roth & Bobko (1997).	Useful method for explicating the underlying value dimensions. Can incorporate non-linearities and non-dollar outcomes. The participant requirements can be daunting. Generally rely heavily on self-reported and subjective parameters.
HR Dashboard or Balanced Scorecard	How the organization or HR function meets goals of "Customers, Financial markets, Operational excellence, and Learning"	Becker, et al. (2001); Kaplan & Norton (1992).	Vast array of HR measures can be categorized. "Balanced Scorecard" is well-known to business leaders. Software can allow users to "drill" or "cut" HR measures, to support their own analysis questions. Potential for naïve users to misinterpret or mis-analyze the information.
Financial Statement Augmentation	Supplements to annual reports (e.g., Skandia and ABB); Human Capital "Navigator"	Skandia Corporation (1996); Sveiby (1997).	Reporting human capital factors with standard financial statements raises the visibility of HR. A vast array of human resource and human capital measures can be reported. The link between reported measures and organizational and investor outcomes remains uninvestigated. "Information overload" can result without a logic framework.
Financial Statement Reconciliation	Human Resource Accounting, Intangible Asset Measurement, "Putting Human Capital on the Balance Sheet"	Flamholtz (1999); Lev & Zarowin (1999); Bassi, et al. (2000).	Reliance on standard financial statements or accounting logic may be compelling to financial analysts. Acknowledges the limitations of financial analysis to account for human capital. May be limited in its ability to inform decisions about human resource program investments.
Intellectual Capital	Patents, networks, information system investments, knowledge stocks and flows	Argote & Ingram (2000); Crossan, et al. (1999); Hall, et al. (2000); Svieby (1997).	Useful specific focus on both stocks and flows of knowledge. Multi-disciplinary array of measures may be more credible to those outside of the I/O psychology discipline. Focus on relationships with financial outcomes may be compelling. Less informative regarding the effects of HR programs on intellectual capital, with recent exceptions (Collins, Smith & Stevens, 2001).
Causal Chain	Path models linking employee attitudes to service behavior to customer responses to profit.	Boudreau & Ramstad (1999); Rucci, et al. (1998); Schneider, et al. (1996).	Useful logic linking employee variables to financial outcomes. Valuable for organizing and analyzing diverse data elements. Danger of focusing on one "path" to the exclusion of other explanatory variables.

Financial efficiency measures of human resource operations. This category includes systems for calculating the costs of HR programs and HR departments, as well as an array of various dollar or time-based ratios for different HR processes such as staffing, compensation, labor relations, etc. These approaches focus on dollar-based indicators of HR operations, and compare those standardized indicators across organizations. Perhaps the most visible examples include products from the Saratoga Institute, as described in the work of Fitz-enz (1995; 1997). The primary focus is on the efficient use of resources, as embodied in "input-output" ratios such as the time to fill vacancies, turnover rates, turnover costs, compensation budgets compared to total expenses, etc. Some elements of "behavioral costing" (Cascio, 2000) also fit into this category (e.g., the cost savings from reducing turnover or absenteeism). Compared to utility analysis, this approach can be quite compelling because of its fairly direct connection to accounting outcomes. Accounting values efficiency and cost control, so these approaches can identify where HR programs can achieve visible cost reductions. The ability to compare such ratios to other organizations allows HR professionals to identify potential improvement targets. Compared to utility analysis, this approach has the advantage of providing a standard approach to gathering and reporting data (in fact, the Saratoga Institute offers computer programs that automatically extract information from data bases such as PeopleSoft ™ and SAS to produce the standard ratios). It does not require understanding the bivariate linearity assumptions underlying utility analysis, and it does not require estimates of the value of employee performance variability.

Of course, this is also the drawback, because such efficiency-focused systems are generally poor at reflecting implications for the value of employees. It seems likely that they will create a focus on cost reduction, perhaps rejecting more expensive alternatives that may have significant payoffs beyond their additional costs. For example, cost-per-hire can be reduced by cutting the number of selection activities, but such reductions may well reduce validity and subsequent workforce quality. In fact, valuable I/O interventions that show high utility will generally increase the cost/hire and time to fill.. Efficiency-based measures, no matter how

"financially" compelling, cannot explicitly reflect employee value. Moreover, such indices provide little guidance as to the associations between interventions/practices and outcomes.

Human resource activity indexes. These approaches directly measure the association between human resource activities, such as merit pay, teams, valid selection, training, etc., and changes in financial outcomes such as profits and shareholder value creation (e.g., Becker & Huselid, 1998; Delery & Doty, 1996; Huselid, 1995; Huselid, Jackson & Schuler, 1997). As Gerhart, et al. (2000) have noted, this approach is also reflected in research on the performance of individual plants or facilities (e.g., Arthur, 1994; Ichniowski, Shaw & Prennushi, 1997; MacDuffie, 1995; Youndt, Snell, Dean & Lepak, 1996). It has produced measurement methods to assess the existence of a particular combination of HR practices, such as "high-performance work systems," deemed appropriate across a wide variety of organizations (e.g., Pfeffer, 1998). Some results have been striking, with evidence that increasing "sophistication" in HR practices may have very significant associations with ultimate financial outcomes (Becker & Huselid, 1998). We noted earlier some of the emerging controversy regarding the reliability of survey measures of HR practices. However, there is no doubt that these results have appropriately received significant attention from both researchers and practitioners. It is also not surprising to see the emergence of commercial products and their associated marketing, suggesting that financial performance might improve by measuring a firm's HR activities, comparing them to the activities that have been most strongly associated with financial outcomes, and then adjusting the array of activities to fit this "best practice" index. Researchers in this field are generally quite clear that general causal inferences are not warranted by much of the existing research (Cappelli & Neumark, 2001). Still, it seems likely that such best-practice indices offer tempting alternatives to decision makers and potentially influence their interpretation of utility analysis data. Compared to utility analysis, the best-practice approach more directly incorporates recognizable financial outcomes. In fact, it can use virtually any financial outcome as a dependent variable. This approach also better reflects the idea of "bundles" of HR practices that work synergistically together (Ichniowski, Shaw, & Prennushi, 1997; MacDuffie, 1995). This

is an important limitation of utility analysis. Yet, to understand these relationships will require more focused examination of the mediating effects between interventions and financial outcomes, and how they vary across organizations (e.g., Gerhart, et al., 2000). Later, we will suggest how utility analysis research might inform these questions. However, for decision makers faced with demands to show tangible relationships between HR practices and financial outcomes, human resource activity indices may seem a much more direct approach than utility analysis.

Multi-attribute utility (MAU) analysis. Deficiencies in dollar-value payoff functions have long been noted, and their possible omission of value dimensions of important constituents (e.g., Boudreau, 1991). Dimensions such as diversity and legal exposure do not appear in utility analysis models, and might well offset utility gains in certain situations (Roth, 1994; Roth & Bobko, 1997). Multi-attribute utility (MAU) techniques have been proposed to incorporate these additional attributes into decision models. Generally, MAU involves identifying a set of important attributes, scaling the attribute levels so that they can be combined, and then combining them into an overall index based on the importance of each attribute to the decision. Utility analysis calculations are often imposed on existing situation, while MAU approaches offer significant involvement for decision makers, potentially producing greater understanding and acceptance of the underlying logic and eventual decisions. MAU explicates many decision elements, making them available for study. Such approaches can also reflect non-linear relationships, and a large and diverse array of non-monetary outcomes, which is difficult in traditional utility analysis. Systems for implementing MAU analysis are well known. Roth & Bobko (1997) present an example of the steps and associated research propositions.

MAU approaches may be daunting, because they require decision makers to define attributes, construct measures, estimate weights and scaling algorithms, construct the utility functions, and then interpret them to make the decision. It is also important to note that the value of MAU analysis hinges on the ability of participants to understand and articulate the important attribute-outcome relationships. Utility analysis relies on explicit assumptions about

statistical distributions, linear relationships, etc., that are not obvious to decision makers. Accordingly, utility analysis might allow a level of sophistication not attained with MAU. Thus, MAU analysis draws attention to important limitations in the outcomes contained in utility analysis models -- the myopia of relying solely on linearity and dollar values. However, it also points out the importance of assuring that decision makers have the capacity and mental models to understand the necessary relationships between attributes and outcomes. We will return later to the integration of utility analysis with such mental maps.

Human resource "scorecards" or "dashboards". Kaplan and Norton (1992, 1996a, 1996b) suggested that traditional "financial perspective" measures tended to lag organizational performance, and proposed to extend organizational measurement systems by adding a "customer perspective" that measures customer satisfaction, market share, etc.; an "internal process" perspective, that measures intermediate value processes such as cycle time, quality and cost; and a "learning and growth" perspective, measuring the systems, organization procedures and people that contribute to competitive advantage. It has been suggested (e.g., Cabrera & Cabrera, 1999) that the results of HR activities might be linked to elements of such a scorecard or dashboard. The concept of a "balanced scorecard" has achieved great popularity in many organizations, and has spawned significant organizational efforts to create HR measures aligned with each of the four perspectives describe above, and to categorize existing HR measures into the four categories (Becker, Huselid & Ulrich, 2001; Donnelly, 2000). Like efficiency measures and financial statement reconciliation/augmentation (discussed next), such approaches have the advantage of tying HR measures to measurement systems that are familiar to line managers. However, this approach also shares the drawback of adopting a measurement logic not specifically developed to deal with human capital and I/O interventions. There are at least two pitfalls in attempts to apply the "scorecard" approach to HR measurement: (1) Relegating HR measures to the "learning and growth" category, rather than integrating the effects of such interventions with strategic outcomes; and (2) Applying the four quadrants only to the human resources function, by calculating HR-function "financials" (e.g.,

HR program budgets), "customers" (e.g., HR client satisfaction surveys), "operational efficiency" (e.g., the yield rates of recruitment sources) and "learning and growth" (e.g., the qualifications of HR professionals). Despite the appearance of a strategic linkage, both pitfalls lead to measurement systems with little link to organizational outcomes, and often little relevance to key decisions.

The "balanced scorecard" framework is useful in that it highlights the importance of intervening variables, such as human resource management I/O psychology processes, in understanding financial success. Scorecards or "dashboards" are now commonly augmented by software that allows decision makers to "drill down" or "cut" the data based on a wide variety of variables, creating cross-tabulations, correlations, and regression analyses based on the unique preferences of individual analysts. For example, HR scorecards routinely allow training costs to be broken down by locations or by course, and linked to trainee turnover. This array of scorecard analysis options is impressive, but remains vulnerable to the same risks of MAU techniques from which they are derived. Specifically they provide broad frameworks, leaving decisions about details to the user, which presumes a high-quality analytical logic among users. If users are not sophisticated, such approaches risk creating a false sense of expertise about the connection between talent and strategic success. For example, Gascho, Marlys and Salterio (2000) placed 58 first-year MBA students in the role of a hypothetical senior executive of a company that had implemented the balanced scorecard. Subjects gave performance evaluations managers in each of two hypothetical divisions, after viewing different arrays of divisional performance information. Results suggested that measures used in common by the two divisions were much more influential than the division-unique measures developed using the balanced scorecard. The authors noted that existing traditional financial measures are already "common" across units, so this may suggest that scorecard measures, often designed to be unique to units, may receive less attention.

Utility analysis incorporates some elements of scorecards (e.g., program outcomes related to learning), and may provide useful logic to guide scorecard users confronted with the

"information overload" that results from a vast array of analysis options. However, to date utility analysis research has not addressed these questions.

Financial statement augmentation and reconciliation. Accounting scholars increasingly suggest that traditional financial statement ratios are less informative to investors. For example, Lev & Zarowin (1999, p. 362) present data showing that "overall results indicate a weakening of the association between market values and accounting information (earnings, cash flows, and book values) over the past 20 years." This pattern was most evident in firms with increasing expenditures for research and development (R&D), while even high-technology firms with large but *stable* R&D investment levels showed far less decline. Evidence like this has prompted a wide variety of proposals to augment financial statements with more information about "intangible" assets. In traditional accounting, such expenditures (e.g., the costs of a new organizational design, training programs, hiring of R&D employees, general R&D) are subtracted as expenses when they are incurred, even if their benefits will accrue over time. It has been suggested that financial reporting might treat such expenditures more like other assets, where only a portion of the cost is counted as "depreciation" in each period, and the rest is listed as an asset. A similar argument was first made in "human resource accounting" over 25 years ago, and continues today (see Flamholtz, 1999). We refer to such approaches as "financial statement reconciliation" because they attempt to reconcile the difference between organization value as seen through traditional financial statements versus the financial market valuation of the organization.

The desire to "put people on the balance sheet" has led to another approach, the reporting of human capital factors alongside traditional financial information, including several highly-cited examples (e.g., Skandia corporation, 1996). Skandia produces over 100 metrics in their "intellectual capital report" (Edvinsson and Malone, 1997), including replacement and acquisition costs, development of cross-functional teams, external relationships, information technology investments, and adoption of industry quality standards. As Liebowitz & Wright (1999) note, many of the measures are quantitative, but many are also very subjective. As yet,

there is no generally accepted method of reflecting investments in people in financial reports, so it is up to the user to develop theories about the relationships to organizational performance. Moreover, these approaches often focus primarily on the firm-level of analysis, and thus provide little guidance about the connection between such augmented financial reports to investor responses. The focus on firm-level numbers also limits the applicability to investments in human resource programs. Still, because such approaches acknowledge and augment traditional financial reports, they are likely to have credibility with those who rely on such reports.

Existing research in this area consists of policy-capturing studies with mixed results as to the importance of intangible factors in the decisions of investment managers (e.g., Bassi, Lev, Low, McMurrer & Seisfeld, 2000; Eccles & Mavrinac, 1995). We know little about the mental models used by such analysts to relate reported human capital numbers to predicted organizational value. The logic of utility analysis might assist such decision makers in understanding the connections between human capital investments and outcomes. The historically rich tradition of cognitive research in I./O psychology could also be useful in articulating such mental models. This would require utility analysis research to change its perspective from estimating the value of programs, to identifying how the logic of utility analysis might inform the interpretation of firm-level patterns. Later, we will describe a model to guide the search for such "bridge" elements.

Intellectual capital and knowledge management. The increased attention to "intangibles" and the associated importance of research and development, has led to increased measurement of knowledge and intellectual capital (Boudreau & Ramstad, in press; Dzinkowski, 2000). A recurring theme in this research is the notion that intellectual capital exists at several levels, such as individuals, teams, organizations, customers and external constituents (Nahapiet & Ghosal, 1998), and that its measurement must incorporate not only the "stock" (amount that exists at a particular time) but also the "flow" (movement from one period to another) of intellectual capital among these constituents and across these levels (Argote & Ingram, 2000;

Boudreau & Ramstad, in press; Crossan, Lane & White, 1999). Intellectual capital models describe useful processes for tracking and measuring knowledge stocks and flows, but they are generally less informative regarding how I/O practices might enhance them, though Collins, Smith and Stevens (2001) have explored this. Utility analysis research could benefit by considering criteria such as knowledge stocks and flows, and intellectual capital research might use utility analysis logic to examine how I/O and HR programs enhance intellectual capital.

Causal-chain analysis. This approach focuses on measuring the links between human resource management programs and organizational outcomes. Perhaps the best-known example is the work by Sears, Roebuck & Co., a large U.S. retailer, where empirical connections were uncovered between the attitudes of store associates, their on-the-job behaviors, the responses of store customers, and the financial performance of the stores (Rucci, Quinn, & Kim, 1998), based on the general connection between service, value and profit (Heskett, Jones, Loveman, Sasser, & Schlesinger, 1994). This notion has also been reflected in employee attitude surveys that reflect strategic goals (Schneider, Ashworth, Higgs & Carr, 1996) and in the work of scholars studying the connections between human resource practices and manufacturing plant performance (MacDuffie, 1995). Decision makers find such approaches attractive because they offer tangible and logical structures and data to understand the intervening links between interventions and business outcomes, a feature that is generally lacking in existing utility models. Even when measurement of every linkage is not possible, the logic of the connections may be compelling. Research on reactions to utility models might investigate whether decision makers apply such mental models. Moreover, comparisons between empirical outcomes from causal-chain models and utility analysis may help assess utility accuracy. In turn, the statistical logic of utility analysis can offer causal-chain research a basis for ensuring that all relevant variables and assumptions are included.

Conclusion. Decision makers have many tools to define how they will use, analyze and interpret data. Each tool has advantages, some are likely to be more compelling than utility analysis, but there are also significant future research opportunities in examining how decision

processes differ depending on the approaches used. All of the measurement methods highlight the need for high-quality logical frameworks linking investments to outcomes, yet few frameworks exist. Utility analysis can help to articulate the actual or perceived links between human capital investments and organizational outcomes.

Design Summaries and Prescriptions

How should the results of analyses be presented, and what conclusions should be drawn? Boudreau (1983; 1991) suggested that presentations might include "break-even" analysis, which calculates the minimum threshold for one or more parameters necessary to achieve an acceptable payoff. Florin-Thuma & Boudreau (1987) presented utility analysis results compared to the prior estimates of managers, demonstrating where the model and the prior estimates agreed and diverged. Theories of persuasion suggest useful frameworks and options regarding communication design (e.g., adopting a position at odds with that expected by receivers, using credible outside sources, tailoring the richness of the message to the involvement and expertise of the audience, choices of the distribution channel, etc.), as Boudreau (1996) and Skarlicki, et al. (1996) have noted. Roth, et al. (2000) suggested some interesting design implications from Image Theory, including designs that are explicitly made compatible with value, trajectory and strategic "images." Macan & Highhouse (1994) reported that HR managers and I/O psychologists used several methods to present program effects (e.g., logic and anecdotes; legal issues, total quality, etc.). We have seen relatively little systematic research in utility analysis regarding key variables in presentation design. Far more attention has been given to examining the effects of utility analysis results, discussed next.

Present Summaries and Prescriptions – Utility Analysis Acceptance

Cascio (1996) suggested that we must focus on communication, if we are to enhance the impact of utility analysis. Rauschenberger & Schmidt (1987, p. 55) noted that "communicating utility analysis research to organizational decision makers is perhaps the most pressing current issue in utility analysis." Research on the presentation of utility analysis consists of a few studies of utility analysis acceptance.

The futility of utility analysis? Latham & Whyte (1994) found that utility analysis actually *reduced* managers' reported support for a hypothetical selection program. "These troubling results have stimulated a great deal of discussion" (Borman, Hanson & Hedge, 1997, p. 321), and spurred a recent stream of research addressing user acceptance and reaction to utility analysis. The Latham & Whyte (1994) study provided a hypothetical selection utility analysis to 143 experienced managers. They noted Mintzberg's (1975) suggestion that actual managers may underemphasize analytical input, and Johns' (1993) findings that technical merit may not always determine the adoption of HR innovations. The study did not intend to test these theories, and explicitly eschewed formal hypotheses. Instead, it asked whether managers are more likely to adopt a psychologist's recommended selection procedure when that advice is accompanied by: (a) explanations of standard validation procedures; (b) standard validation plus an expectancy table based on past experience with another organization; (c) validation plus utility analysis showing significant financial benefits; (d) validation plus both expectancy tables and utility analysis. The experience of a psychologist who delivered the information (one versus ten years since receiving a Ph.D.) was also varied. Managers responded to an eight-item scale tapping their confidence in the effectiveness of the program, ability to justify it to others, and willingness to implement the program. Analyses revealed only one significant difference -- condition "c" produced significantly *lower* ratings than condition "a". While this is a tantalizingly counter-intuitive effect, the negative effect of utility analysis was apparently mitigated by the addition of the expectancy table. No effects of consultant experience were observed, although for condition "c" the more experienced consultant was associated with preferences that were notably *lower* than the inexperienced consultant. The authors noted the artificial setting, and the reliance on "textbook" explanations of utility analysis.

Potential motivational explanations. Whyte & Latham (1997) replicated the original study, while contrasting two written hypothetical summaries of validation results that were either stated to be supported by a psychologist, or to have come from a "hypothetical trusted advisor." A third condition combined the written summary with a video presentation by a psychologist

recommending utility analysis and the opportunity to question him (though none chose to do so). Acceptance/confidence ratings were slightly, but significantly higher with the trusted advisor versus the control condition, but greatly and significantly *lower* in the expert-utility condition. Cronshaw (1997), the expert in the study, suggested this may have reflected perceptions that he was persuading or "selling" the intervention, that his actions may have been seen as coercive or self-motivated, and thus may have reduced audience commitment. He concluded, "it is not utility analysis *per se* that imperils I/O psychologists, but the intemperate way that it is often used." I/O psychologists have a significant role to play in articulating a strategic linkage between such investments and organizational outcomes. Approaching the task through collaboration with business leaders seems likely to produce greater perceived objectivity and actual contextual rigor, as we will describe later.

Information complexity. Carson, Becker & Henderson (1998) proposed that information that is easier to understand will be more persuasive, noting that Latham & Whyte (1994) confounded length and complexity with utility analysis. Carson, et al. replicated the Latham & Whyte experiment with the same "validity only" and "validity plus utility" conditions, but added two simplified explanations of these conditions. They did not replicate the Latham & Whyte (1994) finding of reduced acceptability in the utility analysis condition. The simplified utility description was not only easier to understand, but received non-significantly higher ratings than the simplified validity-only scenario. A second study that added a utility scenario describing the derivation of *SDy* again failed to replicate the Latham-Whyte findings, but found that both revised utility analysis scenarios received higher acceptability ratings than the Latham-Whyte utility and validity-only conditions. Although this is somewhat supportive of simplified utility analysis, Carson, et al. (1998) noted that even the highest ratings achieved in both their study and Latham & Whyte (1994) was below 30 on a scale from 8 to 40. There is much to learn about generating acceptance for I/O psychology and HR interventions among managers beyond simplifying utility presentations. We will return to this later.

Effects of framing. Hazer & Highhouse (1997) presented 179 managers with a scripted dialogue between an HR manager and a company president describing utility analysis for a trial HR program, varying (a) the *SDy* estimation method (40% of salary vs. CREPID), (b) framing in terms of the loss from discontinuing vs. the equivalent gain by continuing the program; and (c) HR program as selection vs. training. Managers rated the credibility and usefulness of the information. Only the *SDy* manipulation was significant (though accounting for less than 5% of variance), with managers favoring the utility analysis estimating *SDy* as 40% of salary. A post-hoc test suggested that framing had the usual effect (framing as cost avoidance resulted in more likely implementation), but only for those who incorrectly understood how benefits were calculated. The authors noted that these results are consistent with some principles of persuasion (e.g., Petty & Cacioppo, 1984), and that they may reflect a number of possible underlying cognitive processes that should be tested further.

Considering alternative audiences. Utility analysis research largely omits the perspectives of constituents other than human resource or line managers, even though financial management and human resource accounting research has focused on investors and share-holders. Perhaps more important, how might utility analysis affect *employees*, the recipients of I/O psychology interventions? Employees seldom decide whether to adopt programs, but it may well be important that employees understand the logic of program success. For example, if the utility of a training program rests on the correlation between training and customer knowledge, employees may be well-suited to support or refute the connection. While training may enhance knowledge, which may correlate with sales, employees may be able to explain why, and thus enhance both the accuracy and persuasiveness of utility presentations. Moreover, I/O psychology programs may be more effective if target employees understand the logic (e.g., “we are training you in customer knowledge because we have found that it seems to relate strongly to sales.”). Employee “line-of-sight” (Boswell, 2000) contributions to utility analysis remain unexplored. Research on applicant reactions to selection procedures and trainee perceptions of

the value of training is also relevant here. Would applicants find testing more palatable, or trainees find training more motivating, if they knew the logic that was used to justify them?

Conclusion. Attention to managerial reactions to utility analysis is a welcome step toward examining cognitive processes in utility analysis, rather than only on "mathematical modeling and psychometric measurement" (Roth, Segars & Wright 2000). Several authors (e.g., Boudreau, 1996; Skarlicki, et al., 1996; Macan & Highhouse, 1994; Carson, et al., 1998) have suggested that theories of persuasive information processing may provide rich hypotheses, particularly the concepts underlying "dual-process" theories that describe when decisions are made systematically versus peripherally. Roth, et al. (2000) noted the need for clearer constructs regarding comprehension, information processing and reactions. Thus, cognitive responses have been studied at the "presentation and acceptance" stage of the decision process, but clearly these cognitive processes are likely to be important at all stages. Extending this work to reflect theories of persuasive communication and message design seems promising. These same theories could be directed toward a variety of constituents beyond HR and line managers, including employees, investors, labor organizations, regulatory agencies, etc. This requires addressing the substantive basis for reactions to I/O and HR investments. Persuasion theory may direct our attention to general attributes of the situation, audience or message that affect acceptance, but it cannot tell us the nature of the skepticism that seems to characterize reactions to utility analysis (recall the relatively low acceptance ratings of Latham and colleagues as well as Carson, et al.). Researchers will need to better describe the particular mental maps that managers and others use to connect investments in I/O and HR practices with organization success. Essentially, we need not only to ask, "what variables correlate with acceptance?" but also "how does the logic of our cost-benefit analyses compare to the logic of those receiving such analyses?" Answers to this question will help explain not only the relatively tepid response of decision makers who are relatively unfamiliar with utility analysis (Latham & Whyte, 1994; Carson, et al., 1998), but also the apparent difficulty in

understanding and disbelief in the size of utility analysis results among those who have used utility analysis (Macan & Highhouse, 1994).

Influence Actual Decisions and Behaviors

Very little research exists on how utility analysis changes actual decisions, program implementations or other behaviors. This stage of the decision process is both critical and difficult to study. This is obviously very different from utility analysis acceptance, or intentions to adopt hypothetical programs. Investigating actual decision behaviors of managers requires a much deeper understanding of organizational context. Florin-Thuma & Boudreau (1987) offered an early attempt to map the decision processes of managers in a small retail frozen yogurt shop. They documented the initial decision not to provide feedback to employees by having employees weigh each serving. They then gathered serving and inventory data and compared the managers' estimates of decision attributes to the empirical results. When entered into the utility equation, even the managers' own estimates supported the value of feedback. Even so, managers had significantly underestimated the performance deviations, and thus the value of feedback to store performance. Their underestimate of the problem apparently led them initially to dismiss the feedback intervention. Morrow, et al. (1997) gathered utility estimates for several training programs in an actual organization. They noted that the utility analysis seemed more acceptable, for having been based on assumptions suggested by the organization leaders, but that ultimately the organization decided against training programs that had shown returns of over 100%. They observed, "training managers, based on the results of the managerial course evaluations concluded that [the needs of] individual participants must be considered … and the core curriculum was discontinued."

Thus, we remain largely ignorant about the influence of utility analysis in organizations, though preliminary results suggest the value of more study. It may be useful to distinguish decisions about HR "policies" -- reflecting the design of programs (e.g., incentive pay), from those concerning HR "practices" -- reflecting the actual execution and application (e.g., whether pay actually varies by performance) (Huselid & Becker, 2000; Gerhart, Wright & MacMahan,

2000). Theories of the diffusion of innovations (e.g., Abrahamson, 1996; Johns, 1993) may also be instructive, suggesting that HR innovations are affected by fads, fashions and an administrative mind-set. Research examining actual decisions would be informative, but it will be difficult to achieve experimentally controlled use of different decision support systems in actual organizations. As an interim step, we would encourage researchers to collect data on the prior beliefs of employees and managers about the connections between interventions and organizational outcomes, and then to compare them to the empirical results (e.g., Florin-Thuma & Boudreau, 1987).

Conclusions

We have proposed a 7-step decision process as a framework for utility analysis research: (1) Learn, Assess and Sense Patterns; (2) Identify and Gather Appropriate Data (3) Analyze and Identify Key Messages; (4) Design Summaries and Prescriptions; (5) Present Summaries and Prescriptions; (6) Influence Key Human Capital Decisions; (7) Affect Execution and Behavior Change. Certainly, the legacy of the 1980's has continued, and Steps #2 and 3 have received a good deal of attention, extending utility analysis and applying it to new areas (e.g., selection with a probationary period; classification, compensation and employee day care). Perhaps due to repeated cautions to avoid making utility overly complex and unusable, we have seen a surge in research to uncover factors that affect managerial reactions and acceptance, reflecting Steps #4 and 5. We see much less attention to the initial sensing processes that lead to decision model choices (Step #1), though there are some promising frameworks, such as persuasion theory and the "technical versus administrative" distinction. Finally, only very limited research addresses the effects of utility analysis or other decision models on actual decisions and behaviors in organizations, including constituents other than line managers (Steps #6 and #7).

We have also noted that research examining the effect of utility analysis on actual decisions has generally focused on describing acceptance patterns, identifying attributes that enhance or detract from the persuasive impact of messages. This is likely to provide useful

general insights into ways to make utility analysis more convincing or acceptable, but focusing only on persuasion implies that utility messages are correct. The accuracy of utility analysis results remains unclear, as indicated by the continuing debate about the structure of utility models, and examples of adjustments that might vastly reduce reported utility estimates (Sturman, 2000).

Moreover, focusing on persuasion suggests that the key hurdle is to convince others. This assumption is understandable. For decades, the profession of human resource management has noted that it lacks respect (Skinner, 1981; Guest & Peccei, 1994), and that pattern persists (Wright, Snell, MacMahan, & Gerhart, 2000). However, learning how to convince decision makers may tell us little about the subjective and objective connections between investments in human capital and organizational outcomes. A recurring theme in all of the decision stages is that understanding such connections is essential for utility analysis to achieve greater acceptability and accuracy. Yet, it is often overlooked that such connections may reveal the underlying logical gaps that explain the skepticism. For example, a framework that articulates these connections could help to identify the attributes that should be included in MAU analysis. Finally, describing and understanding the connections between investments in human capital and organizational success will be necessary to interpret the results of more qualitative research on actual decisions in organizations.

What is needed is a rich and reliable framework for making conceptual connections between talent and organizational success. These connections are the basis for ensuring not only that managers understand the importance of HR work, but also that HR is actually working on things that matter. In short, I/O psychology must take a more “strategic” perspective, looking beyond single HR programs and individual-level outcomes, and encompassing the strategic processes and outcomes of the organization (Boudreau & Ramstad, 2001). We believe that I/O psychology has much to contribute to strategy, especially through the lens of utility analysis, and that strategy provides a valuable alternative perspective for I/O psychologists and HR professionals. This suggests a perspective that is more normative than the largely descriptive

work that has been done so far. By examining the development and diffusion of the most successful decision support systems in organizations (e.g., financial and market analysis), we can identify useful principles to guide descriptive research on decision model adoption and effects, as well as prescriptive research to make future utility analysis and human capital decision models more useful.

Learning from Successful Decision Support Systems

We can enhance human capital measurement by examining the features of successful decision support models in other areas, such as finance. Virtually everyone examines organizations in terms of the logic and measures suggested by finance. This is true even when analyzing resources such as human capital, as the history of utility analysis vividly illustrates. As Boudreau and Ramstad (1998) noted, the success of financial and marketing systems reflects their fundamental focus on enhancing decisions about a key resource (financial capital or customers). In the same way, we have seen that the value of utility analysis and other HR measurement systems lies in their ability to enhance decisions about human capital, including decisions by employees, managers and I/O and HR professionals. Yet, the answer is not simply to adopt financial ratios and apply them to HR programs. Rather, the key is to understand how successful measurement systems have evolved, and search for general principles.

The need for a decision science for HR -- Talentship

Both finance and marketing are decision sciences that evolved from a professional practice. Marketing evolved as a decision science from the professional practice of sales. Finance evolved as a decision science from the professional practice of accounting. Both sales and accounting are important processes. They have professional standards, best practices and they produce important data to assess organizational performance. However, accounting and sales do not in themselves provide a decision science. For example, accounting can provide the numbers that describe the volatility and return on corporate bonds. However, it is the science of Finance that applies portfolio theory to those numbers, to support decisions about the

an appropriate mix of financial instruments to optimize risk and return for an organization, and the appropriate deployment of financial capital to investments. Similarly, the sales process generates important data on sales of products to particular customers. However, it is the science of Marketing that developed and applies the theory of customer segmentation and product life-cycles to support decisions about advertising, product placement, etc. Finance is the decision science that improves organizational performance by enhancing decisions about financial capital. Marketing is the decision science that improves organizational performance by enhancing decisions about customer capital.

Today, the field of human resource management is characterized by a strong professional practice. The professional practice of human resource management, supported by a wide variety of research, tools, best practices, etc., has evolved significantly over the past several years, and with it the stature of the human resource function and professionals. Yet, as we have seen, we still lack a decision framework that connects talent and strategic organizational value. Utility analysis and other frameworks from I/O psychology and other social sciences can form the basis of a decision science for talent that will evolve from the professional practice of Human Resources. We have coined the term "talentship" to capture the distinction between the decision science of talent, and the professional practice of human resource management. Talentship is to human resources as finance is to accounting and as marketing is to sales. ***Talentship is the decision science that improves organizational performance by enhancing decisions that affect or depend on human capital.*** Talentship will build on human resource management practices and measures, but it will go beyond the professional practice to create tools and frameworks that enhance decisions. Note that the domain of decisions is purposefully broad, including not only decisions made by I/O psychologists and human resource professionals, but also individual decisions by employees about their own talent (e.g., whether to take a certain training course or career opportunity), as well as decisions by line managers regarding the talent under their stewardship.

Boudreau and Ramstad suggested that human capital measurement could learn three important lessons from the evolution of finance and marketing: (1) Reveal the value linkages; (2) Focus on the constraints; (3) Intangibility does not prevent measurement.

Reveal the value linkages. The first lesson – reveal the value linkages – is illustrated by Pfeffer's (1998, p. 359) suggestion, "ask yourself the last time the finance or controller's staff, or better yet, internal audit, had to measure its contribution to the bottom line," noting that "measurement systems embody an implicit theory of how the function or the firm operates" (p. 362). The financial system concentrates on articulating the links between decisions about financial capital and organizational outcomes, rather than proposing or defending internal programs recommended by the finance department. Contrast this with the overwhelming focus of utility analysis on acceptance by managers, or the value of particular functional HR programs. Throughout this chapter we have seen that this focus has left gaps in our ability to articulate the logical maps between human capital and organizational outcomes. Although this logic is implied in the structure of utility analysis models (e.g., $r_{x,y}$ relates variation in selection attributes to dollar-valued organizational results, *SDy* translates variability among employees or applicants into organizational outcomes), the *links* that articulate the connection are generally missing.

Focus on the constraints. The second lesson – focus on the constraints – is rooted in the value of information. The importance of decisions depends on the value of the resource being managed. Boudreau & Ramstad (1997) noted management systems achieve prominence in different eras (agriculture, transportation, industrial) in part because they focused on a constrained resource. For example the financial analysis system (e.g., income statements, balance sheets, etc.) predated the Security and Exchange Commission regulations in effect today. Johnson & Kaplan (1987, pp. 6-18) describe how financial models evolved to provide decision support systems necessary to optimize the use of a particular resource – money – at a particular time – the start of the industrial revolution. In addition, they show how financial management systems resulted from the industrial revolution's demand for external capital. Financial analysis achieved prominence when it did, in part because it dealt with an important

constrained resource, at a time when the knowledge about how to manage that resource was very rare or non-existent. Several years later, during the Great Depression, the SEC implemented legislation (SEC acts of 1933 and 1934) to regulate this information at precisely the time when capital was most constrained and labor was most abundant. Boudreau and Ramstad (1997) noted that today organizations have record levels of cash, and routinely "lay off" capital by giving it back to shareholders in the form of stock repurchases. Today's key constraint is increasingly organizational talent. We shall show later how the principle of constraints is important to future research on *SDy*.

Intangibility does not prevent measurement. The third lesson – intangibility does not prevent measurement – reflects the synergy between measurement and decision making. In marketing, for example, a "brand" is intangible, residing primarily in the minds of customers. Yet, organizations systematically manage their brands with measures such as; the amount and quality of shelf space, customer awareness, repeat purchases, etc. These measures did not precede the notion of brands. Rather, organizations perceived the general value of their brands by informally observing customer behavior with crude measurement systems. Sales records might have been organized by sales representative or region, with one salesperson or region generating higher sales. Over time, such higher sales might be attributed to advertising in that region, or the extra client calls made by that salesperson. A hypothesis might evolve to explain this link, suggesting that customer awareness was a key driver of sales. Measures of customer awareness would develop and verify this relationship across many regions and salespeople. Eventually, customer awareness was more finely defined to include brand awareness, and more sophisticated measures emerged. The give-and-take between the professional practice of Sales, which generated the data, and the decision science of Marketing, which created the theory of brands, eventually led to enhancements in both the professional practice and the decision science, driven by enhanced measures.

I/O Psychology and Talentship

I/O psychology might find particular optimism in the analogy to consumer brands, because so much of I/O psychology is devoted to measuring intangible constructs (e.g., personality, attitudes, cognitions). The lessons from marketing suggest that improved measurement will result from a closer synergy between measures and the decision systems they support. Yet, I/O psychology, human resource management and utility analysis are at an early stage in this process, compared to finance and marketing. We have seen tantalizing evidence that familiarity with utility analysis methods leads to perceptions that they are less costly and less complicated (Macan & Highhouse, 1994, p. 431). However, we have yet to see a research agenda specifically building on the potential synergy between measures and decisions. I/O can contribute to the development of talentship – the human capital decision science. Utility analysis, and the broader field of I/O psychology seems well positioned to contribute to the development of the measurement systems that will evolve to address the critical constraint of this era – human capital. The logic and assumptions of utility analysis provide one useful framework for defining such systems. However, this will require that I/O psychology research and measurement more strongly integrate with principles of strategic organizational value. Our decision-based review of the utility analysis literature, and the three lessons from successful decision support systems described here, reveal a consistent theme – the need to articulate the elements that bridge human capital and organizational success. An articulated logic reveals the key constraints, and provides both measures and logic to clarify the "intangible." Next, we describe a framework that articulates the bridge between human capital investments and organizational strategic success.

The Strategic Human Capital Bridge (HC BRidge™) Framework

Articulating the Links Between I/O and HR Investments and Organizational Success

Changing the focus of utility analysis research from measurement to strategic value connections requires articulating the links between I/O interventions and organizational success. This fundamental dilemma for organizational researchers will require solutions that go beyond

I/O psychology, HR management, and utility analysis. Yet, I/O psychology has an important role in constructing the framework, and the need for it is evident in utility analysis research.

Roth, et al. (2000) noted that the utility acceptance process might best be studied through case studies or open-ended interviews deeply examining prior values, decision processes, perceptions of costs and benefits, and environmental factors. We agree that qualitative analysis is promising, and suggest that research go further, to examine not just acceptance but decision logic. A framework for articulating and evaluating the previously-held mental maps of decision makers is needed to assess not only acceptance, but where decision processes can be improved.

Rauschenberger & Schmidt (1987) recognized the need for articulation, urging that "the practitioner develop a definition of utility appropriate for the organizational decision makers who will be expected to understand and use it," and "different organizational decision makers within the *same* organization may require different definitions of utility" (p. 54). Recognizing the perspective of decision makers is clearly important. However, that should not imply that the value of our frameworks is judged solely on the basis of acceptance. The more appropriate focus for I/O psychology is to discover and articulate a logical framework linking talent to organizational success that is a useful tool for *common* understanding. For example, Finance professionals do not strive merely to have line managers accept their models of how financial capital relates to business success. Instead, finance professionals *educate* their counterparts in a professionally-developed decision science about financial capital. Similarly, for I-O psychology and HR management, the ultimate goal is to enhance decisions, even if that requires *correcting* constituents' understanding of the links between talent and organization success.

Gerhart, Wright, McMahan & Snell (2000) suggested that the inter-rater reliability of the reported number of HR practices may be so low as to make implausible existing estimates of the HR practice and firm performance relationship. Controversy persists (Gerhart, Wright & MacMahan, 2000; Huselid & Becker, 2000) regarding how to identify knowledgeable

respondents and discern how firm size and diversity affect the ability of decision makers to grasp key relationships. All parties seem to agree on the need to understand the variables that mediate between HR practices and strategic success. Morrow, Jarrett & Rupinski (1997) alluded to this when they noted (p. 94) "training can have a large [yet] unimportant effect in a decision-making context … the relevance of the criteria to the job must be measured and controlled in order for effect sizes to be comparable in an organizational context."

Our proposal goes beyond assessing the empirical relation between utility estimates and actual productivity increases (Schmidt, Hunter, Outerbridge & Trattner, 1986). Such evidence will benefit from a logical framework to explain the intervening processes. Our proposal also extends beyond simply involving recipients in defining utility parameters, or identifying the assumptions that will persuade the audience. Evidence of the value of participation is mixed (Latham, Erez & Locke, 1988; Roth, et al., 2000), but participation will be enhanced by more explicitly describing the mental models used by managers and leaders, and comparing these mental models to evidence about how HR and I/O investments actually link to organizational performance. A systematic decision science may actually uncover fallacies in managerial assumptions (e.g., Florin-Thuma & Boudreau 1987). Typically, managers encounter such logic only when they are being "sold" or persuaded of the value an HR or I/O program. As Latham & Whyte (1994) and Cronshaw (1997) suggest, such situations can engender distrust rather than learning. HR and I/O psychology must articulate these linkages independent of persuasion attempts.

The need for an articulated linking framework is also apparent in studies that have invoked the idea of a "strategic" perspective on utility analysis. The recurring theme is to "illuminate the middle ground" (Boudreau & Ramstad, 1997) in ways that are tangible, articulated, and subject to discussion and refutation by key constituents. Cabrera & Cabrera (1999) proposed that balanced scorecards articulate hypotheses about how the elements of an organization connect to create value. Jones & Wright (1992) suggested considering the larger bureaucratic and organizational costs. Russell, Colella & Bobko (1993) presented several

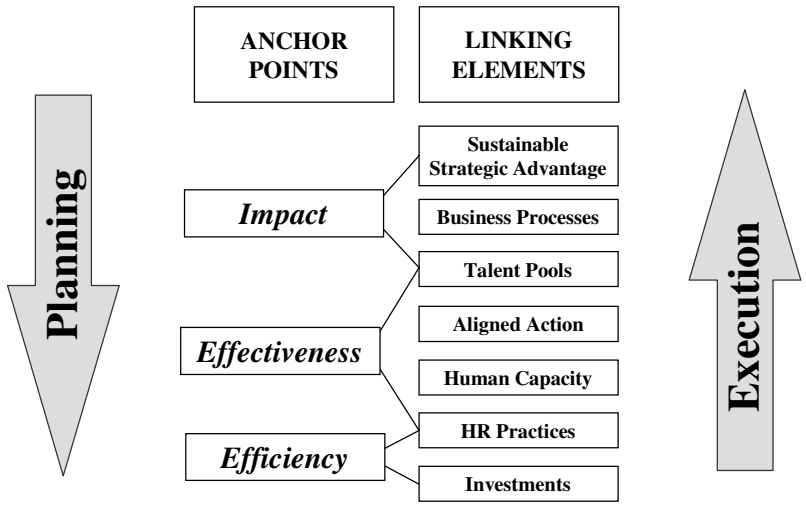
hypothetical examples indicating how the timing of the returns from I/O interventions may well affect their strategic value, depending on the "strategic context," such as whether an operation is likely to fail with or without the added value derived from enhanced human capital.

Russell (unpublished) used the notion of "value distance," first suggested in 1967, to capture the number of processes between individual performance and the customer experience (e.g., the toothpaste maker at Proctor & Gamble is very distant, while the owner-operator of a one-man tailor shop is quite proximal). Russell correctly observes that "value distance" might affect the relevance of correlations based on performance ratings, as parameters in calculating the value of I/O interventions. In fact, we next suggest that articulating this concept with the benefit of recent work on strategy, business processes and value chains from the strategy literature, offers precisely the map for understanding that is currently lacking. For an illustration of the value of value chains, see Lorenzoni and Lipparini (1999), who mapped the value chains for several packaging products in Italy through interviews with key process owners.

From "Black Box" to Bridge … The HC BRidge™ Strategic Human Capital Framework

An increasingly common theme in strategic human resource management research is the need to reveal what is within the "black box" between HR practices and strategic organizational outcomes (e.g., Dyer & Shafer, 1999; Becker & Gerhart, 1996; Chadwick & Cappelli (1999); McMahan, Virick & Wright, 1999). Inspired by the tantalizing evidence noted earlier, that HR practices associate with firm-level financial outcomes, researchers have begun to insert selected intervening variables into studies of this relationship (e.g., attitudes, turnover, etc.). We propose that systematic integration of principles from I-O psychology and strategy research holds to promise to go to the next step -- to move beyond simply acknowledging the "black box" and instead to articulate and test a rich and detailed framework of linking elements. In essence, to move from "black box" to a bridge. As we have seen, the lessons from disciplines such as Marketing and Finance suggest the importance and power of such frameworks for advancing theory-building, measurement and management influence. We must develop a decision science that specifies a rich and logical set of connections between talent and strategic success.

Figure 2
HC BRidge™ Framework



Copyright © 1999 John. W. Boudreau & Peter M. Ramstad (PDI). All rights reserved.

Figure 2 contains the model we have proposed to articulate organizational or business unit strategies tangibly enough to connect them to human capital and human resource investments. It is based on causal-chain analysis and value distance, as it specifies linking elements between I/O and HR investments and organizational success. Some of these links have been proposed before (e.g., Becker & Huselid, 1998; Fitz-enz, 2000; Cascio, 1996; Boudreau, 1998; Boudreau & Ramstad, 1997). A more detailed application of the HC BRidge™ framework to the strategic challenges of the internet can be found in Boudreau, Dunford & Ramstad (2001). Here, we concentrate on the three major anchor points of the framework.

"Impact" identifies whether and how elements of strategic success (e.g., uniqueness, growth, profitability) link with talent pools. We use the term talent pools, rather than jobs, to focus on contribution rather than administration. For example, in a theme park a key talent pool would be those who have significant customer contact. This includes jobs such as characters and amusement ride hosts, but also includes store clerks, groundskeepers and even parking lot attendants. There is no particular "job" of customer contact, yet these workers comprise a talent pool whose work collectively (and perhaps collaboratively) affects customer experience.

"Effectiveness" connects HR practices to talent pools. This anchor point encompasses familiar I/O questions about the impact of interventions on ability, attitudes and motivation, which are sub-elements of "Human Capacity" in Figure 2. However, it also articulates whether and how that capacity produces aligned actions that contribute to the effectiveness of the talent pool.

"Efficiency" links the resources expended to the resulting HR practices and I/O interventions. As noted above, many traditional HR measurement approaches concentrate primarily on efficiency. Efficiency measures are useful, but must be embedded within the context of *impact* and *effectiveness* to avoid misinterpretation.

HC BRidge™ and Utility Analysis

The HC BRidge™ framework clarifies the progress and potential of utility model development. Using Figure 2, we can see that early utility analysis work observed a link between *HR practices* and *aligned actions* (e.g., test scores and job performance ratings) and then extrapolated directly to *strategic success* by translating into dollar values. Figure 2 suggests that the this approach provided only limited explanations regarding how *aligned actions* create *talent pools*, which in turn support key *business processes* such as quality, speed, innovation, logistics and production, that lead to sustainable *strategic success*. It should be no surprise that asking raters to combine these links into a single translation task from performance to dollar values (*SDy* estimation) has presented a daunting task, as we will discuss below. Modifications of the early utility model have included embellishments to reflect additional HR practices (e.g., recruiting, training, retention and pay), but utility models generally retained the same logical leap from an observed performance criterion to dollar values. For example, adjusting utility estimates in line with traditional business measurement systems (e.g., financial adjustments) recognized the connection but did not articulate intervening processes.

Thus, the HC BRidge™ model suggests untapped opportunities in utility analysis and I/O research, focusing on articulating how HR practices connect to aligned actions and key business processes. For example, the CREPID *SDy* estimation process (and others) weighs

performance dimensions according to their perceived importance, but provides little guidance or investigation into the factors leading to perceived importance. We find that HC BRidge™ helps experts articulate the links between performance dimensions, business processes, and the value or uniqueness of the organization's competitive position. It seems likely that such articulation will produce utility estimates that are more understandable and credible to decision makers, and allow a much richer diagnosis of managers' thought processes.

For example, applying the HC BRidge™ framework to the case of Encyclopedia Britannica (Boudreau, et al., 2001) focused on how talent linked to sources of sustainable uniqueness on the internet. This analysis revealed the fallacy of the typical assumption that Britannica's future rested mostly on maximizing the performance of web technicians, and purging the organization of "old economy" talent (e.g., door-to-door sales staff). The web technician talent pool, and its associated aligned actions, were indeed important, but provided no *unique* source of value. A unique and competitively differentiating web experience required drawing on Britannica's traditional strength in finding and presenting distinctive information. Paradoxically, this uniqueness required elements of the "old economy" talent pools, such as information specialists and former door-to-door salespeople. Utility analysis of selection tests or training for web technicians at Britannica would likely have shown a positive return, even while failing to acknowledge the combination of "old economy" and "new economy" talent necessary to achieve unique strategic value. This might explain managers' skepticism toward utility analysis showing significant value from enhanced selection for web technicians, if the managers recognize the simultaneous need to transform their "old economy" talent.

This has fundamental implications for utility analysis and I/O research. As we have shown, prior utility analysis research has focused primarily on measurement limitations, including demographic characteristics of raters or performance ratings in a single job. Consider how future investigations might differ if based on a framework like that shown in Figure 2. Researchers would elicit a list of specific talent pools, specific key business processes affected by those talent pools, and specific elements of strategic advantage they might affect. Reactions

to utility analysis might be examined based on the logical connections that are omitted and included. High utility values may seem unbelievable until a specific connection between human capacity (e.g., enhanced knowledge) is traced to its effect on aligned actions (e.g., fewer errors), key business processes (e.g., solving customer problems the first time) and competitive advantage (e.g., unique levels of customer satisfaction). Such an analysis would also allow I/O researchers to better diagnose the nature of constituent reactions, and pinpoint where greater measurement or communication efforts are needed.

Finally, the HC BRidge™ framework suggests departures from traditional approaches to I/O activities. It may be much more important to identify the most critical talent pools *before* focusing on the value of particular programs. Traditionally, utility analysis – and I/O psychology research more generally – takes the intervention as the point of departure. Having identified the intervention, attention focuses on understanding its effects on employees in a particular job. Yet, the definition of *SDy* in utility analysis reveals that *variation* in employee value is a key factor in effectiveness, and is independent of the intervention. Thus, it may be more fruitful to assess the economic potential of talent *first*, and then apply I/O interventions where they can have the greatest strategic effect. This reverses the traditional approach and elevates the economic analysis of talent pools to a prominent position. Training research recognizes the importance of needs analysis, yet training utility analysis is typically seen merely as evaluation, after the fact. Future research might fruitfully focus on how to use utility analysis logic to diagnose the high-potential opportunities. As we will see, those opportunities might be defined by the relative *SDy* levels among talent pools. This brings us to the *strategic* relevance of *SDy*.

The Strategic Relevance of *SDy* in Defining "Pivotal" Talent Pools

One can certainly forgive those readers who approach this section, on *SDy* ,with trepidation. This parameter – the "standard deviation of employee performance in dollars" – has been the object of significant technical debate and psychometric measurement attention. However, the frequency of *SDy* measurement research has recently diminished considerably. Boudreau (1991) described how pre-1991 research embodied vigorous debate and attention to

measuring *SDy*, characterized as the "Achilles' heel" of utility analysis. *SDy* was very subjective, whereas other utility elements were more tangible. It has been suggested (e.g., Arvey & Murphy, 1998; Boudreau, 1991) that further research on *SDy* and the logic used by its estimators may never make utility analysis estimates extremely precise. Boudreau (1991) suggested that lacking an objective criterion to evaluate SDy estimates, convergence around one accepted estimation method was unlikely, and noted how infrequently SDy estimation differences actually affected the correct decision.

We will review recent *SDy* research below, but first we propose a different, and more strategic perspective, suggested by the HC BRidge™ framework. As we noted earlier, SDy is of significant potential value, as a powerful link between I/O psychology and strategic human resource management. This is also generally true of utility analysis. Demonstrating the point using SDy is perhaps the strongest test, because traditional SDy research epitomizes the fixation on measurement and parameter definition that has so often limited the relevance of utility analysis. Thus, here we will redefine the *SDy* debate, to focus on a seldom-acknowledged issue that is fundamental to I/O psychology, human resource management, and strategy. That issue is how to identify the key talent pools – those that are most critical to organizational success.

In Figure 2, this issue arises in the *Talent Pools* parameter. This is a critical connection point in linking I/O and HR to strategic success. Research and practice in business strategy typically focuses on the model elements above *Talent Pools*, defining the elements of strategic success and the business processes that support it, but seldom specifying which talent is critical and why. Analogously, research and practice in HR and I/O psychology typically focuses on the model elements below *Talent Pools*, with theories and measures of HR practices, resulting human capacity (capability, opportunity and motivation), and aligned actions (performance, turnover or other behaviors), but seldom evaluating whether they are the most critical. Despite this gap, there is tantalizing evidence to show how several disciplines could contribute to this issue. I/O psychology has long acknowledged that the effect of psychological interventions

depends on the target employee population. Larger *SDy* values imply greater potential utility because of larger employee performance variations (Boudreau, 1991). The issue is also touched upon in the evaluation of jobs in setting pay policies (higher-paid positions carry greater importance due to greater responsibility, knowledge, etc., (cf. Milkovich & Newman, 1999); training evaluation (cf. Kirkpatrick's 1994 notion that training intervention effects depend on the link from reactions to learning to behaviors to results); and in employee surveys tied to strategic services (e.g., Schneider, et al. 1996).

Yet, average pay, job results or service levels are clearly not an adequate proxy for employee impact. Logistics experts are extremely critical to Wal-Mart or Federal Express, but less critical for SUN or Cisco Systems, yet all four companies might employ them at similar market pay levels. Accounts of "unsung heroes" in lower-paid jobs abound, including the "trash sweepers" at Disney (Boudreau, 1998; Boudreau & Ramstad, 1999), the information specialists at Brittanica.com (Boudreau, Dunford & Ramstad, 2001), the repair technicians at Xerox (Brown & Duguid, 2000), and the store associates at Sears (Rucci, Kirn, and Quinn, 1998). These positions carry low pay, low-complexity job descriptions, and a significant value distance from customers. They would probably receive low *SDy* estimates. Yet, performance differences in such roles can produce pivotal effects on key business processes.

HR strategy writers routinely refer to concepts such as "core competencies," and "key employees" (Ulrich, 1996; Prahalad & Hamel, 1990; Nonaka & Takeuchi, 1995; Porter 1996, Treacy & Wiersema 1997), generally noting that "core" or "key" refer to proximity to organizational goals. The emerging resource-based-view suggests that which roles are pivotal changes (Teece, et al, 1997) particularly with strategic events (Barney, 1992; Barnett, Greve, & Park, 1994). Lepak & Snell (1999) addressed this issue specifically, describing an "HR architecture" differentiated by employee uniqueness and value, but we have no accepted measures to differentiate employees by value. Key employees may indeed merit different HR treatment, but identifying which employees are "key" and why remains elusive. Godfrey and Hill (1995) noted that many of the critical constructs in emerging strategy theories remain

unobservable. It is precisely this unobservability that creates a powerful nexus for integrating principles from I/O psychology, human resource management, and strategy. SDy provides a good example.

An overlooked principle in defining key talent is the distinction between average value and variability in value, something that utility analysis explicitly recognizes. When strategy writers describe critical jobs or roles, they typically emphasize the average level of value (e.g., the general influence, customer contact, uniqueness or power of certain jobs). Yet, *variation* interacts with average importance to determine the talent where HR practices can have the greatest effect. The HC BRidge™ model suggests (Boudreau & Ramstad, 1998; Boudreau, Dunford & Ramstad, 2001) that roles are *pivotal* when variability in performance affects critical resources (Barney, 1992) or constrained business processes (Porter, 1996). An important question for I/O and HR strategy is not which talent has the greatest *average* value, but rather in which talent pools does performance *variation* create the biggest strategic impact.

For example, our field work with Federal Express' Asia-Pacific operations revealed that the average strategic value of pilots was very high. Pilot shortages could potentially halt shipping operations, pilots are highly paid, and their job description requires high intelligence and qualifications. Yet, when we used the HC BRidge™ framework to connect talent to strategy, we found that variation in pilot performance and among pilot job applicants was relatively small. The high levels of certification and training required by law to apply or take a pilot position essentially create a very narrow distribution. Average impact was high; variability in impact was low. Thus, investments in HR practices to enhance pilot performance would produce little strategic benefit.

Now, consider the couriers at Federal Express Asia-Pacific. Courier job descriptions traditionally reflected driving and picking up packages. Performance variation among couriers was much larger than among pilots, in part because their low pay and relatively low stature meant that they had received much less attention than more visible and strategic talent pools, such as pilots. Indeed, variation in driving performance was relatively small, but when the

courier role was connected to strategy, it became clear that couriers have significant effects on on-time delivery and customer satisfaction. For example, one "aligned action" involved a common customer request: If the courier can just wait 15 minutes, the customer will have 20 more boxes to ship. What is the correct action? It depends, of course, on whether waiting will delay the shipments already collected enough to miss the deadline to be loaded on the last flight to the U.S. On this performance dimension, couriers varied widely, with high-performing couriers and dispatchers working together to make more appropriate decisions, and the difference could often be worth thousands of dollars. The strategic variability in courier performance was higher than for pilots, but both traditional strategy analysis, and even *SDy* estimates based on job descriptions would miss this.

What are the implications for utility analysis, I/O and HR research, *SDy* and strategy? The logic of *SDy* suggests defining key human resources, based on performance variation. In the HC BRidge™ model, talent pools are comprised of *pivotal* roles, meaning that organizational outcomes "pivot" significantly on variation in worker quality. Thus, *SDy* estimation is important not only to evaluate I/O interventions *after the fact*, but even more important to identify which talent pools are most important *prior to* such interventions. I/O psychology has typically estimated *SDy* on single jobs, while HR strategy has struggled with differential importance *across* talent pools. There may be great promise in future research that actually measures the *Impact* (see Figure 2) of performance variability across different talent pools, even if such measurements are never used to evaluate an intervention.

Research on the Standard Deviation of Employee Value in Dollars (*SDy*)

Research on *SDy* measurement has continued, strongly reflecting questions of accuracy, but more recently emphasizing how more accurate *SDy* estimates might enhance credibility and influence with decision makers. Arvey & Murphy (1998) proposed that *SDy* may not be such a critical parameter, and questioned the continued investment in *SDy* estimation research, stating "rather than focusing so much attention on the estimation of *SDy*, we suggest that utility researchers should focus on understanding exactly what *Y* represents." (p. 162),

supporting our suggestion to better articulate the links between human capital and organizational value.

Estimating *SDy* more directly

Researchers have suggested ways to simplify *SDy* estimation, to tie it more closely to observable performance elements, or to its underlying assumptions. Cesare, Blankenship & Giannetto (1994) found that in social services, archival supervisory job performance and worth ratings were linearly related ($r = .67$), supporting a basic utility assumption. Raju, Burke & Normand (1990) suggested more practical *SDy* estimates might start with observed performance standard deviations, then transform them using subjective estimates of the relative range of performance ratings versus actual employee value, and finally multiply the transformed performance standard deviations by the estimated slope of the employee performance-value function. They suggest a number of ways to estimate the slope, such as average salary. Morrow, et al. (1997) calculated it as the "fully-loaded cost of employment including benefits and overhead" (p. 98). Raju, Cabrera and Lezotte (1996) developed a utility model in which performance is viewed as categorical rather than continuous. Raju, et al. (1990) suggested that shifting subjective judgment from *SDy* to these two new factors may enhance the quality of utility analysis estimates, which has been debated (Judeisch, Schmidt & Hunter, 1993; Raju, Burke, Normand and Lezotte, 1993; Schmidt & Hunter, 1998). However, there is agreement that the performance transformation requires expert judgment, and the choice of slope scaling factors (e.g., compensation, sales, full employment costs) remains a challenge for which we have little research and few tools.

Judiesch, Schmidt & Mount (1992) showed that *SDy* estimates were consistent with the proposition that raters anchor on average value, and estimate the 15th and 85th percentiles by multiplying by *SDp* – the ratio of *SDy* to average value. They compared estimated *SDp* to actual output or sales, or to proxies obtained from prior research on similar job titles. After adjustments, the average *SDp* values from subjective percentile estimates were similar to the output or sales-based estimates, and estimated and output-based ratings correlated .70.

However, *SDp* is a percentage, not a dollar value. So, like Raju, et al. (1990), Judiesch, et al. (1992) recommended multiplying *SDp* by an "objective estimate of average revenue value," proposing taking the ratio of total payroll for the job divided by total payroll for the organization, multiplied by total organization revenue, and divided by the number of employees. They noted that while this is consistent with some labor market assumptions, forces in any particular firm may render this estimate incorrect, a problem that plagues all estimation based on average wages. They proposed "allowing senior executives to adjust the relative value of the job upward or downward if they judged that relative wages did not accurately reflect the relative value of jobs" (p. 247). Thus, both approaches rely on subjective judgments about the value of human capital, emphasizing the importance of articulating the underlying mental models, as we noted earlier.

With regard to estimating *SDp*, Hunter, Schmidt & Judiesch (1990) examined jobs where sales or output quantity was judged to be the primary indicator of value, focusing on studies with actual output counts, or using variability in compensation for jobs judged to have a very strong link between compensation and sales (attorneys, physicians and dentists). They specifically reported findings for: a wide variety of "routine" blue-collar jobs; "routine" clerical jobs; crafts (radar mechanics, cooks, repairpersons, welders, handcrafters and drillers); life insurance sales agents; retail and industrial sales; and professionals. Jobs of higher complexity had higher *SDp* levels, suggesting that job complexity might provide a simple general rule of thumb for estimating *SDp*. Hunter et al. (1990) found that sales jobs had *SDp* levels far higher than their complexity scores would indicate, suggesting (p. 37) that "other constructs may be required for sales jobs." This is correct, as many other factors may influence the value of performance variation, even in jobs with objective output measures. For example, salespeople may achieve high sales at the expense of essential paperwork that would help improve future products, or production workers achieve high output at the expense of helping others. This would lower the actual value of workers achieving high sales or output, biasing *SDp* levels upward. Observed sales might also underestimate *SDp* if those who achieve low current sales also alienate

customers, affecting future sales. Cesare, et al. (1994) and Judiesch, et al. (1992) found approximately 50% of the variability in estimated *SDp* was due to non-output factors or error, so even if estimates converge toward actual values, there is still much to be explained. The "aligned action" element of the HC BRidge™ model can help articulate these complexities. Using general rules of thumb, such as job complexity, has merit, but can be enhanced by better understanding the other constructs involved.

Becker & Huselid (1992) proposed measuring *SDy* by directly correlating or regressing unit financial performance on individual performance ratings. Their results from performance ratings of 335 retail-store supervisors in 117 locations suggested that the ratio of *SDy* to average salary ranged from 74% and 100% of salary. The authors noted that this requires special conditions in which unit-level outcomes and performance appraisals are available (where it may be possible to forego *SDy* completely by directly observing how HR practices and unit performance relate). They also noted the dangers of reverse causation, unmeasured factors (e.g., a downturn in the local economy would lower *SDy* even with no change in performance levels and variability), and that with multiple supervisors per store, *SDy* based on individual performance might overstate individual managers' contributions. Cesare, et al. (1994) found supervisors' dollar-valued performance estimates were not related to archival employee performance ratings, but were correlated with factors such as the supervisors' own self-worth estimates. They called for training raters on what factors to consider. Again, the logical links explaining the relationship between store outcomes and supervisor performance are critical.

Identifying the factors that influence *SDy* estimates

A second research theme is how demographic and situational factors affect *SDy* estimates. Bobko, Shetezer and Russell (1991) varied the anchor sequence (50th then 85th and vice versa) and the frame (faculty member leaving versus being acquired) in a survey of search committee members at universities. They found that framing affected *SDy* (calculated as the difference between the percentile estimates), with higher *SDy* values for acquisitions than losses. They suggested different *SDy* estimation methods for different purposes (e.g., selection

versus retention) that "multiple values of *SDy* exist, and the choice depends upon the researcher/practitioner's purpose in generating a dollar utility estimate" (p. 184), and that their respondents noted the difficulty of translating intangible faculty contributions into dollars. All of which reinforces the need for better articulation of logical connections, noted earlier.

Roth, Pritchard, Stout & Brown (1994) examined what information judges used to make *SDy* estimates, and the judges' demographic background. Their subjects estimated the value of employees at the 15th, 50th, 85th and 97th performance percentiles, and the variable costs associated with those percentiles, in a sample of 159 insurance agents, supervisors and managers. They found that variable costs increased with the performance percentiles, but that costs as a percent of value were a higher at lower percentiles. Costs were 123% of the value of the 15th percentile, suggesting that 15th-percentile employees actually represent a net loss, a rare finding when subjects estimate only dollar values, not costs. Subjects rated the importance of 14 factors in their decisions, giving very similar ratings to all of them, though "work performance" and "initiative" were rated significantly higher. This approach has promise, but little theory or context was available to guide the choice of factors. Figure 2 would suggest articulating relationships between *aligned actions* and *business processes* might be an appropriate starting point.

Conclusions.

As Boudreau (1991) and recent reviewers (Arvey & Murphy, 1998) noted, we may be no closer to understanding if *SDy* captures variability in employee value, and journal editors may have tired of such attempts. Even when performance and output are closely tied, value estimates and actual output are seldom correlated greater than .70. Observed job-specific *SDy* estimates apparently reflect the combined effect of performance in the target job with "other factors of production," suggesting the need to identify other factors and their effects. Boudreau (1991, pp. 649-650), noted the dangers of focusing solely on jobs because similar job titles such as computer programmer or sales associate may encompass very different tasks, and different relationships to the value-creation systems of organizations. Hunter, et al. (1992, p.

236) suggested "in many jobs there is very little relationship between wages and output for individual employees." Increasingly, organizations have broadened pay ranges and job classes, to better reward and motivate employee behaviors beyond traditional job titles. Job titles become less homogenous, and average pay for a job title becomes a less specific proxy for value. The logical link between employee variability and value is the essential element of SDy. We need more theory and research on this link.

Research on factors influencing *SDy* estimates has also produced intriguing results, but the studied factors vary widely, ranging from salary and performance, to supervising subordinates and community relations, to demographic characteristics (Roth, Pritchard, Stout and Brown, 1994, p. 439). Raters apparently adopt varying approaches, and researchers have few frameworks to identify explanatory variables. Future research might benefit from focusing on the fundamental question posed by Arvey & Murphy (1998): "Understanding exactly what Y represents," perhaps using linking models like that shown in Figure 2.

Summary and Conclusion

The title of this chapter includes "strategic I/O psychology," perhaps a counter-intuitive phrase for a review of utility analysis. Even I/O psychologists often find utility analysis research excessively focused on the esoterica of models and measurement. Yet we have shown that utility analysis is inextricably connected to strategic human capital research. Research that aims to predict and explain utility analysis and its effects inevitably confronts the need to understand the key logical perceptions and processes linking human capital to sustainable strategic advantage.

Thus, we examined utility models through a decision process lens, revealing the value of future research focused on decision processes, rather than exclusively on refining models and estimates. This will enhance our understanding of how and when model enhancements are important. Utility analysis research risks atrophy without such a research agenda. Focusing on decisions also revealed that the primary cognitive task underlying utility analysis is to link

investments in human capital to organizational success. Even the debate about *SDy* measurement rests on this fundamental question.

So, we proposed the HC BRidge™ framework in Figure 2, depicting the elements that bridge investments in human capital and organizational strategic success. Future research will likely embellish and alter this framework, but we believe that the fundamental value of this linking logic will be essential. The elements of Figure 2 are implied in virtually all utility models, so it may help assess the contribution of future utility model enhancements. Such a framework also provides a valuable template for research on the cognitive connections that decision makers must make to link investments in I/O and HR programs to changes in human capacity and then to performance and organizational outcomes. These linkages are central to the task of identifying "key talent" and reveal new ways in which I/O psychology may inform HR strategy and vice versa. For example, *SDy*, one of the most esoteric of utility parameters, represents a core concept in identifying which talent is strategically "key."

These linking elements, whether represented by the HC BRidge™ framework, or by the future frameworks that will develop, have implications for many areas of "strategic" I/O psychology, even beyond utility analysis. I/O processes such as job analysis, test development, performance measurement, reward design, and training are significantly important to strategic success. Utility analysis has long been the sole vehicle for translating I/O programs to strategy. By taking a more strategic perspective on utility, we actually begin to develop a more strategic perspective on I/O.

References

Abrahamson, E. (1991). Managerial fads and fashion: The diffusion and rejection of innovations. Academy of Management Review, 16, 586-612.

Abrahamson, E. (1996). Management fashion, Academy of Management Review, 21, (1) 254-285.

Alexander, R. A., & Barrick, M. R. (1987). Estimating the standard error of projected dollar gains in utility analysis. Journal of Applied Psychology, 72, 475-479.

Alley, W. E., & Darbyk, M. M. (1995). Estimating the benefits of personnel selection and classification: An extension of the Brogden table. Educational and Psychological Measurement, 55, 938-958.

Argote, L., & Ingram , P (2000). Knowledge transfer: A basis for competitive advantage in firms. Organizational Behavior and Human Decision Processes, 82 (1), 150-169

Arthur, J. B. (1994). Effects of human resource systems on manufacturing performance and turnover. Academy of Management Journal, 37 (3), 670-687.

Arvey, R.D., & Murphy, K. R. (1998). Performance evaluation in work settings. Annual Review of Psychology, 49, 141-168.

Barnett, W. P., Greve, H. R., & Park, D. Y. (1994). An evolutionary model of organizational performance. Strategic Management Journal, 15, 11-28.

Barney, J. B. (1992). Integrating organizational behavior and strategy formulation research: A resource based analysis. Advances in Strategic Management, 8, 39-61.

Barrick, M.R. & Alexander, R.A. (1991). Assessing the utility of stochastic employee movements. Decision Sciences, 22, 171-180.

Barrick, M.R. & Alexander, R.A. (1992). Estimating the benefits of a quality circle intervention. Journal of Organizational Behavior, 13 (1), 73-80.

Bassi, L.J., Lev, B., Low, J., McMurrer, D.P., & Seisfeld, G.A. (2000). Measuring corporate investments in human capital. In M.M. Blair & T.A. Kochan (eds.). The new relationship: Human capital in the American corporation, 334-381. Washington, D.C.: Brookings, Institution.

Bazerman, M. (1998). Judgment in managerial decision making (4th ed.). New York: Wiley.

Becker, B., & Gerhart, B. (1996). The impact of human resource management on organizational performance: Progress and prospects. Academy of Management Journal, 39 (4), 779-801.

Becker, B.E. & Huselid, M.A. (1992). Direct estimates of Sdy and the implications for utility analysis. Journal of Applied Psychology, 77 (3), 227-233.

Becker, B.E. & Huselid, M.A. (1998). High performance work systems and firm performance: A synthesis of research and managerial implications. Research in Personnel and Human Resource Management, 16, 53-101.

Becker, B. E., Huselid, M. A., & Ulrich, D. (2001). The HR Scorecard: Linking People, Strategy and Performance. Boston: Harvard Business School Press.

Bierman, H. Jr, Bonnini, C.P. & Hausman, W.H. (1991). Quantitative Analysis for Business Decisions. Burr Ridge, IL: Richard Irwin.

Bobko, P., Shetzer, L., & Russell, C. (1991). Estimating the standard deviation of professors' worth: The effects of frame and presentation order in utility analysis. Journal of Occupational Psychology, 64, 179-188.

Borman, W., Hanson, M, & Hedge, J. (1997). Personnel selection. Annual Review of Psychology, 48, 299-337.

Boswell, W. R. (2000). Aligning employees with the organization's strategic objectives: Out of line of sight out of mind. Unpublished Ph.D. dissertation, Cornell University.

Boudreau, J. W. (1983). Economic considerations in estimating the utility of human resource productivity improvement programs. Personnel Psychology, 36, (3) 551-576.

Boudreau, J.W. (1991). Utility analysis for decisions in human resource management. In M.D. Dunnette & L.M. Hough (Eds.), Handbook of Industrial and Organizational Psychology (Vol. 2, pp. 621-745). Palo Alto, CA: Consulting Psychologists Press.

Boudreau, J. W. (1995). "So what?": HR measurement as a change catalyst. Paper presented at the national meeting of the Academy of Management, August, Vancouver, Canada.

Boudreau, J. W. (1996). The motivational impact of utility analysis and HR measurement. Journal of Human Resource Costing and Accounting, 1 (2), 73-84.

Boudreau, J.W. (1998). Strategic human resource management measures: Key linkages and the PeopleVANTAGE model. Journal of Human Resource Costing and Accounting, 3, (2), Autumn, 21-40.

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

Boudreau, J.W., Dunford, B. B., & Ramstad, P. M. (2001). The human capital impact on e-business: The case of encyclopedia Britannica. In N. Pal & J.M. Ray (Eds.) Pushing The Digital Frontier, Chapter 10, pp. 192-221, New York: Amacom.

Boudreau, J. W., & Ramstad, P. M. (1997). Measuring intellectual capital: Learning from financial history. Human Resource Management, 36 (3), 343-356.

Boudreau, J. W., & Ramstad, P. M. (1999). Human resource metrics: Can measures be strategic? Research in Personnel and Human Resources Management, Supplement 4, 75-98.

Boudreau, J.W. & Ramstad, P.M. (2000). "Talentship" and the Human Capital Value Proposition. Presented to the Center for Advanced Human Resources (CAHRS) Sponsor Meeting. Ithaca, New York: Cornell University, May.

Boudreau, J.W. & Ramstad, P.M. (2001). Strategic I/O psychology. Professional development workshop presented at the Society for Industrial and Organizational Psychology national meeting. San Diego, CA.

Boudreau, J.W. & Ramstad, P.M. (in press). Strategic knowledge measurement and management. In S.E. Jackson, M. Hitt and A.S. DeNisi (eds.). Managing knowledge for sustained competitive advantage. New York: Jossey-Bass/Pfeiffer.

Boudreau, J. W. & Rynes, S. L. (1985). Role of recruitment in staffing utility analysis. Journal of Applied Psychology, 70, 354-366.

Boudreau, J. W., Sturman, M. C., & Judge, T. A. (1994). Utility analysis: What are the black boxes and do they affect decisions? In Anderson N., & Herriot, P. (Eds) Assessment and Selection in Organizations: Methods and Practice for Recruitment and Appraisal. New York: Wiley, 77-96.

Boudreau, J.W., Sturman, M.C., Trevor, C.O., Gerhart, B.A. (1999). The Value of Performance-Based Pay in the War for Talent. CAHRS working paper #99-06, Ithaca, NY: Cornell University.

Brogden, H. E. (1949). When testing pays off. Personnel Psychology, 2, 171-183.

Brookings Institute (2000). Understanding intangible sources of value: Human capital sub group report. [Online] http://www.brook.edu/es/research/projects/intangibles/doc/sub_hcap.htm.

Brown, J.S. & Duguid, P. (2000). The social life of information. Boston: Harvard Business School Press.

Burke, M.J., & Frederick, J.T. (1986). A comparison of economic utility estimates for alternative *SDy* estimation procedures. Journal of Applied Psychology, 71, 334-39.

Cabrera, E.F. & Cabrera, A. (1999). Strategic utility analysis. Paper presented at the Academy of Management national meeting, Chicago, IL, August.

Cabrera, E.F. & Raju, N.S. (2001). Utility analysis: Current trends and future directions International Journal of Selection and Assessment, 9 (1), 1-11

Canibano, L., Garcia-Ayuso, M., Sanchez, P. (2000). Accounting for intangibles: A literature review. Journal of Accounting Literature, 19, 102-130.

Cappelli, P. & Neumark, D. (2001). Do "high-performance" work practices improve establishment-level outcomes? Industrial and Labor Relations Review, 54 (4), 737-775.

Carson, K. P., Becker, J. S., & Henderson, J. A. (1998). Is utility really futile? A failure to replicate and an extension. Journal of Applied Psychology, 83 (1), 84-96.

Cascio, W. F. (1996). The role of utility analysis in the strategic management of organizations. Journal of Human Resource Costing and Accounting, 1 (2), 85-95.

Cascio, Wayne F. (1999). Costing Human Resources: The Financial Impact of Behavior in Organizations, 4th ed., Cincinnati, OH: South-Western College Publishing.

Casio, Wayne F. (2000). The Cost Factor: The Financial Impact of Human Resources in Corporations. Thomson Learning.

Cascio, W.F., & Sibley, V. (1979). Utility of the assessment center as a selection device. Journal of Applied Psychology, 64, 107-118.

Cesare, S. J., Blankenship, M. H., & Giannetto, P. W. (1994). A dual focus of *SDy* estimations: A test of the linearity assumption and multivariate application. Human Performance, 7 (4), 235-255.

Chadwick, C., & Capelli, P. (1998). Alternatives to generic strategy typologies in strategic human resource management. In P. M. Wright, L. D. Dyer, J. W. Boudreau, & G. T. Milkovich (Eds.), Research in Personnel and Human Resource Management (Supplement 4, pp.1-29). Greenwich, CT: JAI Press, Inc.

Collins, C, Smith, K. G., & Stevens, C. K. (2001). Human resource practices, knowledge creation capability and performance in high technology firms. Unpublished working paper.

Cronshaw, S. F. (1997). Lo! The stimulus speaks: The insider's view on Whyte and Latham's "the futility of utility analysis." Personnel Psychology, 50 (3), 611-615.

Crossan, M.M., Lane, H.W. & White R.E. (1999). "An organizational learning framework: From intuition to institution". Academy of Management Review, 24 (3) 522-537.

DeCorte, W. (1994). Utility analysis for the one-cohort selection-retention decision with a probationary period. Journal of Applied Psychology, 79 (3), 402-411.

DeCorte, W. (1997). Utility analysis for the probationary selection decision to obtain a fixed quota of successful selectees. Journal of Organizational Behavior, 18 (1), 67-82.

DeCorte, W. (1998 a). An analytic procedure to estimate the benefits of a particular type of personnel classification decision. Education and Psychological Measurement, 58 (6), 929-943.

DeCorte, W. (1998 b). Estimating and maximizing the utility of sequential selection decisions with a probationary period. British Journal of Mathematical & Statistical Psychology, 51,101-121.

DeCorte, W. (2000). Estimating the classification efficiency of a test battery. Education and Psychological Measurement, 60 (1), 73-85.

DeCorte, W. (2000). Using order statistics to assess the sampling variability of personnel selection utility estimates. Journal of Applied Statistics, 27 (6), 703-713.

Delery, J. E., & Doty, D. H. (1996). Modes of theorizing in strategic human resource management: Tests of universalistic, contingency, and configurational predictions. Academy of Management Journal, 39, 802-835.

DeNisi, A.S. (1996). Cognitive approach to performance appraisal: A program of research. New York: Routledge.

Donnelly, G. (2000). Recruiting, retention and returns. CFO Magazine, March, 68-74.

Dyer, L., & Shafer, R. A., (1998). From human resource strategy to organizational effectiveness: Lessons from research on organizational agility. In P. M. Wright, L. D. Dyer, J. W. Boudreau, & G. T. Milkovich (Eds.), Research in Personnel and Human Resource Management (Supplement 4, pp145-174). Greenwich, CT: JAI Press, Inc.

Dzinkowski, Ramona (2000). The measurement and management of intellectual capital: An introduction. Management Accounting, 78, 32-36.

Edvinsson, L. & Malone, M. (1997). Intellectual capital. Cambridge, MA: Harvard Business School Press.

Eccles, R.G. & Mavrinac, S.C. (1995). Improving the corporate disclosure process. Sloan Management Review, 36 (4) 11-25.

Fitz-enz, J. (2000). The ROI of Human Capital: Measuring the Economic Value of Employee Performance. New York: Amacom.

Fitz-enz, J. (1997). The Eight Practices of Exceptional Companies: How Great Organizations Make the Most of Their Human Assets. New York: Amacom.

Fitz-enz, J. (1995). How to Measure Human Resources Management. McGraw Hill.

Flamholtz, E.G. (1999). Human Resource Accounting (3rd ed.). Boston, MA: Kluwer.

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

Gardner, T.M., Wright, P.M. & Gerhart, B.A. (2000). The HR-firm performance relationship: Can it be in the mind of the beholder? CAHRS working paper #00-02. Ithaca, NY: Cornell University.

Gascho L., Marlys & Salterio, S.E. (2000). The balanced scorecard: Judgmental effects of common and unique performance measures. The Accounting Review, 75 (3), 283-298.

Gerhart, B.A., Wright, P.M., McMahan, G.C. & Snell, S. (2000). Measurement error in research on human resources and firm performance: How much error is there and how does it influence effect size estimates? Personnel Psychology, 53 (4), 803-834.

Gerhart, B.A., Wright, P.M. & McMahan, G.C. (2000). Measurement error and estimates of the HR – firm performance relationship: A response to Becker & Huselid. Personnel Psychology, 53 (4), 855-873.

Godfrey, P.C., & Hill, C.W.L. (1995). The problem of unobservables in strategic management research. Strategic Management Journal, 16, 519-533.

Grossman, R. J. (2000). Measuring up. HRMagazine, 45(1), 28-35.

Guest, D. & Peccei, R. (1994). The nature and causes of effective human resource management, British Journal of Industrial Relations, 32, (2).

Hall, B., Jaffe, A., & Trajtenberg, M. (2000). Social capital, intellectual capital, and the organizational advantage. Academy of Management Review, 23 (2), 242-266.

Hazer, J. T., & Highhouse, S. (1997). Factors influencing managers' reactions to utility analysis: Effects of *SDy* method, information frame, and focal intervention. Journal of Applied Psychology, 82 (1), 104-112.

Heskett, J. L., Jones, T.O., Loveman, G.W., Sasser, Jr., W.E. & Schlesinger, L.A. (1994). "Putting the Service-Value-Profit Chain to Work," Harvard Business Review.

Highhouse, S. (1996). The utility estimate as a communication device: Practical questions and research directions. Journal of Business and Psychology, 11 (1), 85-100.

Hunter, J.E., Schmidt, F.L. & Judiesch, M.K. (1990). Individual differences in output variability as a function of job complexity. Journal of Applied Psychology, 75, 28-42.

Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. Academy of Management Journal, 38 (3), 635-672.

Huselid, M. A., Jackson, S. E., & Schuler, R. S. (1997). Organizational characteristics as predictors of personnel practices. Personnel Psychology, 42, 727-786.

Huselid, M.A. & Becker, B.E. (2000). Comment on Measurement error in research in human resource decisions and firm performance: How much error is there and how does it influence effect size estimates?, Personnel Psychology, 53 (4), 835-854.

Ichnioswki, C., Shaw, K., & Prennushi, G. (1997). The effects of human resource management practices on productivity: A study of steel finishing lines. American Economic Review, 87 (3), 291-313.

Johns, G. (1993). Constraints on the adoption of psychology-based personnel practices: Lessons from organizational innovation. Personnel Psychology, 46, 569-612.

Johnson, H.T. & Kaplan, R.S. (1987). Relevance Lost, Boston: Harvard Business School Press.

Jones, G. R., & Wright, P. M. (1992). An economic approach to conceptualizing the utility of human resource management practices. Research in Personnel and Human Resources Management, 10, 271-299.

Judiesch, M. K., Schmidt, F. L., & Hunter, J. E. (1993). Has the problem of judgment in utility analysis been solved? Journal of Applied Psychology, 78 (6), 903-911.

Judiesch, M. K., Schmidt, F. L., & Mount, M.K. (1992). Estimates of the Dollar Value of Employee Output in Utility. Journal of Applied Psychology, 77 (3), 234-250.

Kaplan, R.S. & Norton, D.P. (1992). The balanced scorecard – measures that drive performance. Harvard Business Review, January/February, 71-79.

Kaplan, R.S. & Norton, D.P. (1996a). Using the balanced scorecard as a strategic management system. Harvard Business Review, January/February, 75-85.

Kaplan, Robert S. & Norton, David P. (1996b). Linking the balanced scorecard to strategy, California Management Review, 39, (1) 53-79.

Kirkpatrick, D. (1994). Evaluating Training Programs: The Four Levels. San Francisco: Barrett-Koehler.

Klass, B. S., & McClendon, J. A. (1996). To lead, lag, or match: Estimating the financial impact of pay level policies. Personnel Psychology, 49, 121-142.

Kossek, E.E. & Grace, P. (1990). Taking a strategic view of employee child care assistance: A cost-benefit model. Human Resource Planning, 13 (3) 189-192.

Landy, F. (1989). Psychology of work behavior (4th ed.). Pacific Grove, CA, USA: Brooks/Cole Publishing Co.

Latham, G. P., Erez, M., & Locke, E. A. (1988). Resolving scientific disputes by the joint design of crucial experiments by the antagonists: Application to the Erez-Latham dispute regarding participation in goal setting. Journal of Applied Psychology, 73(4) 753-772.

Latham, G. P., & Whyte, G. (1994). The futility of utility analysis. Personnel Psychology, 47 (1), 31-47.

Lepak, D. P., & Snell, S. A. (1999). The human resource architecture: Toward a theory of human capital allocation and development. The Academy of Management Review, 24, (1) 34-48.

Lev, B. (1997). The boundaries of financial reporting and how to extend them. Working paper, presented at the OECD Conference "Industrial Competitiveness in the Knowledge Based Economy. February, Stockholm, Sweden.

Lev, B. & Zarowin, P. (1999). The boundaries of financial reporting and how to extend them. Journal of Accounting Research, 37, 353-385.

Liebowitz, J. & Wright, K. (1999). Does measuring knowledge make 'cents'? Expert Systems with Applications, 17, 99-103.

Lorenzoni, G. & Lipparini, A. (1999). The role of the manager's human capital in discretionary disclosure. Journal of Accounting Research, 37 Supplement, 167-181

Low, J. & Siesfeld, T. (March/April, 1998). Measures that matter. Strategy & Leadership.

Mabon, H. (1996, Spring). The cost of downsizing in an enterprise with job security. Journal of Human Resource Costing and Accounting, 1, 35-62.

Mabon, H. (1998). Utility aspects of personality and performance. Human Performance, 11, (2/3), 289-304.

Macan, T. H., & Highhouse, S. (1994). Communicating the utility of HR activities: A survey of I/O and HR professionals. Journal of Business and Psychology, 8 (4), 425-436.

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, (2) 197-221.

McMahan, G. C., Virick, M., & Wright, P. M. (1998). Alternative theoretical perspectives for strategic human resource management revisited: progress, problems and prospects. In P. M. Wright, L. D. Dyer, J. W. Boudreau, & G. T. Milkovich (Eds.), Research in Personnel and Human Resource Management (Supplement 4, pp. 99-122). Greenwich, CT: JAI Press, Inc.

McNemar, Q. (1962). Psychological statistics. New York: Wiley.

Milkovich, G. T., & Newman, J. M. (1999). Compensation (6th Ed.) Boston, MA : Irwin/McGraw-Hill.

Mintzberg, H. (1975). The manager's job: Folklore and fact. Harvard Business Review, July-August, 49-61.

Morrow, C.C., Jarrett, M.Q. & Rupinski, M.T. (1997). An investigation of the effect and economic utility of corporate-wide training. Personnel Psychology, 50, 91-119.

Nahapiet, J. & Ghosal, S., (1998). Social capital, intellectual capital, and the organizational advantage. Academy of Management Review, 23 (2) 242-266

Nonaka, I., & Takeuchi, H. 1995. The knowledge-creating company: How Japanese companies create the dynamics of innovation. New York: Oxford University Press.

Perloff, R.M. (1993). The dynamics of persuasion. Hillsdale, NJ: Erlbaum Associates.

Petty, R. E., & Cacioppo, J. T. (1984). The effects of involvement on responses to argument quantity and quality: Central and peripheral routes to persuasion. Journal of Personality and Social Psychology, 46, 69-81.

Pfeffer, J. (1998). The Human Equation, Boston, MA: Harvard Business School Press.

Porter, M.E. (1996). What is strategy? Harvard Business Review; Nov-Dec 74, (6) 61-77.

Porter, M.E. (1985). Competitive advantage: Creating and sustaining superior performance. New York: Free Press.

Prahalad, C. K., & Hamel, G. 1990. The core competence of the corporation. Harvard Business Review, 68 (May-June): 79-91.

Quinn, R. E., Hildebrandt, H. W., Rogers, P. S., & Thompson, M. P. (1991). A competing values framework for analyzing presentational communication in management contexts. The Journal of Business Communication, 28, 213-232.

Raju, N.S., Burke, M.J. (1996). Utility analysis. In R.A. Burke (Ed.) Performance assessment: Methods and applications: 186-202. Baltimore, MD: Johns Hopkins.

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

Raju, N. S., Burke, M. J., Normand, J., & Lezotte, D. V. (1993). What would be if what is wasn't? Rejoiner to Judiesch, Schmidt, and Hunter. Journal of Applied Psychology, 78 (6), 912-916.

Raju, N.S., Cabrera, E.F. & Lezotte, D.V. (1996). Utility analysis when employee performance is classified into two categories: An application of three utility models. Paper presented at the Annual Meeting of the Society for Industrial and Organizational Psychology, April, San Diego, CA.

Rauschenberger, J. M., & Schmidt, F. L. (1987). Measuring the economic impact of human resource programs. Journal of Business and Psychology, 2 (1), 50-59.

Reardon, K. K. (1991). Persuasion in practice. Newbury Park, CA: Sage.

Rich, J.R., & Boudreau, J.W. (1987). The effects of variability and risk in selection utility analysis: An empirical comparison. Personnel Psychology, 40, 55-84.

Roth, P. L. (1994). Multi-attribute utility analysis using the Promes approach. Journal of Business and Psychology, 9 (1), 69-80.

Roth, P. L., & Bobko, P. (1997). A research agenda for multi-attribute utility analysis in human resource management. Human Resource Management Review, 7 (3), 341-368.

Roth, P. L., Pritchard, R.D., Stout, J. D., & Brown, S. H. (1994). Estimating the impact of variable costs on SDy in complex situations. Journal of Business and Psychology, 8 (4), 437-454.

Roth, P., Segers, A., & Wright, P. (2000). The acceptance of utility analysis: Designing a model. Paper presented at the Academy of Management Annual Meeting, Toronto, Canada.

Rucci, A.J., Kirn, S.P. & Quinn, R.T. (1998). The employee-customer-profit chain at Sears. Harvard Business Review, January-February, pp. 83-97.

Russell, C. J. (1998). Maybe they shouldn't believe, or why personnel selection is like a peanut butter sandwich: Value distance as a source of ambiguity in utility estimates. Paper presented at the national meeting of the Society of Industrial and Organizational Psychology.

Russell, C., Colella, A., and Bobko, P. (1993). Expanding the context of utility: The strategic impact of personnel selection. Personnel Psychology, 46, 781-801.

Schmidt, F.L. & Hunter, J.E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. Psychological Bulletin, 124 (2), 262-274.

Schmidt, F.L., Hunter, J.E., McKenzie, R.C., Muldrow, T.W. (1979). Impact of valid selection procedures on work-force productivity. Journal of Applied Psychology, 64, 609-626.

Schmidt, F.L., Hunter, J.E., Outerbridge, A.N., & Trattner, M.H. (1986). The economic impact of job selection methods on size, productivity, and payroll costs of the federal work force: An empirically based demonstration. Personnel Psychology, 39, 1-30.

Schneider, B., Ashworth, S.D., Higgs, A.C. & Carr, L. (1996). 'Design, validity and use of strategically focused employee attitude surveys". Personnel Psychology, 49, 695-705.

Skandia Corporation (1996). "Power of Innovation—Skandia Navigator." Supplement to Skandia's 1996 Interim Report. Pages 10-11.

Skarlicki, D.P., Latham, G. P., & Whyte, G. (1996). Utility analysis: Its evolution and tenuous role in human resource management decision making. Revue Canadienne des Sciences de l'Administration, 13 (1), 13-21.

Stamps, D. (2000). Measuring minds. Training, May, 1-7.

Sturman, M. C. (2000). Implications of utility analysis adjustments for estimates of human resource intervention value. Journal of Management, 26 (2), 281-299.

Sveiby, Karl Erik, The New Organizational Wealth. San Francisco: Barrett-Koehler, 1997.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18, 509-533.

Treacy, M., & Wiersema, F. (1997). The discipline of market leaders. Reading, MA: Addison-Wesley.

Trevor, C. O., Gerhart, B., & Boudreau, J. W. (1997). Voluntary turnover and job performance: Curvilinearity and the moderating influences of salary growth and promotions. Journal of Applied Psychology, 82 (1): 44-61.

Ulrich, D. (1996). Human resource champions. Boston, MA: Harvard Business Review.

U.S. Securities and Exchange Commission, Securities Act of 1933.

U.S. Securities and Exchange Commission, Securities Exchange Act of 1934.

Welbourne, T. M., & Andrews, A. O. (1996). Predicting the performance of initial public offerings: Should Human Resource Management be in the equation? Academy of Management Journal, 39, (4) 891-919.

Whyte, G., & Latham, G. (1997), The futility of utility analysis revisited: When even an expert fails. Personnel Psychology, 50 (3), 601-610.

Wright, P.M., MacMahan, G.C., Snell, S. & Gerhart, B.A. (2001). Comparing line and HR executives' perceptions of HR effectiveness: Services, roles and contributions. Human Resource Management, 40 (2) 111-123.

Youndt, M. A., Snell, S. A., & Dean, J. W. (1996). Human resource management, manufacturing strategy, and firm performance. Academy of Management Journal, 39, (4) 836-867.

About the Authors

John W. Boudreau, Ph.D., Professor of human resource studies at Cornell University is recognized worldwide for breakthrough research on the bridge between superior human capital, talent and sustainable competitive advantage. His research has received the Academy of Management's Organizational Behavior New Concept and Human Resource Scholarly Contribution awards. Dr. Boudreau consults and conducts executive development with companies worldwide that seek to maximize their employees' effectiveness by quantifying the strategic bottom-line impact of superior people and human capital strategies, including Boeing, Bristol-Myers Squibb, Citigroup, GE, IBM, JP Morgan Chase, Novartis, Schering-Plough, Shell International, Sun Microsystems, Transamerica, the United Nations, Verizon, and Williams-Sonoma. Professor Boudreau was an architect and the first Visiting Director of Sun Microsystems' unique Research and Development Laboratory for Human Capital. Professor Boudreau is a Fellow of the National Academy of Human Resources.

Dr. Boudreau has published more than 40 books and articles, including the best-selling Human Resource Management (Irwin: 1997), now in its eighth edition in multiple languages worldwide. In addition to HR metrics, Dr. Boudreau's large-scale research studies and highly focused qualitative research have addressed decision-based HR, executive mobility, HR information systems and organizational staffing and development. His research findings have been published in *Management Science, Academy of Management Executive, Journal of Applied Psychology, Organizational Behavior and Human Decision Processes, Personnel Psychology, Asia-Pacific Human Resource Management, Human Resource Management, Journal of Vocational Behavior, Human Relations, Industrial Relations, Journal of Human Resources Costing and Accounting,* and *Personnel Administrator*.

Features on his work have appeared in *The Wall Street Journal, Fortune, Business Week, Training*, and *Human Resources Management*.

The winner of the General Mills Award for teaching innovations, Dr. Boudreau also founded the Central Europe Human Resource Education Initiative, which links American HR professionals and academic researchers with faculty and students in the Czech and Slovak Republics. A strong proponent of corporate/academic partnerships, Dr. Boudreau directed the Center for Advanced Human Resource Studies (CAHRS), which partners executives from America's top corporations with university researchers and students to explore leading-edge HR issues. This Cornell University "think tank" has generated groundbreaking insights and practical solutions for the human resource challenges that affect most organizations today.

Dr. Boudreau is a member of the board of advisors for Brassring.com, a technology information and career portal. He chaired the Academic Advisory Board of the California Strategic HR Partnership, a silicon-valley HR executive consortium, Saratoga Institute, a leading global source of human capital benchmarking and performance measures; and Primelearning.com, which provides performance-based business and professional skills training over the Internet. He has also been elected to the executive committees of the Human Resources Division of the Academy of Management and the Society for Industrial and Organizational Psychology. Dr. Boudreau holds an undergraduate degree in business from New Mexico State University, and a Masters degree in Management and Ph.D. in industrial relations from Purdue University's Krannert School of Management.

Peter M. Ramstad is Executive Vice President for Strategy and Finance at Personnel Decisions International (PDI). Over the last ten years, Mr. Ramstad has held various leadership positions within PDI. As a result, he has had many opportunities to work first-hand with the core tools of business strategy, organizational effectiveness, and talent development. Prior to joining PDI, Mr. Ramstad was a partner with a major public accounting firm focusing on financial, operational, and systems consulting in high tech and service environments.

Mr. Ramstad has undergraduate degrees in Math and Accounting with minors in Economics and Computer Science, and significant graduate studies in Economics, Mathematics, and Accounting. He is a Certified Public Accountant, Certified Management Accountant, and a member of the AICPA. He has been a speaker at many professional and academic conferences. He has participated as a faculty member in executive education environments and for many corporate events.

Mr. Ramstad has formed two research partnerships with faculty from major universities (Cornell and Texas A&M) to study how people create value, and how that value can be measured. As a part of this research, Mr. Ramstad has worked with clients to understand and measure the financial implications of employee development and effective management. The models and tools for this process are known as Return On People™.

Many people see Mr. Ramstad's breakthrough thinking in this area as fundamental to an organization's ability to implement the systems and techniques required to fully manage human resources as assets, rather than merely expenses. Mr. Ramstad's work goes beyond traditional HR system analysis to focus on the core issues of how organizational capabilities create value and the implications this has for business strategy in the knowledge-based economy.