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Decision Making Factors in Estimating SDy in Utility Analysis: Effects of Frame, Stimulus Salience, and Anchoring

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(ABSTRACT)

The present research is concerned with the cognitive dimensions of procedures for estimating the standard deviation of job performance (SDy) in utility analysis. The overall goal was to integrate SDy estimation with advances in the area of decision making, and with advances in the social psychological study of person perception. Three variables were considered: problem frame, that is, whether the estimation task is posed in terms of the gain or loss of employees, stimulus salience, that is, the level of detail regarding the employee whose worth is being evaluated, and anchor values from previous estimates provided to judges as the starting point in forming their judgments.

In previous research by Shetzer & Bobko (1987), estimates of overall worth obtained under negative frames were significantly greater than estimates obtained under positive frames. Experiment 1 tested whether the effect of frame would be as evident with high salience stimuli as with the traditional low salience scenario. A significant effect due to salience was found and the study concluded that salience is a primary variable. Experiment 2 examined the relation between the effect of framing and anchor values provided to subjects as the starting point in

estimation. Experiment 2 found a significant effect for anchoring but no effect due to frame, suggesting that subjects' estimates are anchored on initial values. Anchoring was also found to reduce the variability of estimation. The reduction in the variability of negatively framed estimates appears to be relatively greater when anchors are provided than is the reduction in the variability of positively framed estimates. These findings confirm earlier research concerning the efficacy of the sequential feedback procedure for reducing within-cell variance.

The results of the two experiments suggest that the effect of problem frame is not as important a variable in SDy estimation as are salience and anchoring. This conclusion should be welcomed by utility analysts, since it suggests that the estimation procedure can be made more precise by providing judges with the maximum amount of relevant information thus mitigating the impact of more peripheral variables, such as how the problem is framed.

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INTRODUCTION

There has recently been renewed interest in the decision theoretic equations developed by both Brogden (1949) and Cronbach and Gleser (1965) for estimating the utility of organizational interventions. This interest is evidenced by the increasing application of utility estimation to an expanding variety of situations. Much of this application has been in the area of employee selection, for example, for selecting sales personnel (Cascio and Silbey, 1979; Burke and Frederick, 1984), computer programmers (Schmidt, Hunter, McKenzie and Muldrow, 1979), telecommunications managers (Cascio and Ramos, 1986), insurance counsellors (Bobko, Karren and Parkington, 1983), convenience store managers (Weekly, Frank, O'Connor and Peters, 1985), budget analysts (Hunter and Schmidt, 1982) and steelworkers (Arnold, Raushenberger, Souble and Guion, 1982). In addition, there has been a push to include a broader range of human resource management domains in utility analysis, such as turnover and retention (e.g. Boudreau and Berger, 1985), performance feedback (Landy, Farr and Jacobs, 1982), training (Schmidt, Hunter and Pearlman, 1982), and stress reduction programs (Bobko, 1986).

The present research is concerned with procedures for estimating the standard deviation of job performance in utility analysis. These estimation procedures, which involve human judgment, have been the focus of increasing attention in recent years. Although the procedures have seen increasing usage, there has been a notable lack of research in which they are examined in terms of their cognitive and decision making dimensions. The current research attempts to narrow that gap, by integrating SDy estimation with advances in the area of decision making. The present investigation begins with an overview of utility estimation, and the origin and current status of SDy estimation procedures. Relevant contributions from decision making research will then be considered, and an earlier study which made use of these contributions will be described. Finally, the results of two research studies which addressed unanswered questions about the decision making aspects of SDy estimation will be reported.

Overview: Development of utility estimation

The Taylor-Russell approach: The impetus to develop utility estimation procedures arose from the realization that, in attempting to index the value of a selection test, the Pearsonian correlation leaves much to be desired (Ghiselli, Campbell and Zedeck, 1981). How much more useful to an organization is a test which correlates .60 with the criterion than one which correlates .35? Taylor and Russell (1939) first attempted to provide a more meaningful index of utility by focusing on decision accuracy. They incorporated measures of base rate and the selection ratio along with the test- criterion correlation. Base rate refers to the proportion of employees considered to succeed on the job, a measure which requires that the criterion be dichotomized into good and poor performers. The selection ratio is simply the number of available job openings compared to the total number of available applicants. Taylor and Russell (1939) developed tables which indicate the increase in the percentage of correct predictions over the base rate given a particular selection ratio and validity coefficient. For example, these tables show that, in general, when the selection ratio is low, even tests with low validity coefficients are useful, and conversely, when the selection ratio is high, the predictor must possess substantial validity to be of value. Alternatively, with respect to base rate, the tables demonstrate that the greatest gain in decision accuracy from using a more valid selection procedure comes at the 50/50 split, that is, where half the candidates are considered successful performers. As the base rate departs from this value, it becomes increasingly difficult to improve upon it with a selection test.

Several drawbacks are apparent in the Taylor-Russell (1939) formulation. One is the dichotomous classification of performance, a classification which is meaningful for some jobs but not others (Cascio, 1982). In situations where it can be assumed that the use of higher cutting scores will lead to higher average job performance, the Taylor-Russell model actually underestimates the actual amount of gain (Ghiselli, Campbell and Zedeck, 1981). The problem of the dichotomous criterion is alleviated by the Naylor-Shine modification to the Taylor-Russell model, in which utility is defined in terms of the increase in the average criterion score to be expected from using a selection instrument with a given validity and selection ratio (Blum and Naylor, 1968). However, two problems still remain with the approach: first, the Taylor-Russel model deals only with false positives (i.e. selected individuals who turn out unsuccessful) and true hits (i.e. selected individuals who turn out successful)-the error of rejecting individuals who would have been successful (false negatives) is not considered. Secondly, considering the utility of a selection procedure in terms of decision accuracy still falls short of addressing the issue of value in terms of costs and benefits to the organization.

The Brogden-Cronbach-Gleser model: Brogden (1949) and later Cronbach and Gleser (1965) advanced the progress of utility estimation by demonstrating mathematically that ΔU, the net gain in utility associated with a particular selection instrument is equal to

$$(Ns\ rxy\ SDy\ \theta) - C$$

where Ns is the number of hires, rxy is the test-criterion validity coefficient, SDy is the standard deviation of worker output, θ is the selection ratio expressed in standard score form, and C is the cost of administering the selection procedure. SDy may be indexed by any linear metric, and while it has typically been measured in dollars, in some applications non-monetary indices such as work hours gained, work output, or attendance may be more appropriate. As indicated above, the basic equation has been adapted to utility measurement for interventions other than selection, such as training, performance feedback, and stress reduction. The basic equation has also been considerably extended and refined (e.g. Boudreau and Berger, 1985) to measure the organizational impact of a selection procedure in more global terms (e.g. in relation to the effect on other organizational systems such as placement and training, and over the long term).

Supervisory estimates of SDy: For a number of years, the potential for the application of the Brogden/ Cronbach-Gleser formulation was not realized because of the difficulty associated with measuring one parameter in the equation, SDy. Calculation of SDy required a laborious cost accounting procedure (c.f. Roche, 1965) in which performance is broken down into components, each of which is individually costed and later recombined.

In order to circumvent the need for cost accounting, a number of SDy estimation procedures have been developed and investigated. The method which has received greatest attention was proposed by Schmidt et al. (1979), which requires supervisors to estimate the dollar value of the output of workers who perform at the 50th, 85th and 15th percentile levels of performance. Assuming that job performance is normally distributed, the three values provide two independent estimates of SDy (i.e., 85th - 50th and 50th - 15th). SDy may also be calculated as half the difference between the 85th and 15th percentile estimates. A second technique which has been under scrutiny is the Cascio-Ramos CREPID method (Cascio, 1982), which breaks down the job into activities which are then weighted by their frequency, importance, consequence of error and difficulty. Employing wages as a baseline, CREPID estimates the overall value of job performance by assigning a dollar value to each weighted activity. Finally, a "rule of thumb" estimate of SDy puts it at 40% of annual salary, and is based on Hunter and Schmidt's (1983) review of empirical findings.

Schmidt et al. (1979)'s estimation task employed the following instructions in order to obtain estimates of worth for the job of computer programmer:

> The dollar estimates we are asking you to make are critical in estimating the relative dollar value to the government of different

selection methods. In answering these questions, you will have to make some very difficult judgments. We realize they are difficult and that they are judgments or estimates. You will have to ponder for some time before giving each estimate, and there is probably no way you can be absolutely certain your estimate is accurate when you do reach a decision. But keep in mind three things:

(1) The alternative to estimates of this kind is application of cost accounting procedures to the evaluation of performance. Such applications are usually prohibitively expensive. And, in the end, they produce only imperfect estimates, like this estimation procedure.

(2) Your estimates will be averaged with those of other supervisors of computer programmers. Thus errors produced by too high and too low estimates will tend to be averaged out, providing more accurate final estimates.

(3) The decisions that must be made about selection methods do not require that all estimates be accurate down to the last dollar. Substantially accurate estimates will lead to the same decisions as perfectly accurate estimates

Based on your experience with agency programmers, we would like you to estimate the yearly value to your agency of the products and services produced by the average (or superior, or low performing) computer GS 9-11 programmer. Consider the quality and quantity of output typical of the average (or superior, or low performing) programmer and the value of this output. In placing an overall dollar value on this output, it may help to consider what the cost would be of having an outside firm provide these products and services.

Based on my experience, I estimate the value to my agency of the average (or superior, or low-performing) computer programmer at_______ per year (p. 621).

Schmidt et al. (1979) had supervisors estimate the value of average performers first, superior performers second, and low performers last. A superior performer was defined as one at the 85th percentile, whose performance "is better than that of 85% of his or her fellow programmers, and only 15% turn in better performance." Similarly, a low performing programmer was defined as one who is at the 15th percentile such that

"85% of all computer programmers turn in performances better than the low performing programmer, and only 15% turn in worse performances."

Problems with supervisory estimates of SDy: A variety of questions have arisen in reference to the information gained from the Schmidt et al. (1979) procedure, particularly in regard to the method's accuracy in relation to other estimation procedures and archival data, and its robustness to contextual effects (Bobko, Karren and Kerkar, 1987). For example, Weelky et al. (1985) found that, although the CREPID and 40% rule produced roughly comparable estimates, estimates produced by the Schmidt et al. (1979) procedure were approximately 1.8 times greater than the other two methods. While Bobko et al. (1983) and Janz and Etherington (1983) found agreement between direct estimates of SDy and archival performance data, DeSimone, Alexander and Cronshaw (1986) found that direct estimates "were significantly lower than the actual value of SDy" (p.93). Further, research suggests that the accuracy of SDy estimates is significantly affected by the degree to which performance information can be translated into dollar metrics (Reilly and Smither, 1985), and/or by the particular organizational level of the judges (Mayer, 1982). Reilly and Smither (1985) found that as it becomes cognitively more difficult to process performance information in dollar terms (in their case actual vs. projected sales), SDy estimates based on the Schmidt et al. (1979) procedure become more variable and less accurate. The difficulty of eliciting direct estimates of SDy where judges are not accustomed to dealing with performance in dollar terms also surfaced in a study by Eaton, Wing and Mitchell (1985), in which U.S. Army personnel estimated the performance of tank commanders. Eaton et al. (1985) pointed to the fact that the Army is not in the habit of associating a dollar value with job performance. The inappropriateness of a dollar metric for utility analysis with military personnel has also been noted by Sadaca and Campbell (1985).

Additionally, one often noted feature of the Schmidt et al. (1979) procedure is the extreme variation in estimates across different supervisors (cf. Bobko et al., 1983; Reilly and Smither, 1985; Schmidt et al., 1979). In the original Schmidt et al. (1979) data, for instance, the standard deviation of estimates of SDy was actually greater than the mean estimate of SDy. This extreme within-cell variation raises the possibility that different judges were basing their estimates on different factors. In this regard, Bobko et al. (1983) found a high correlation between the 50th percentile estimate and the estimate of SDy, suggesting that judges were employing idiosyncratic scales. Burke and Frederick (1984) further suggested that judges may also be idiosyncratic in the order in which they provide the three estimates, an additional factor which would contribute to the high within-cell variation. Still another possibility, noted by Reilly and Smither (1985), is that the way Schmidt et al. (1979) framed the task for their subjects may have introduced confusion and unreliability into the SDy estimates. Specifically, it was noted above that the Schmidt et al. (1979) procedure first asks subjects to estimate the value of "overall products and services" and then asks them to consider the "cost of having an outside firm provide these products and services". Boudreau (1983) has pointed out that, in objective terms, the value of products and services is not equal to the cost of obtaining them from an outside firm. It is also possible that the two ways of framing the estimation task are also not cognitively comparable.

In sum, these empirical findings have raised several basic questions about the Schmidt et al. (1979) procedure or, more generally, about any procedure for estimating overall worth which involves human judgment. As noted by Bobko et al. (1987) and DeSimone et al. (1986), more is needed in our understanding of the factors which supervisors use in forming their judgments, the rules used in combining information, and the effects of context (e.g. scenario, order) on such judgments. Recent developments in the area of decision making may offer insight into the cognitive dimensions of the Schmidt. et al. (1979) procedure, or variations of that procedure requiring human judgment. The relevance of such developments will now be considered.

Contributions from decision making research

Framing: Decision making research has shown that framing a problem of estimation or choice positively (i.e., in terms of potential gain) can usually not be expected to produce the same result as when the problem is posed in a negative frame (i.e., in terms of potential loss), even when the actual objective outcome of the two versions is identical (Kahneman and Tversky, 1979, 1984; Tversky and Kahneman, 1981). For example, in their "epidemic problem" Tversky and Kahneman, (1981) asked subjects to choose between two programs in response to an upcoming epidemic where 600 lives were at risk. The outcome of the choice was framed positively for some subjects and negatively for others. In the positive frame, subjects were told that program A would save 200 people, while program B would have a one third probability of saving all 600 people, and a two thirds probability of saving no one. Subjects in the negative frame were told that with program A, 400 people would die, while with program B, there was a one- third probability that nobody would die, and a two-thirds probability that all 600 would die. Although the objective outcome of the choice in terms of number of lives saved is identical regardless of the frame, a majority of subjects who were presented with the positive frame selected the certain option (program A), while a majority of subjects presented with the negative frame chose the probabilistic option (program B). Tversky and Kahneman (1981) propose that in the negative frame subjects assume a perspective in which no one dies, so the alternatives are cognitively evaluated in terms of losses relative to the standard. In the positive frame, on the other hand, the reference standard adopted is one in which all the people die, so that alternatives are evaluated in terms of potential gain. The epidemic problem illustrates the failure of invariance due to frame, or in other words, that choices are affected by the way the problem is structured. A similar demonstration was provided by McNeil, Pauker, Sox and Tversky (1982), who showed that preferences of physicians and patients for hypothetical therapies for lung cancer depend on whether outcomes are described in terms of mortality or survival. This failure of invariance is described by Kahneman and Tversky (1984) as being both pervasive and robust ... "as common among sophisticated respondents as naive ones, not eliminated even when the same respondents answer both questions within a few minutes ... In their stubborn appeal, framing effects resemble perceptual illusions more than computational errors" (p. 343).

The epidemic problem also illustrates that gains are treated differently than losses. This is consistent with Kahneman and Tversky's (1979) "prospect theory", where judges are found to be risk seeking when confronted with loss, while risk averse when faced with gain. For example, in the case of gain, Kahneman & Tversky (1984) report that when faced with the choice between a certain win of $800, and an 85% chance of winning $1000, a majority of subjects chose the certain option. Alternatively, when faced with the choice of losing $800 for certain, or an 85% chance of losing $1000, a majority of subjects expressed preference for the gamble over the certain option.

The non-equivalence of gain and loss is also illustrated by what Thaler (1980) has referred to as the "endowment effect", in which a higher selling price will be demanded to part with an asset already in one's possession than one would be willing to pay to acquire the same asset. Thaler uses the endowment effect to explain the sales strategy of allowing a two-week trial period with a money-back guarantee, or why credit card companies have lobbied to have the difference between a credit card and a cash purchase referred to as a "cash discount", rather than as a "credit surcharge".

The effect of framing can also be observed in situations where disadvantages can be framed either as a cost or a loss. Slovic, Fischoff, and Lichtenstein (1982) observed that the purchase of insurance, for example, may be framed as a choice between a sure loss, and the risk of a greater loss. They found that 80% of subjects were risk seeking when presented with a gamble over a sure loss (preferring a 25% chance of losing $200 over a sure loss of $50), but only 35% of subjects refused to pay $50 for insurance against a 25% risk of losing $200. Again, subjects were risk averse in the face of potential gain, preferring a sure outcome over a gamble that has a higher or equal expectation, and risk seeking in the face of potential loss, rejecting a sure outcome in favor of a gamble of lower or equal expectation.

Anchoring: A second application of decision-making research to SDy estimation concerns the effect known as anchoring (Tversky and Kahneman, 1974). The essence of this phenomenon is that judges often respond to a problem depending on the initial starting point which it provides. For example, Lichtenstein, Slovic, Fischoff, Layman and Combs (1978) had subjects estimate the frequency of death due to a variety of causes. The effect of anchoring was manipulated by beginning the task for one group of subjects with a high-frequency example (e.g., "approximately 50,000 people die annually in motor vehicle accidents"), while the task for a second group of subjects was begun with a low-frequency example (e.g., "approximately 1000 people die annually from electrocution"). It was demonstrated that the low-frequency group provided estimates of frequencies of deaths, across almost all causes of deaths, which were significantly less than the high-frequency group estimates -- with the two groups differing by as much as a factor of 5 in some cases. Such judgmental biases occur because the judge places too much weight on the anchor and fails to adjust the estimate in light of other relevant considerations. Anchoring effects have also been found in preference for gambles (Lichtenstein and Slovic, 1971), sales predictions (Hogarth, 1980), and predictions of spousal consumer preferences (Davis, Hoch and Ragsdale, 1986). Tversky and Kahneman (1974) have shown that intuitive numerical estimation tends to be anchored on initially presented values even when those values are selected randomly in the subject's presence.

In sum, the literature on framing and anchoring suggests that, first, problems of estimation are often affected by the way in which the problem is framed, and secondly, that estimates are often affected by the initial starting point with which the problem is presented.

A Preliminary investigation of framing and anchoring

Based on the literature on framing and anchoring, Shetzer and Bobko (1987) hypothesized that if the framing of overall worth were systematically controlled and varied, estimates of individual worth under negative frames would be significantly greater than estimates elicited under positive frames. In reference to anchoring, Shetzer and Bobko (1987) hypothesized that if the order of estimation were varied, estimates of overall worth would not be robust to variation in ordering. Rather, it was predicted that estimates would vary if the order of presentation was varied. It was further predicted that estimates of 85th percentile performance would be significantly greater when they were provided first, than when they were provided in the traditional ordering. This prediction followed directly from the anchoring effect, because eliciting the largest estimate first provides no comparison which would serve to restrain the magnitude of estimation.

Shetzer and Bobko (1987) tested these hypotheses by asking undergraduate introductory psychology students to estimate the yearly overall worth of university professors who perform at the 50th, 85th and 15th percentile levels of performance. Estimates were elicited by means of brief paragraph scenarios (See Appendix 1). The effect of frame was investigated by posing the problem for half the subjects in a positive frame; for the other half the problem was posed in a negative frame. Wherever possible, the wording of the scenarios used paralleled that of Schmidt et al. (1979).

The second independent variable in the Shetzer and Bobko (1987) investigation was presentation order. Subjects in both the positive and negative frame conditions received one of three presentation orders: a request for their 50th percentile estimate, followed by the 85th and 15th percentiles (the traditional ordering); the 85th percentile requested first, followed by the 50th and the 15th percentiles; or, the 15th percentile requested first, followed by the 50th and the 85th percentile. The reason that these three presentation orders were selected (out of the total 3! or 6 possible combinations) was that these were judged to be most different from one another, and they allowed looking at the both 15th and 85th percentile estimates in the first position.

The Shetzer and Bobko (1987) study found that estimates of overall worth elicited under negative frames were significantly greater than those elicited under positive frames. The hypothesis regarding the effect of framing on estimates of overall worth was thus confirmed, providing evidence that using a positive frame to elicit dollar estimates of performance is not cognitively equivalent to posing this task using a negative frame. While the predicted main effect for presentation order was not significant, Shetzer & Bobko (1987) did find that presentation order interacted significantly with differential framing such that the most extreme estimates resulted when the 85th percentile of performance was elicited first in the negative frame. This suggested that the loss of a particular performer is weighted more heavily than the gain of that performer, and when estimating the loss of a superior performer first in the sequence, that loss looms most costly of all.

Further questions regarding the effects of framing and anchoring: Extensions of the Shetzer & Bobko (1987) study

The Shetzer & Bobko (1987) study was a first step in examining the effects of framing and anchoring in judgments of overall worth. The finding that negatively framed estimates were of larger magnitude than positively framed ones appeared to be consistent with the framing literature (e.g. Kahneman and Tversky's (1979) "prospect theory"; Thaler's (1980) "endowment effect"). The interaction between frame and presentation order uncovered by Shetzer & Bobko (1987) provided preliminary evidence that estimates are anchored on initially presented values in certain frame conditions, although the anchoring literature would not predict an interaction with frame. As noted, the main effect of presentation order predicted by the anchoring literature was not obtained.

The current research attempted to further probe the contribution of framing and anchoring in judgments of overall worth. Experiment 1 was concerned with the question of why framing should affect estimates of worth, and attempted to link the variable of frame with that of stimulus salience. Drawing on the social psychological literature on salience in person perception, Experiment 1 noted that the traditional Schmidt et al. (1979) scenarios provide only abstract descriptions of employees and job performance, and asked whether the effect of frame might be a product of the low salience scenarios.

Experiment 2 returned to the question of anchoring by attempting to relate the framing effects obtained by Shetzer & Bobko (1987) to a variation of the Schmidt et al. (1979) procedure developed by Bobko et al. (1983). In this procedure, judges are given actual dollar values as starting points in their estimation. Providing subjects with an initial value is thus a direct examination of the effect of anchoring. Experiment 2 further asked whether it is the specific dollar value provided or the percentile level of performance which serves as the anchor. A preliminary test of this question was made by using two anchor values, derived from either the positive or negative frames of the Shetzer & Bobko (1987) study. Finally, Experiment 2 attempted to determine the relation between anchoring and framing effects by once again posing the task in either a positive or negative frame.

Both the framing and anchoring manipulations in Experiments 1 and 2 were examined in relation to two control conditions which replicated the Shetzer & Bobko (1987) study. The present research also including a number of manipulation checks which were absent from the preliminary investigation by Shetzer & Bobko. Among these were a check that subjects do, in fact, think in terms of gain versus loss depending on the experimental instructions, and a check that subjects employed the anchor values provided in Experiment 2. Finally, the current research attempted to improve upon the Shetzer & Bobko (1987) study by gathering more complete and detailed demographic information regarding the subject sample.

EXPERIMENT 1

The Contribution of stimulus salience to the effect of framing

As noted above, while Shetzer & Bobko (1987) found that estimates of overall worth obtained under negative frames appear to differ from those obtained under positive frames, the underlying mechanisms which would explain these estimation differences are not immediately apparent. It deserves mention that the decision making literature provides no explanation of what mechanisms underlie the differential effect of frame. Two possible explanations regarding the effect of frame on estimates of overall worth were suggested are by a) the utility literature itself, and b) social psychological research on the effects of stimulus salience. The former line of reasoning may be termed the sunk costs hypothesis, and the latter, the salience hypothesis.

The sunk costs hypothesis: First, a relatively straightforward explanation may simply be that judges place greater emphasis on the loss of a performer (negative frame) because that person is already on the job, has been socialized to the organization, and the organization has already expended "sunk" costs (Northcorft and Wolf, 1984) in obtaining and retaining that person. It may be noted that the sunk costs hypothesis is consistent with the decision making literature in predicting a differential effect due to frame.

The salience hypothesis: A direct examination of the relation between framing and stimulus salience has not previously been undertaken, however, research in the area of salience has shown that perceptually salient information is overrepresented in causal explanation (Fiske and Taylor, 1984). For example, Higgins, Roles, & Jones (1977) unobtrusively primed either positive or negative trait terms ("self confidence" or "conceit"), and found that subsequent evaluations of an ambiguously described target person was consistent with the primed category. Identical behavior was later described as indicating self-confidence or conceit depending on which trait had been previously made salient. Similarly, Taylor, Fiske, Close, Anderson, & Ruderman (1978) found that when an individual was the sole black participant in a group discussion, that individual was perceived as talking more and being more influential than when he was not the only black.

Other salience research has shown that people are more influenced by a single piece of salient information than by base rate or consensus information (Kahneman and Tversky, 1973; Nisbett, Borgida, Crandall, & Reed, 1976.) Hamill, Wilson, and Nisbett (1980), for example, found that the detailed presentation of a single welfare case affected attitudes toward welfare recipients more than did the presentation of compelling statistics. Similarly, Borgida and Nisbett (1977) showed that face-to-face information from a student about a course had a greater affect on course preferences than did complete summaries of course evaluations. Nisbett et al. (1976) argue that the greater impact of case history information resides in the fact that it is more concrete, vivid and salient. Taylor & Fiske (1978) further argue that case history information is more imageable than statistical information and is therefore encoded both iconically and in verbal form, whereas statistical information is encoded in verbal form only. Salient information is thus multiply encoded and is subsequently more readily retrieved (Fiske and Taylor, 1984).

In sum, the social psychological perspective on stimulus salience would suggest that a highly salient description of a person is processed differently than a low salience person description. The implication for the present investigation is that estimates of overall worth may be affected by the salience of the scenarios employed, or by the interaction of salience with problem frame. It should be noted that the salience hypothesis does not predict whether high salience will increase or decrease the magnitude of resulting estimates of overall worth, but only that estimates elicited with high salience scenarios will differ from estimates based on low salience instructions. Thus it is possible that high salience will decrease the magnitude of resulting estimates.

Sunk costs vs. salience explanation of framing

Experiment 1 examined the effect of stimulus salience in the Schmidt et al. procedure for estimating employee worth. Specifically, the Schmidt et al. procedure is a low salience situation since the judge is not asked to think in terms of specific employees or instances of worth. With a low salience stimulus, judges are given relatively free reign in generating an internal representation of the estimation problem. It is therefore possible that with a low salience stimulus, the problem frame itself contributes greatly to the internally generated representation. For example, when considering the value of the loss of a professor, the judge's reference point might tend to be an actual professor which presents a relatively salient stimulus. In contrast, in the positive/acquisition frame, the judgment concerns a professor who has yet to be hired. In this case the reference point is more likely an abstract prototype which is non salient and emotionally neutral. To summarize this line of reasoning, since the procedure itself does not provide judges a salient stimulus, it is the frame of the problem which determines whether the internal representation will be of relatively low salience (employee gain-- positive frame) or of relatively high salience (employee loss-- negative frame). It may be noted that the salience hypothesis expands upon the traditional view of framing, since it predicts that framing effects will vary with stimulus salience.

Summary and hypotheses: Experiment 1 looked for mechanisms which potentially underlie the finding that estimates obtained under a negative frame (i.e. in terms of employee loss) were significantly greater than those obtained under a positive frame (i.e. in terms of employee gain). Two potential explanations are offered. The sunk costs explanation is that employee loss is judged to be of greater consequence than employee gain because the organization has expended a great deal of resources on someone already on the job as opposed to someone yet to be acquired. In terms of the sunk costs explanation, therefore, it should make no difference whether judges are presented with the gain or loss of an abstract prototype (e.g. an "85th percentile performer") versus a concrete referent (e.g. "employee X- an 85th percentile performer"). For the sunk costs explanation frame is a superordinate variable: simply having judges think in terms of gain or loss produces the differential estimates.

The salience explanation attributes the difference between gain and loss frames to the low salience of the estimation procedure. Since the traditional scenarios do not provide concrete referents (i.e. specific examples of employees or performance) the judge is more likely to refer to an actual on-the-job employee when estimating the value of employee loss than when estimating the value of employee gain, where there is a greater tendency to think in terms of an abstract prototype. According to the salience hypothesis, therefore, increasing the concreteness of the stimuli will result in estimates which do not significantly differ by frame.

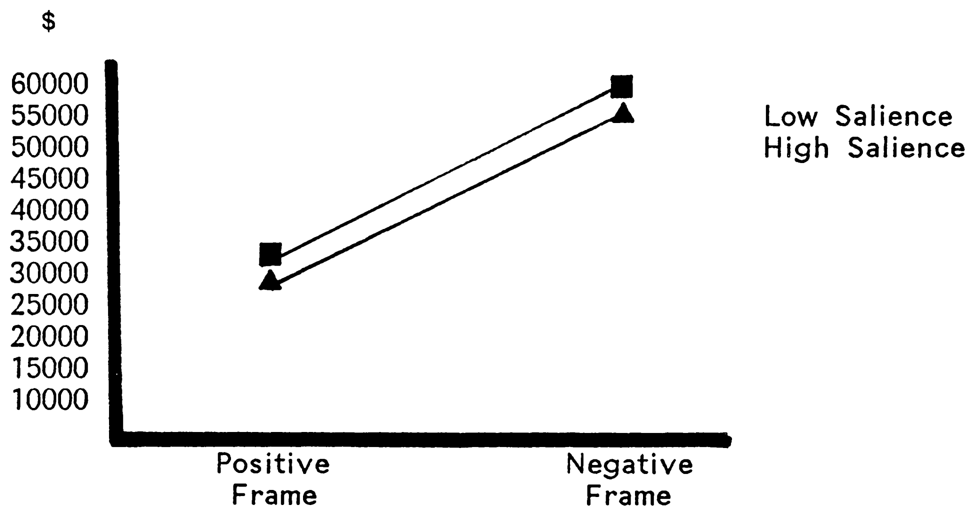
To summarize the predictions of the two hypotheses, the sunk costs hypothesis predicts that, employing concrete scenarios (see below) will not alter the effect of frame: estimates elicited under negative frames will be still be significantly greater than estimates elicited under positive frames, as was the case with the low salience scenarios in the Shetzer and Bobko (1987) study. In other words, the sunk costs hypothesis predicts a main effect due to frame, no difference due to salience, and no interaction between salience and frame. The pattern of means for frame and salience conditions predicted by the sunk costs hypothesis is plotted in Figure 1a.

Alternatively, the salience hypothesis predicts that high salience scenarios will not result in the significant differences between negative and positive frames which were seen in the low salience Shetzer and Bobko (1987) data. Therefore, the salience hypothesis predicts a significant interaction between frame and salience, as illustrated in the pattern of predicted means in Figure 1b, because it predicts that frame will only have an effect for the low salience scenarios. The salience hypothesis also predicts an overall difference between high and low salience conditions, in other words, a significant main effect due to salience independent of the frame X salience interaction.

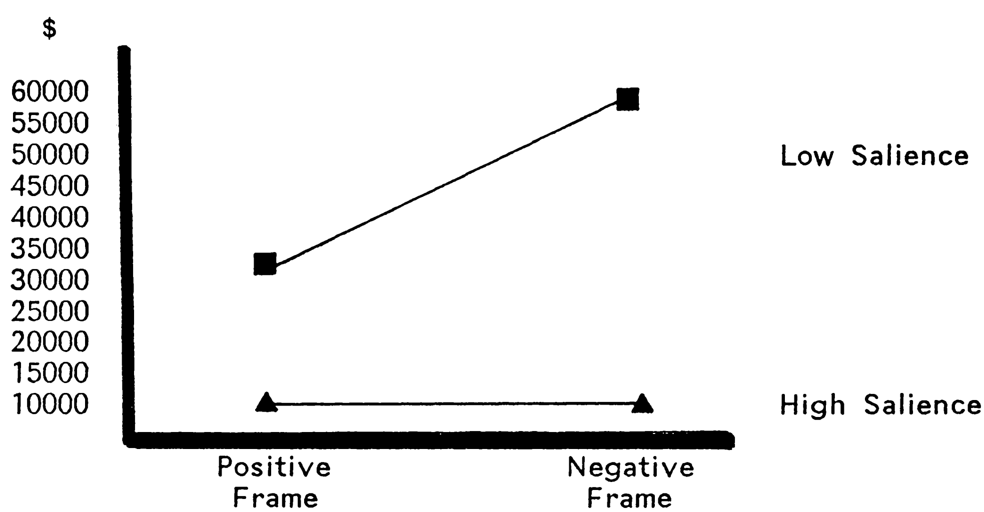
METHOD

Determination of sample size: Using the procedure described by Kirk (1968, pp. 107-109) a power analysis was conducted which employed the mean square values for treatment and error variances from the Shetzer and Bobko (1987) study as estimates. This analysis (see Appendix 2) revealed that with 22 subjects per cell at α = .05, the earlier research had achieved a power level $(1-\beta) = .88$. Based on these calculations it was decided that a minimum of twenty subjects per cell were required. Actual cell sizes are shown in Table 2.

Experimental design: For half the subjects the problem was posed in a positive frame; for the other half the problem was posed in a negative frame. The second independent variable was stimulus salience, consisting of a control (low salience) condition identical to the Shetzer & Bobko



a. Prediction made by sunk costs hypothesis



b. Prediction made by salience hypothesis

Figure 1

Predictions made by sunk costs versus salience hypotheses

(1987) study, and a high salience condition in which brief descriptions of hypothetical 50th, 85th, or 15th percentile performers were provided (see Appendix 3). The design therefore was a 2 x 2 x 3 split plot factorial, with the between subjects factors being frame (positive versus negative) and salience (high versus low), and the within subject factor being the three percentile estimates of overall worth (50th, 85th, and 15th percentiles.)

Subjects: Subjects were undergraduate psychology students enrolled in an introductory psychology course who received credit towards their final course grade for their participation. The median age of subjects was 19 years. Fifty-one percent of the sample indicated having had some form of supervisory experience. Fifty-eight percent of the sample were female students, 42% were male. The median academic rank of subjects was freshman (49%). The three most common majors of subjects were psychology (47%), engineering (21%), and general arts and sciences (17%). Complete distributions of subjects' age, academic rank, and majors may be seen in Appendix 4.

Procedure: Subjects were randomly assigned to the four treatment conditions. Subjects were provided with brief paragraph scenarios requiring them to estimate the yearly dollar value of professors who perform at the 50th 85th and 15th percentile levels of performance. All instructions had been pretested on a group of applied psychology graduate students to ensure readability and clarity. After providing their estimates of overall worth, subjects completed an eight-item questionnaire consisting of demographic items and manipulation checks (See Appendix 5).

Dependent measures

Estimates of overall worth, SDy: Each subject provided a dollar estimate for the 50th, 85th, and 15th percentile level of performance. Additionally, for each subject, a value of SDy was calculated as half the difference between the 85th - 15th percentile estimates.

Manipulation checks: As a check of the framing manipulation, all subjects were asked in the post-estimation questionnaire (Question 6 Appendix 5) whether they had thought in terms of the loss or the gain of professors when they had provided their dollar estimates.

Two checks of the salience manipulation were conducted. First, subjects were asked to estimate how long, on average, had the various professors under consideration been at the university (see Question 7 Appendix 5). A second check of the salience manipulation was conducted using a random sample of fifteen of the subjects in the low salience conditions. Since these subjects had not been exposed to the salient professor descriptions, they were asked to complete an additional task after the experiment was over (see Appendix 6). They were provided with the professor descriptions from the high salience conditions, and were asked, first, whether the three professors described were about the same age, and second, whether the professors had been with the university approximately the the same lengths of time. Finally, subjects were asked to rank the expected performance of the three professors based solely on the descriptions.

RESULTS

Manipulations checks

Framing: Table 1 shows the proportion of subjects in positive and negative conditions who reported thinking in terms of the loss or gain of professors (Question 6 Appendix 5). These data show that there was a significant tendency $X^2(4, N=98) = 68.66$, $p < .001$ for subjects to respond appropriately to the framing manipulation.

Salience: A 2 X 2 analysis of variance revealed no significant difference in estimates of the average rating of the length of time that professors had been with the university by salience condition (M high salience = 4.57 versus M low salience = 4.95 -see Question 7 Appendix 5). This finding is important because it illustrates that the salience manipulation did not inadvertently give the impression that the tenure of the high salience professors was different from that of the low salience professors. An unexpected finding was a significant difference in estimated tenure by frame $F(1,96) = 6.50$, $p < 0.01$, with negative frame subjects providing a higher average tenure rating than did positive frame subjects (5.35 versus 4.18). Thus, regardless of the salience manipulation, subjects considering professor loss tended to report that the professors had been with the university longer than did subjects considering professor gain. The significance of this finding will be addressed in the discussion section below.

Of the fifteen subjects who were provided the professor descriptions after completing the experiment proper (see Appendix 6), nine (60%) reported that they thought the three professors were different

Table 1

Proportion of subjects in Experiment 1 in positive versus negative frames who reported thinking in terms of gain versus loss (Question 6 - Appendix 5)

	Frequency Percent Row Pct Col Pct	Frame: Negative	Frame: Positive	Total
Thought in Terms of	Loss	41 42.27 97.62 85.42	1 1.03 2.38 2.04	42 43.30
	Gain	7 7.22 12.73 14.58	48 49.48 87.27 97.96	55 56.70
	Total	48 49.48	49 50.52	97 100.00

ages, while six (40%) reported they were the same age. Twelve of the fifteen (80%) thought that the three professors had been with the university approximately the same length of time. Finally, fourteen (93%) of the subjects ranked the expected professor performance in accordance with the intentions of the descriptions (i.e. performance of Swift > Jones > Sloan). Taken together these data suggest that the salience manipulation appeared realistic to subjects, and that the tenure of the professors were perceived to have been roughly equal, both across salience conditions and within the high salience conditions.

Estimates of overall worth

Mean percentile estimates and standard deviations for each of the two frames and salience conditions are presented in Table 2. If a subject gave an estimate of worth less than or equal to zero, that subject was dropped from the analysis since such estimates could not be subjected to the necessary log transformation (see below). The numbers of subjects so dropped from each condition are shown in Table 2. Means of the four treatment conditions are plotted in Figure 2.

An analysis of variance of these results is presented in Table 3. Consistent with previous research using the Schmidt et al. technique, within-cell distributions exhibited positive skewness typical of economic estimates, as well as substantial heteroscedasticity across conditions (see Table 2). Since the the within-cell standard deviations were approximately linearly related to the cell means a logarithmic transformation was employed in order to stabilize variances (Neter and Waterman, 1974, Ch. 15). Thus, the analyses of variance are based upon log-transformed

Table 2

Mean judgments of overall worth, in thousands of dollars, by frame, salience condition, and performance level (standard deviations in parenthesis).

Condition: Low Salience (Control)

	15th	50th	85th	Average
Positive Frame:	16.6	34.2	105.7	52.2
(n=25-6)[1]	(15.6)	(31.3)	(220.0)	(89.0)
Negative Frame:	13.0	34.7	133.4	60.4
(n=24-5)	(20.6)	(64.8)	(353.3)	(146.2)
Average:	14.8	34.5	119.6	55.8
	(18.1)	(48.1)	(286.7)	(117.6)

Condition: High Salience

	15th	50th	85th	Average
Positive Frame:	12.8	26.7	53.6	31.0
(n=26)	(10.6)	(30.1)	(63.6)	(34.8)
Negative Frame:	9.4	28.8	86.9	41.7
(n=23)	(11.3)	(41.8)	(200.7)	(84.6)
Average:	11.1	27.8	70.3	36.4
	(11.0)	(36.0)	(132.2)	(59.7)

[1]number of subjects - number excluded from analysis.

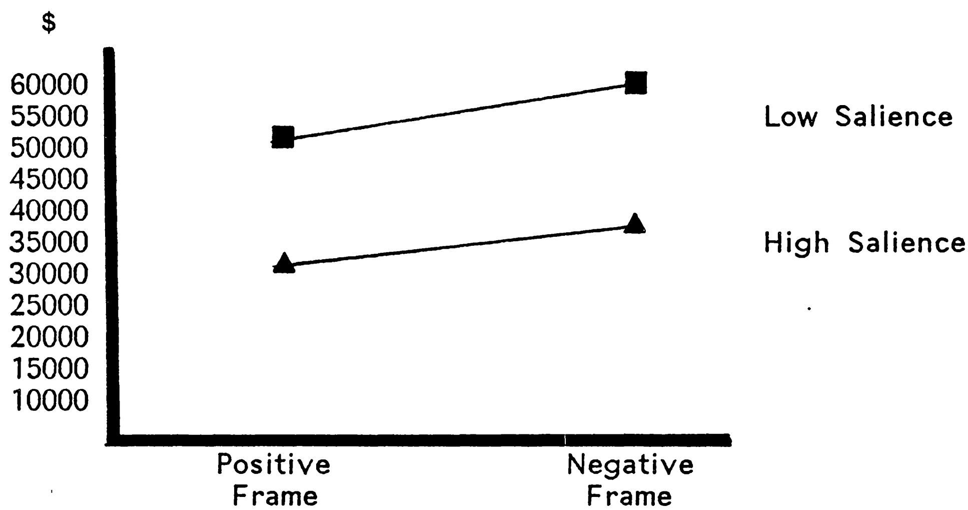


Figure 2

Mean estimates by frame and salience

data, although all other reported mean and standard deviation statistics are based upon the untransformed data. It deserves mention that the effect of the transformation is to compress the scale of measurement so that within-cell variances are equated. Analysis of variance then allows us to examine differences in mean values as if variances were equal, and this examination is separate from looking at the extent of within-cell variability across groups.

The analysis of variance indicates a significant main effect for salience $F(1, 83) = 6.92$, $p < 0.01$, and performance level $F(2, 166) = 67.57$, $p < 0.0001$. The significant effect for performance level may be taken as an internal check on the estimation procedure. The significant effect for salience resulted from the fact that estimates of overall worth obtained using high salience descriptions were more conservative than those obtained using low salience descriptions (*M* = $36,450 -- high salience versus *M* $55,800 -- low salience).

Although the overall direction of the effect of frame was consistent with the Shetzer & Bobko (1987) study, in that the negative frames produced greater estimates than did positive frames (*M* = $50,600 versus *M* = $41,700), the effect of frame was not significant. The interaction of frame with salience was also non-significant, for as Figure 2 illustrates, the lower estimates resulting from the high salience scenarios occurred for both positive and negative frames.

The lack of significance of the effect of frame was an unexpected departure from the Shetzer & Bobko (1987) study. This departure is perhaps due to the fact that, at both levels of salience, 15th percentile

Table 3

Analysis of variance of the effects of frame, salience, and percentile level of performance on judged overall worth

Source	df	Sum of Squares	Mean Squares	F value
Frame (F)	1	8.50	8.50	1.32
Salience (S)	1	44.44	44.44	6.92**
F * S	1	5.70	5.70	0.89
Subject (F * S)	83	532.88	6.42	
Performance Level (L)	2	195.79	97.99	67.57***
F * L	2	6.75	3.38	2.33
S * L	2	6.99	3.50	2.41
F * S * L	2	2.82	1.41	0.97
L * Subjects (F * S)	166	240.51	1.45	
Total	260	1052.89	4.05	

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

estimates were actually greater in the positive versus negative frame (see Table 2). While this finding was not expected, it may be noted that such a reversal also occurred in the Shetzer & Bobko (1987) study for one of the three presentation orders (specifically, the presentation order in which the 15th percentile estimates were elicited first: 15-50-85). On the other hand, the overall difference between frames in the present data can be attributed to the large difference between negative and positive 85th percentile estimates. The fact that 85th percentile estimates yielded the largest differences between frames is also consistent with the Shetzer & Bobko (1987) study, which attributed this difference to the relatively unanchored nature of 85th percentile estimates.

Estimates of SDy

Table 4 shows mean estimates of SDy across levels of frame and salience. While the negative frame SDy estimates were greater than the positive frame estimates, analysis of variance revealed that these differences were not significant. The effect of salience was also non-significant, as was the interaction of the two variables.

DISCUSSION

The intention of Experiment 1 was to compare high and low salience scenarios in the Schmidt et al. procedure for estimating overall worth. It will be recalled that the sunk costs hypothesis predicted a significant main effect for frame but not for salience (Figure 1a), while the salience hypothesis predicted a significant interaction between frame and salience, as well as a significant overall difference between salience conditions independent of the interaction (Figure 1b).

Table 4

Mean estimates and standard deviations of the standard deviation of performance (SDy), in thousands of dollars, across levels of frame and salience

	Frame		
	Postitve	Negative	Average
Control (Low Salience	44.5 (105.2)	55.8 (157.9)	50.2 (131.6)
High Salience	21.2 (29.5)	37.9 (102.2)	29.6 (65.9)

The percentile estimates obtained (Table 2) supported the predictions regarding the main effect of salience made by the salience hypothesis. It does appear that high salience alters the process of estimating overall worth, since, as noted above, estimates obtained with the high salience descriptions were consistently smaller than their low salience counterparts. While the SDy values calculated using these data did not show a significant main effect due to salience, the results were in the expected direction in that high salience SDy's were smaller than their low salience counterparts (M = \$29,600 versus M = \$50,200). It appears, therefore, that providing subjects with concrete scenarios results in a more conservative estimation process. In this regard, it noteworthy that for both the point estimates and estimates of SDy (Tables 2 and 4), the high salience conditions resulted in roughly half the within-cell variability than did the low salience conditions (SD = \$117,600--low salience versus \$59,700-- high salience for point estimates, and SD = \$131,600--low salience versus \$65,900-- high salience for estimates of SDy). In terms of the cognitive mechanisms which underlie estimating overall worth therefore, having subjects think in terms of concrete examples appears to limit the idiosyncratic nature of the estimation process. It is possible that with high salience scenarios, subjects tend to base their estimates more on the information presented by the task at hand and less on their internal representations of the problem.

While salience emerged as a variable of central importance in SDy estimation, the prediction made by the salience hypothesis regarding the frame X salience interaction was not borne out by the data. While the results also do not directly support the the sunk costs hypothesis, in that there was no main effect of frame, the sunk costs interpretation received some indirect support in the finding noted earlier regarding the frame difference in estimates of tenure. As noted, subjects considering professor loss tended to report that the professors had been with the university longer than did subjects considering professor gain, regardless of salience. Thus it appears that frame is confounded to some extent with perceived tenure. In total, the present results call the role of frame in estimating overall worth into question.

In fact, in the present results, the salience of the scenarios had an influence on judgments of overall worth whereas problem frame did not. High salience estimates were significantly smaller than their low salience counterparts. In addition, high salience estimates were less variable than low salience estimates. These findings have an obvious implication for obtaining SDy estimates in applied settings. Specifically, they suggest that providing judges with greater contextual information or specifics regarding the job, the workforce, or the organization would serve to stabilize the estimation procedure, and would result in a more conservative estimation process. The ability of high salience descriptions to reduce within-cell variation is particularly pertinent since this is a problem which, as noted, has been the bane of utility researchers. A further line of inquiry in the problem of stabilizing within-cell variation is examined in Experiment 2.

EXPERIMENT 2

Effect of anchoring on within-cell variation

Hogarth (1981) has pointed out that while many human judgmental processes are studied in the laboratory as discrete events, in the real world they are, in fact, continuous processes. A negative consequence of the failure to appreciate the continuous nature of judgement and choice is that insufficient attention is often paid to the importance of feedback between the organism and its environment. Unlike the typical laboratory situation, errors made at one stage in real world decision making can often be attenuated by the end of the task. Corrective feedback allows the decision maker to handle complex tasks in terms of simpler stages. While individual responses may be relatively inaccurate, continual adjustments take the decision maker progressively closer to the target.

The logic of Hogarth's argument was applied to the Schmidt et al. estimation procedure by Bobko et al. (1983), who attempted to employ feedback to reduce the substantial within-cell variation which the procedure invariably produces (e.g. Bobko, et al., 1983; Burke and Frederick, 1984; Schmidt et al., 1979). In Bobko et al.'s sequential feedback procedure, all judges first provide their 50th percentile estimates. Then, in a process modeled after the Delphi method of group decision making (Dalkey, 1969), the mean group value for the 50th percentile estimate is provided as feedback to each judge and forms the basis for the remaining two estimates. This feedback procedure has been found effective in reducing within-cell variation in some studies (e.g. Bobko et al., 1983; Burke and Frederick, 1984), but not in others (e.g., Karren and Bobko, 1983; Wroten, 1984). In these studies the ability of feedback to reduce within-cell variance has been measured in terms of the reduction in standard deviations of the point estimates and SDy's from the no-feedback to the feedback conditions. For example, Burke and Frederick (1984) reported that the feedback procedure reduced the within-cell standard deviation by $99,600 for the point estimates, and by $50,300 for estimates of SDy.

It will be recalled that Shetzer & Bobko (1987) examined the within-cell variability of SDy estimates when different orders of obtaining the three estimates were used (i.e. 85th, 50th, 15th versus 15th, 50th, 85th, versus the traditional order of 50th, 85th, 15th), and found that the least variable estimates resulted when the 50th percentile estimate was elicited first (i.e. the traditional order). This suggested that the variance of estimates may be stabilized when subjects are provided with information about where the center of the scale lies. The basic question of the present research was, therefore, whether providing judges with initial anchor points would reduce within-cell variation when positive versus negative frames were employed, and also the extent to which estimates would be anchored on the initial values provided. A related question about anchoring was, if it does occur, are the estimates anchored on the specific dollar values provided, or on the percentile level of performance provided. In other words, is it the actual dollar value which serves as the anchor, or the fact that that value represents 50th percentile performance? To provide a tentative answer to this question, Experiment 2 employed two anchor conditions such that either a higher or lower dollar value was provided as the 50th percentile level of performance.

Summary and hypotheses: Experiment 2 examined the the process of estimating overall worth when judges were first provided with averaged 50th percentile estimates as anchor points, and when estimates were once again elicited in either a positive or negative frame. The resulting estimates were compared with the control conditions which replicated the Shetzer & Bobko (1987) study. Based on the Shetzer & Bobko study, a significant effect of frame on both point estimates and estimates of SDy was predicted. In addition, it was predicted that estimates would tend to be anchored on initial values resulting in a significant effect for anchor in both the percentile estimates and in the resulting estimates of SDy. The question of whether estimates are anchored on the dollar values or the percentile level would be examined by testing whether the estimates of the two anchor conditions would be significantly different from each other (since the dollar values were varied whereas the 50th percentile level of performance remained constant). Of course, this manipulation was intended to provide only an initial answer to this question, since only the dollar values were varied, and not the percentile levels which those values represented. Finally, it was predicted that anchor points derived from both positive and negative frame feedback would result in reduced standard deviations for both the point estimates and estimates of SDy.

METHOD

Determination of sample size: Using the procedure described by Kirk (1968, pp. 107-109) a power analysis was conducted which employed the mean square values for treatment and error variances from the Shetzer and Bobko (1987) study as estimates. This analysis (see Appendix 2) revealed that with 22 subjects per cell at α = .05, the earlier research had achieved a power level $(1-\beta)$ = .88. Based on these calculations it was decided that a minimum of twenty subjects per cell were required. Actual cell sizes are shown in Table 7.

<u>Experimental design:</u> The problem was posed to half the subjects in a positive frame (i.e. in terms of faculty acquisition), and to the other half of the subjects in a negative frame (i.e. in terms of faculty loss). Secondly, the anchor value provided to subjects in the two anchor conditions was the mean of either positively framed estimates (i.e. \$27,900) or of negatively framed estimates (i.e. \$51,300) from Shetzer & Bobko (1987). For example, in the negative frames subjects were told "The yearly loss to the university if an average professor were to leave has been estimated to be \$27,900 (positive frame anchor, or \$51,300 --negative frame anchor)". In the positive frames, on the other hand, subjects were told "The yearly gain to the university if an average professor were to be acquired has been estimated to be \$27,900 (or \$51,300)". The no-anchor conditions were the two control conditions from Experiment 1, in which estimates were elicited in either positive or negative frame with no initial anchor value being provided. The anchor scenarios are shown in Appendix 7.

In summary, the design was a 2 X 3 X 2 split plot factorial with two levels of frame (positive versus negative), three levels of anchoring (no anchor, positive frame anchor, and negative frame anchor), with each subject providing two percentile estimates (15th and 85th percentile levels of performance).

Subjects: Subjects were undergraduate psychology students enrolled in an introductory psychology course who received credit towards their final course grade for their participation. The median age of subjects was 19 years. Fifty percent of the sample were female students, 50% were male. The median academic rank of subjects was freshman (33%). The three most common majors of subjects were psychology (41%), engineering (22%), and general arts and sciences (21%). Complete distributions of subjects' age, academic rank, and majors may be seen in Appendix 8.

Procedure: Subjects were randomly assigned to the six treatment conditions. Using the scenarios just described each subject in the anchor conditions was asked to estimate the yearly dollar value of university professors who perform at the 85th level of performance and at the 15th level of performance (as noted in Experiment 1, control condition subjects also provided 50th percentile estimates). Following the Bobko et al. (1983) feedback procedure, subjects in the anchor conditions were provided the mean estimates of 50th percentile performance before providing their 85th and 15th percentile estimates. As noted, the anchor values provided were derived from Shetzer & Bobko (1987). All instructions had been pretested on a group of applied psychology graduate students to ensure readability and clarity. After providing their estimates of overall worth, subjects completed an eight-item questionnaire consisting of demographic items and manipulation checks (See Appendix 5).

Dependent measures

Estimates of overall worth, SDy: Each subject provided a dollar estimate for the 85th and 15th percentile level of performance. Additionally, for each subject, a value of SDy was calculated as half the difference between the 85th - 15th percentile estimates.

Manipulation checks: As a check of the framing manipulation, subjects were asked in the post-estimation questionnaire (Question 6 Appendix 5) whether they had thought in terms of the loss or the gain of professors when they had provided their dollar estimates.

As a check of the anchor manipulation, subjects were asked whether they been provided with an initial dollar value and whether they had used the initial value in forming their estimates (Question 8 -Appendix 5).

RESULTS

Manipulations checks

Framing: Table 5 shows the proportion of subjects in positive and negative conditions who reported thinking in terms of the loss or gain of professors (Question 6 Appendix 5). As in Experiment 1, these data show that there was a significant tendency $X^2(4, N=143) = 74.85$, $p < .001$ for subjects to respond appropriately to the framing manipulation.

Anchoring: Table 6 shows the responses to Question 8, which asked about the use of the initial value, of subjects in the anchor versus no anchor conditions. These data show a significant tendency $X^2(6, N=143) = 122.495$, $p < .0001$ for subjects to respond appropriately to the anchor manipulation.

Table 5

Proportion of subjects in Experiment 2 in positive versus negative frames who reported thinking in terms of gain versus loss (Question 6 - Appendix 5)

	Frame			
	Frequency Percent Row pct Col pct	Negative	Positive	Total
Thought in terms of	Loss	57 40.14 91.94 79.17	5 3.52 8.06 7.14	62 43.66
	Gain	15 10.56 18.75 20.83	65 45.77 81.25 92.86	80 56.34
	Total	72 50.70	70 49.30	142 100.00

Table 6

Subjects in Experiment 2 -- anchor versus no anchor conditions and reported use of initial value (Question 8 - Appendix 5)

Anchor Condition

	Frequency Percent Row pct Col pct	No Anchor	Anchor	Total
Reported Use of Initial Value	Was not Provided Initial Value	42 29.37 100.00 85.71	0 0.00 0.00 0.00	42 29.37
	Used Initial Value	3 2.10 3.19 6.12	91 63.64 96.81 96.81	94 65.73
	Did not Use Initial Value	4 2.80 57.14 8.16	3 2.10 42.86 3.19	7 4.90
	Total	49 34.27	94 65.73	143 100.00

Judgments of overall worth

Mean percentile estimates and standard deviations for each of the three anchor conditions and two frames are presented in Table 7. As in Experiment 1, a logarithmic transformation was performed in order to stabilize variances (Neter & Wasserman, 1974, Ch. 15). Analysis of variance on log transformed data (Table 8) indicated a significant effect for anchor $F(2, 122) = 14.93$, $p < 0.001$, a significant effect for performance level $F(1, 122) = 364.38$, $p < 0.001$, as well as a significant interaction between anchor and performance level $F(2, 122) = 11.60$, $p < 0.001$. Tukey comparison among treatment means shown in Table 7 revealed than all three anchor conditions differed significantly from one another ($p < .05$). Neither frame, nor the interaction of frame with anchor yielded significant differences.

The significant effect for performance level may be taken as an internal check on the estimation procedure. Figure 3 plots the performance level X anchor interaction, and illustrates that it is the difference in 85th percentile estimates which underlies the differential effect of anchoring. Comparing the two anchor conditions with the control condition it thus appears that anchoring attenuates the 85th percentile estimates but does not augment the 15th percentile estimates, which may point to the operation of a floor effect.

Estimates of SDy

Table 9 shows mean estimates and standard deviations of SDy across levels of frame and anchor conditions. Analysis of variance of the log transformed SDy values (Table 10) revealed a significant effect of anchor

Table 7

Mean percentile estimates, in thousands of dollars by frame, anchor and performance level (standard deviations in parenthesis)

	15th	85th	Average
No anchor (Control)			
Positive Frame:	16.6	105.7	61.2
(n=25-6)[1]	(15.7)	(220.4)	(118.2)
Negative Frame:	13.0	133.4	73.2
(n=24-5)	(20.5)	(353.3)	(186.9)
Average:	14.8	119.6	67.2[2]
	(18.1)	(286.9)	(152.6)
Positive Frame anchor			
Positive Frame:	17.8	39.0	28.4
(n=24-1)	(4.5)	(9.9)	(7.2)
Negative Frame:	15.8	46.9	31.4
(n=24)	(5.8)	(16.3)	(11.1)
Average:	16.8	43.0	29.9[2]
	(5.2)	(13.1)	(9.2)
Negative Frame anchor			
Positive Frame:	26.5	(72.5	49.5
(n=23-1)	(12.6)	(13.9)	(13.3)
Negative Frame:	25.8	77.1	51.5
(n=23)	(10.8)	(13.7)	(12.3)
Average:	26.2	74.8	50.5[2]
	(11.7)	(13.8)	(12.8)

[1]n = number of subjects - number excluded from analysis.
[2]means significantly different at α=0.05, critical value of studentized range=3.355

Table 8

Analysis of variance of the effects of frame, anchor, and percentile level of performance on judged overall worth

Source	df	Sum of Squares	Mean Squares	F value
Frame (F)	1	0.06	0.06	0.07
Anchor (A)	2	22.40	11.2	14.93***
F * FB	2	0.25	.13	.16
Subject(F * A)	122	91.55	.75	
Performance Level (L)	1	105.44	105.43	364.38***
FB * L	2	6.72	3.36	11.60***
F * FB * L	3	1.07	.36	1.23
L * Subjects (F * A)	122	35.30	.29	
Total	255	257.82	1.01	

*** p. <.001

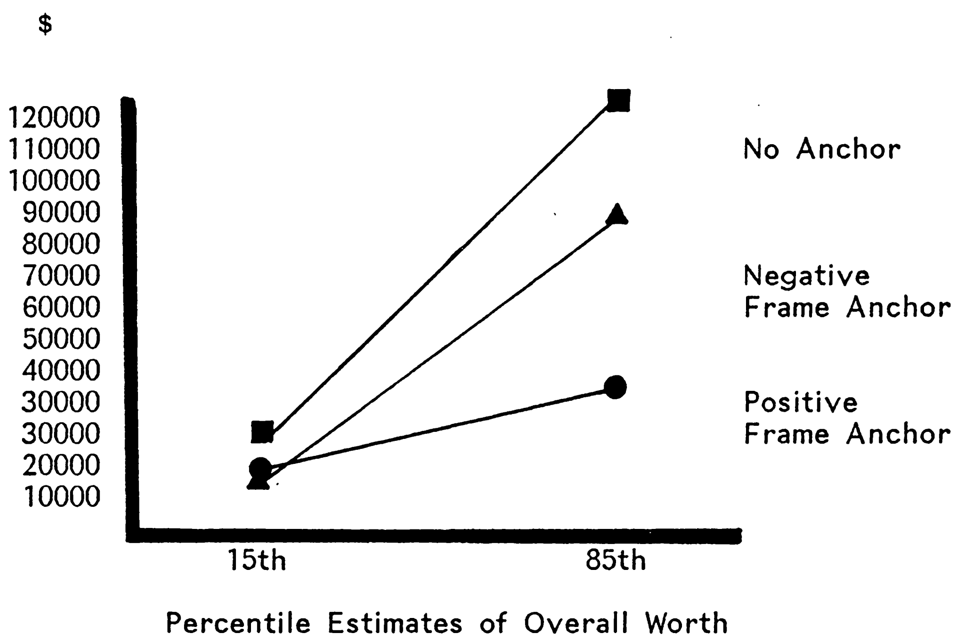


Figure 3

Mean estimates by percentile level and anchor

Table 9

Mean estimates and standard deviations of the standard deviation of job performance (SDy), in thousands of dollars, across levels of frame and anchor

	Frame		
	Positive	Negative	Average
Control (No Anchor)	44.5 (105.2)	55.8 (157.9)	50.2 (131.6)
Positive Frame Anchor	10.6 (6.2)	15.6 (10.0)	13.1 (8.1)
Negative Frame Anchor	23.0 (10.4)	25.7 (10.6)	24.4 (10.5)

Table 10

Analysis of variance of the effects of frame, anchor, and percentile level of performance on estimates of SDy.

Source	df	Sum of Squares	Mean Squares	F value
Frame (F)	1	1.37	1.37	1.97
Anchor (A)	2	11.91	5.96	8.58***
F * A	2	0.37	.19	.27
Residual	124	86.05	.69	
Total	129	99.72	.77	

*** p. <.001

Table 11

Reduction in the standard deviations of point estimates and estimates of SDy (in thousands of dollars) by positive and negative frame anchor.

$ Reduction in Point Estimates:

	15th percentile	85th percentile	Average
Control - Positve Frame Anchor	12.9	273.8	143.4
Control - Negative Frame Anchor	6.4	273.1	139.8

$ Reduction in Estimates of SDy:

Control - Positve Frame Anchor	123.5
Control - Negative Frame Anchor	121.4

on estimates of SDy $F(2, 124) = 8.58$, $p < .001$. In conjunction with the significant reduction in the magnitude of the point estimates noted above (Table 7), the finding that SDy estimates are also significantly smaller in the anchor conditions than in the control provides further evidence that estimates are anchored on initial values provided to subjects.

Within-cell variability

Table 11 shows the extent to which the two anchor conditions reduced the standard deviations of both the point estimates and estimates of SDy. Following previous studies which have looked at the effect of feedback on reducing within-cell variability, the values reported in Table 11 were derived by subtracting the standard deviation of estimates from the no-anchor conditions shown in Tables 7 and 9. For example, Table 11 shows that for the 15th percentile estimates, the positive frame anchor reduced the standard deviation of estimates by $12,900 (i.e. $18,100 - $5,200 from Table 7). Table 11 reveals a considerable reduction in standard deviation both for point estimates and estimates of SDy. Overall, the reductions in standard deviations were of a somewhat greater order of magnitude than those reported by Burke and Frederick (1984), whose average reduction in standard deviation for percentile estimates was $99,600. From Table 11 it may also be seen that both anchor conditions were roughly equivalent in their ability to reduce within-cell variability ($143,400 versus $139,800 for positive versus negative frame anchor for the point estimates, and $123,500 versus $121,400 for the positive versus negative frame anchor for estimates of SDy). Table 11 also reveals that anchoring had a considerably more marked reduction on the variability of the 85th percentile estimates than on the variability of the 15th percentile estimates. Such a difference, it may be noted, was also evident in the results of Burke and Frederick (1984), who reported a reduction of $57,800 in the SD's of 15th percentile estimates versus $141,400 for the reduction in the SD's of 85th percentile estimates.

Another comparison among the standard deviations of the anchor and no-anchor conditions which may be made addresses the question of whether the reduction in within-cell variability was greater for positive or negative frames. From Table 7 we may note that the standard deviation of the positive frames averaged over the two anchor conditions was $10,250 (i.e. the mean of $7,200 and $13,300), while the standard deviation of the negative frames averaged over the two anchor conditions was $11,700 (i.e. the mean of $11,100 and $12,300). While the positive versus negative frame standard deviations for the two anchor conditions were thus roughly equivalent, in the no-anchor control condition the negative frame had a considerably larger standard deviation, so that the difference between control and anchor conditions is relative larger for the negative versus positive frame (i.e. a reduction of $175,200 for negative frames versus $107,950 for positive frames). Thus it appears that anchoring reduces within-cell variability to a greater extent in negative frame conditions, although this conclusion must remain tentative, first because the effect of frame on the magnitude of estimates was non-significant, and secondly because the reductions in standard deviations obtained may be restricted by a floor effect.

DISCUSSION

The purpose of Experiment 2 was to examine the effect of anchoring on judgments of overall worth and resulting estimates of SDy, and to determine whether such anchoring is determined by the specific dollar values provided or by the percentile level of performance that the anchor values represent. Further, Experiment 2 examined the relation between anchor and problem frame. Finally, Experiment 2 asked whether anchoring would reduce the within-cell variability of the estimation process.

An inspection of the means in Table 7, Tables 9, and Figure 3, and the significant effects of anchoring on both the percentile estimates of overall worth and SDy estimates suggest that the anchor manipulation did serve to anchor the estimation process on the anchor values provided. It was found that anchoring significantly reduced the size of estimates in comparison to the no-anchor control condition (see Figure 3). Further, the fact that the Tukey comparison found that estimates in the two anchor conditions also differed significantly from one another suggests that estimates are anchored on the actual values as opposed to the 50th percentile level of performance. These findings are consistent with the body of research cited above in the decision making area on anchoring effects, and further confirm the importance of viewing SDy estimation as a cognitive process which is significantly affected by the parameters of task.

In terms of the relation between anchoring and frame, the present findings suggest that the effect of the former are more powerful than those of the latter, since framing effects were non-significant. Once again, the lack of significant effects due to problem frame is noteworthy, since this finding departs not only from the Shetzer & Bobko (1987) study, but also from the decision making literature which would predict such effects. The conclusion from the present findings, therefore, is that providing judges with an initial dollar value from which to base their estimates will have an effect, but whether the task is posed in terms of employee acquisition or departure will not.

In terms of within-cell variability, the present findings (Table 11) confirm earlier studies which pointed to the efficacy of the sequential feedback procedure which Bobko et al. (1983) developed for reducing within-cell variance of SDy estimation. The reduction of variability uncovered in the present data was of a somewhat larger order of magnitude than in the previous research (e.g. Burke & Frederick, 1984). The fact that both a larger and smaller anchor value appeared to reduce variability to roughly the same extent is noteworthy, because it suggests that while the magnitude of the estimates will be anchored on the specific anchor values provided, any anchor given to judges will serve to reduce the variability of the estimation process. In terms of the relation between anchor and frame, a tentative conclusion of the present study is that anchoring reduces the variability of negatively framed estimates to a relatively greater extent than it reduces the variability of positively framed estimates.

GENERAL DISCUSSION

In conjunction with the Shetzer & Bobko (1987) study, the present investigation of the cognitive dimensions of SDy estimation reinforces the notion that estimates of the dollar value of job performance are not robust to contextual effects (cf. Bobko, Karren, & Kerkar, 1987). Rather, estimates vary as the format of the estimation procedure is manipulated. The earlier findings suggested that the way the problem was framed could affect the estimates which result. An implication of these findings was that utility analysts should attempt to design estimation procedures carefully and consistently, employing a particular frame, rather than combining them, as the Schmidt et al. (1979) procedure implicitly does. While the present results did not replicate the earlier findings, utility analysts might still want to pay attention to this variable in cases where judges are provided with instructions that are lacking in detail.

The present findings suggested that the effect of frame is secondary to the salience of stimulus material, and by anchor values provided to subjects. The implication is that utility analysts should attempt to provide judges with the maximum amount of relevant information on which to form their judgments. This might include information about the job, the performance situation, or any information related to the actual dollar value of performance (e.g. previously obtained estimates). In terms of specific suggestions, the present investigation would advise researchers to increase the detail about the job or incumbents (Experiment 1). The powerful anchoring effects revealed in Experiment 2 suggest that analysts might wish to pay more attention to this technique. In addition, utility analysts should attempt to make explicit the purposes of utility evaluations, and should, wherever possible, tailor procedures to specific applications. This is particularly important in view of the fact that utility equations can be readily modified to assess the impact of a variety of organizational interventions. For example, Boudreau and Berger (1985) extended the Cronbach and Gleser (1965) utility formula to take into account the turnover/ retention characteristics of selected employees. Schuler (1984) described modifications of the procedure designed to estimate the utility of a training program, while Bobko (1986) adapted the procedure to the measurement of the utility of an organizational stress intervention. Finally, Landy, Farr, & Jacobs (1982) adapted utility estimation to the case of performance feedback. With the diversity of areas in which it is thus possible to perform utility analyses, it would seem a reasonable assumption that procedures for obtaining estimates of SDy should be designed with the particular application in mind. For example, one might expect that in an organization focusing on turnover and retention, the focus of the SDy estimation task might differ from an organization concerned exclusively with the utility of selection tests. Similarly, getting supervisors to judge overall worth when the utility of a training program is under scrutiny would probably benefit from a specific training focus. Utility researchers might wish the heed the advice of Fischoff, Slovic, & Lichtenstein (1980), who suggested that deliberately varying the manner in which decision problems are posed will reveal how robust judgments are to particular procedural changes.

The present results have shown that two manipulations, increasing stimulus salience, and providing anchor points, could reduce within- cell variability of SDy estimation. These findings are important in view of the often noted extreme variability in estimates across different supervisors (cf. Bobko et al., 1983; Reilly and Smither, 1985; Schmidt et al., 1979). The present findings regarding within- cell variability and salience lend support both to Burke and Frederick's (1984) suspicion that, with the low salience scenarios of the Schmidt et al. procedure, different judges were basing their estimates on different factors, and to Bobko et al.'s (1983) suspicion that judges were employing idiosyncratic scales.

These findings also indirectly address the question of the accuracy of SDy estimation, raised in the introduction. There, research was cited which suggests that the accuracy of SDy estimates is significantly affected by the degree to which performance information can be translated into dollar metrics. For example, Reilly and Smither (1985) found that as it becomes cognitively more difficult to process performance information in dollar terms (in their case actual versus projected sales), SDy estimates become more variable and less accurate. In a study by Eaton, Wing and Mitchell (1985) in which U.S. Army personnel estimated the performance of tank commanders, the researchers pointed to the difficulty in estimating the worth of performance due to the fact that the Army is not in the habit of associating a dollar value with job performance. The inappropriateness of a dollar metric for utility analysis with military personnel was also noted by Sadaca and Campbell (1985). These investigations point to the difficulty of eliciting direct estimates of SDy where judges are not accustomed to dealing with performance in dollar terms. The implication of the current results is that increasing the amount of relevant information provided to judges may not only reduce within-cell variability, but could also indirectly increase accuracy because judges seem able to benefit from additional detail in forming their estimates. A related implication in terms of models of organizational communication and effectiveness is that the present findings support the contention that sending information as far down the organizational hierarchy as possible might serve to increase the accuracy of organizational decision making processes.

Another more global implication of the present investigation is the importance of acknowledging the perceptual component of organizational decision making processes. Specifically, the implication of the current investigation is that judging the value of performance is an evaluation which is markedly affected by the context in which the evaluation is made. This view is consistent with the emerging position in a number of areas, which portray the organizational decision maker as someone who is actively and dynamically affected by contextual information. For example, in the area of performance appraisal it has been suggested that particular performance information will be processed differently depending on whether that information fits the evaluator's prototype of good or poor performance in the particular situation (Feldman, 1981; Landy & Farr, 1983; Nathan & Alexander, 1985). Further, research on the cognitive categorization of leadership (Foti, Fraser & Lord, 1982; Philips, 1984; Phillips & Lord, 1982) suggests that the perception of leadership qualities depends in part on how consistent the leader's behavior is with the subordinate's implicit leadership schemas. In both the areas of performance appraisal and leadership, then, it is becoming increasingly clear that the context in which information occurs is central to the impact that information will have. The present work has has extended the realization that organizational decision making has a perceptual component by showing that judgment of overall worth must also be viewed as a perceptual process.

Caveats and future research

A primary limitation of the research reported here was the use of university students as subjects. In addition to the fact, noted above, that over half the sample had reported having had some supervisory experience, there are a number of further arguments which serve to justify the use of students in this research. First, students do have a supervisory role of sorts, in that they regularly contribute to the evaluation of professors in the form of teacher ratings, and they are a fundamental point of contact in the university system. It might also be argued that, with the exception of sales-related personnel, many actual on-the-job supervisors are no more familiar with the economic value of their subordinates' contribution to the organization, even while they may be highly familiar with the performance of those subordinates. Secondly, since previous research consistently demonstrated large within-cell variance when using the Schmidt et al. (1979) procedure, access to a large number of subjects was critical for the avoidance of type II error.

At a more basic level, the use of a student sample is a meaningful starting point in the examination of the cognitive dimensions of the task of estimating worth precisely because we are investigating cognitive mechanisms which operate at early stages of processing. If, for example, as Kahneman and Tversky (1984) note, "framing effects resemble perceptual illusions more than computational errors" (p.343), then such effects should be as meaningful when evidenced in naive judges as in sophisticated ones. The ultimate validity of this assertion requires empirical verification. Thus further systematic study, and investigation in applied settings, will enhance our basic understanding of SDy estimates, as well as provide maximum fit to organizational needs.

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APPENDIX 1
Shetzer & Bobko (1987) Scenarios
Positive Frame

Many factors make up the contribution of a professor to the university. In the three questions on the next page, your task is to estimate the overall gain to the university, stated in dollars, if additional professors were to be acquired. Base your estimates on your perception of the value of the contribution of professors to the university. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

Based on your experience with professors, we would like you to estimate the yearly gain to the university if an average professor were acquired. Consider both the quality and quantity of output typical of the average professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of an average professor to be ____________ dollars per year.

We would now like you to consider the gain resulting from the addition of a superior professor. Let us define a superior professor as one who is at the 85th percentile. That is, his or her performance is better than that of 85% of his or her fellow professors, and only 15% turn in better performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a superior professor to be ____________ dollars per year.

Finally, we would now like you to consider the gain resulting from the addition of a low performing professor. Let us define a low performing professor as one who is at the 15th percentile. That is, 85% of all professors turn in performances better than the low performing professor, and only 15% turn in worse performances. Consider both the quality and quantity of output typical of the low performing professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a low performing professor to be ____________ dollars per year.

Shetzer & Bobko (1987) Scenarios
Negative Frame

Many factors make up the contribution of a professor to the university. In the three questions on the next page, your task is to estimate the overall loss to the university, stated in dollars, if various professors were to be leave. Base your estimates on your perception of the value of the contribution of professors to the university. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

Based on your experience with professors, we would like you to estimate the yearly loss to the university if an average professor left. Consider both the quality and quantity of output typical of the average professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of an average professor to be ___________ dollars per year.

We would now like you to consider the yearly loss to the university if a superior professor left. Let us define a superior professor as one who is at the 85th percentile. That is, his or her performance is better than that of 85% of his or her fellow professors, and only 15% turn in better performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a superior professor to be ___________ dollars per year.

Finally, we would now like you to consider the loss to the university if a low performing professor left. Let us define a low performing professor as one who is at the 15th percentile. That is, 85% of all professors turn in performances better than the low performing professor, and only 15% turn in worse performances. Consider both the quality and quantity of output typical of the low performing professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a low performing professor to be ___________ dollars per year.

APPENDIX 2

Power calculations based on treatment effects from Shetzer & Bobko (1987) with 22 subjects per cell (Kirk (1968, pp. 107-109)

$$\theta = \frac{\sqrt{\sum \beta^2 j / k}}{\sigma\varepsilon / \sqrt{n}}$$

$\sum \beta^2 j$

$$= (k - 1)/n \text{ (MS between groups - MS within groups)}$$

$$= (6 - 1)/22 \ (5.76 - .53)$$

$$= 5/22 \ (5.23)$$

$$= 1.18$$

$$\sigma\varepsilon = \sqrt{\text{MS within groups}} = \sqrt{.53} = .72$$

$$\theta = \frac{\sqrt{1.18/6}}{.72/\sqrt{22}} = \frac{.443}{.154} = 2.87$$

Power (1-β) at α = .05, $\nu 1$ = 5, $\nu 2$ = 127
and θ = 2.87 = .88

APPENDIX 3
Instructions to Subjects -- High Salience Scenarios
Positive Frame

Many factors make up the contribution of a professor to the university. In the three questions on the next page, your task is to estimate the overall gain to the university, stated in dollars, if additional professors were to be acquired. Base your estimates on your perception of the value of the contribution of professors to the university. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

There are three types of professors whose worth you will have to estimate, and you are provided with examples of the kinds of individuals we would like you to consider.

Dr. Jones is an average performing professor. His last year was spent as a visiting professor at the University of Britain in London. This was a particularly valuable experience because Dr. Jones and his wife enjoy traveling and the experience of other cultures. The quality and quantity of Dr. Jones's output is average in when compared to other university professors.

Based on your experience with professors, we would like you to estimate the yearly gain to the university resulting from the addition of an average professor, such as Dr. Jones. Consider both the quality and quantity of output typical of the average professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of an average professor to be ____________ dollars per year.

Dr. Swift is a superior professor. Last year, Dr. Swift won the President's Award for Excellence. Although Dr. Swift is extremely dedicated to his work, he considers it important to pursue outside interests, and is an avid photographer and sailor. The quality and quantity of Dr. Swift's output is at the 85th percentile when compared to other university professors. That is, his performance is better than that of 85% of his fellow professors, and only 15% turn in better performances.

We would now like you to estimate the yearly gain to the university resulting from the addition of a superior professor, such as Dr. Swift. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a superior professor to be ____________ dollars per year.

Dr. Sloan is a low performing professor. He does not keep up with developments in his field and often comes across as distant and disinterested. He devotes more of his energy to the small business he is setting up. The quality and quantity of Dr. Sloan's output is at the 15th percentile when compared to other university professors. That is, 85% of all professors turn in performances better than Dr. Sloan's, and only 15% turn in worse performances.

We would now like you to consider the gain to the university resulting from the addition of a low performing professor, such as Dr. Sloan. Consider both the quality and quantity of output typical of the low performing professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a low performing professor to be ____________ dollars per year.

Instructions to Subjects -- High Salience Scenarios
Negative Frame

Many factors make up the contribution of a professor to the university. In the three questions on the next page, your task is to estimate the overall loss to the university, stated in dollars, if various professors were to leave. Base your estimates on your perception of the value of the contribution of professors to the university. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

There are three types of professors whose worth you will have to estimate, and you are provided with examples of the kinds of individuals we would like you to consider.

Dr. Jones is an average performing professor. His last year was spent as a visiting professor at the University of Britain in London. This was a particularly valuable experience because Dr. Jones and his wife enjoy traveling and the experience of other cultures. The quality and quantity of Dr. Jones's output is average in when compared to other university professors.

Based on your experience with professors, we would like you to estimate the yearly loss to the university if an average professor, such as Dr. Jones were to leave. Consider both the quality and quantity of output typical of the average professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of an average professor to be ____________ dollars per year.

Dr. Swift is a superior professor. Last year, Dr. Swift won the President's Award for Excellence. Although Dr. Swift is extremely dedicated to his work, he considers it important to pursue outside interests, and is an avid photographer and sailor. The quality and quantity of Dr. Swift's output is at the 85th percentile when compared to other university professors. That is, his performance is better than that of 85% of his fellow professors, and only 15% turn in better performances.

We would now like you to consider the loss to the university resulting from the departure of a superior professor, such as Dr. Swift.

Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a superior professor to be ____________ dollars per year.

Dr. Sloan is a low performing professor. He does not keep up with developments in his field and often comes across as distant and disinterested. He devotes more of his energy to the small business he is setting up. The quality and quantity of Dr. Sloan's output is at the 15th percentile when compared to other university professors. That is, 85% of all professors turn in performances better than Dr. Sloan's, and only 15% turn in worse performances.

We would now like you to consider the loss to the university resulting from the departure of a low performing professor, such as Dr. Sloan. Consider both the quality and quantity of output typical of the low performing professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a low performing professor to be ____________ dollars per year.

APPENDIX 4

Age	Frequency	Percent
17	1	1.0
18	19	19.4
19	49	50.0
20	19	19.4
21	8	8.2
22	1	1.0
23	1	1.0

Age of subjects in Experiment 1.

Level	Frequency	Percent
*	1	.
Freshman	47	48.5
Sophomore	32	33.0
Junior	16	16.5
Senior	2	2.1

Academic level of subjects in Experiment 1.

Major	Frequency	Percent
*	7	.
Pschology	43	47.3
Sociology	1	1.1
Engineering	19	20.9
Animal Sc.	3	2.2
Education	3	3.3
Hotel Man.	2	2.2
Accounting	1	1.1
Computer Sc.	4	4.4
Gen. Arts & Sc.	15	16.5
Business	1	1.1

Academic major of subjects in Experiment 1.

* Did not respond.

APPENDIX 5

Post Estimation Questionnaire

Please do not go back and change the estimates you have provided once you have reached this point. Please provide the following information:

1. Your age:______ 2. Your sex:______

3. Are you a (check one:)

   ____freshman
   ____sophomore
   ____junior
   ____senior

4. What is your Major? ____________________

5. Have you ever have any experience in supervising others? (check one):

   ____yes
   ____no

   If yes, what did this supervisory experience consist of?

6. In providing your dollar estimates, were you thinking in terms of (check one):

   ____the loss of professors
   ____the gain of professors

7. In forming your estimates about the various professors, how long, on the average, would you say the professors had been at the university ? (check one):

   ____less than 1 year
   ____1 - 2 years
   ____2 - 3 years
   ____3 - 4 years
   ____4 - 5 years
   ____5 - 6 years
   ____6 - 7 years
   ____8 - 9 years
   ____9 - 10 years
   ____10 years or more

8. In forming your estimates, did you use the initial dollar value which was provided as a starting point?

   ____I was not provided with an initial dollar value
   ____I did use the initial value in my estimation
   ____I did not use the initial value in my estimation

THANK YOU FOR YOUR PARTICIPATION!

APPENDIX 6

Professor Description Manipulation Check

Please read the following professor descriptions and then answer the three questions below. First, consider the following three university professors, Dr. Jones, Dr. Swift and Dr. Sloan:

Dr. Jones:

Dr. Jones spent last year as a visiting professor at the University of Britain in London. This was a particularly valuable experience because Dr. Jones and his wife enjoy traveling and the experience of other cultures.

Dr. Swift:

Last year, Dr. Swift won the President's Award for Excellence. Although Dr. Swift is extremely dedicated to his work, he considers it important to pursue outside interests, and is an avid photographer and sailor.

Dr. Sloan:

Dr. Sloan does not keep up with developments in his field and often comes across as distant and disinterested. He devotes more of his energy to the small business he is setting up.

1. From the above descriptions, do you feel that the three professors Dr. Jones, Dr. Swift and Dr. Sloan are

____probably about the same age
____probably quite different ages

2. From the above descriptions, do you feel that the three professors Dr. Jones, Dr. Swift and Dr. Sloan

____probably have been with the university the same length of time
____probably have been with the university different lengths of time

3. Based on the above descriptions, please rank order the three professors, Dr. Jones, Dr. Swift and Dr. Sloan in terms of your expectation about their probable performance from highest performer to lowest performer.

I expect Dr.__________________to be the highest performer

Dr.__________________to be the middle performer

Dr.__________________to be the lowest performer

APPENDIX 7

Instructions to Subjects -- Positive Frame Feedback Scenarios

Positive Frame

Many factors make up the contribution of a professor to the university. In the questions on the next page, you will be asked to provide two estimates about the overall gain to the university, stated in dollars, if additional professors were to be acquired. Base your estimates on your perception of the value of the contribution of professors to the university. To assist you in your estimation, an initial value will be provided for you to use as a starting point in your estimation. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

The yearly gain to the university if an average professor were acquired has been estimated to be $27,900. The estimate was based on both the quality and quantity of output typical of the average professor and the value of this output to the university.

We would now like you to consider the gain resulting from the addition of a superior professor. Let us define a superior professor as one who is at the 85th percentile. That is, his or her performance is better than that of 85% of his or her fellow professors, and only 15% turn in better performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a superior professor to be ____________ dollars per year.

Finally, we would now like you to consider the gain resulting from the addition of a low performing professor. Let us define a low performing professor as one who is at the 15th percentile. That is, 85% of all professors turn in performances better than the low performing professor, and only 15% turn in worse performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a low performing professor to be ____________ dollars per year.

Instructions to Subjects -- Positive Frame Feedback Scenarios
Negative Frame

Many factors make up the contribution of a professor to the university. In the questions on the next page, you will be asked to provide two estimates about the overall loss to the university, stated in dollars, if various professors professors were to leave. Base your estimates on your perception of the value of the contribution of professors to the university. To assist you in your estimation, an initial value will be provided for you to use as a starting point in your estimation. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

The yearly loss to the university if an average professor were to leave has been estimated to be $27,900. The estimate was based on both the quality and quantity of output typical of the average professor and the value of this output to the university.

We would now like you to consider the loss resulting from the departure of a superior professor. Let us define a superior professor as one who is at the 85th percentile. That is, his or her performance is better than that of 85% of his or her fellow professors, and only 15% turn in better performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a superior professor to be ____________ dollars per year.

Finally, we would now like you to consider the loss resulting from the departure of a low performing professor. Let us define a low performing professor as one who is at the 15th percentile. That is, 85% of all professors turn in performances better than the low performing professor, and only 15% turn in worse performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a low performing professor to be ____________ dollars per year.

Instructions to Subjects -- Negative Frame Feedback Scenarios
Positive Frame

Many factors make up the contribution of a professor to the university. In the questions on the next page, you will be asked to provide two estimates about the overall gain to the university, stated in dollars, if additional professors were to be acquired. Base your estimates on your perception of the value of the contribution of professors to the university. To assist you in your estimation, an initial value will be provided for you to use as a starting point in your estimation. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

The yearly gain to the university if an average professor were acquired has been estimated to be $51,300. The estimate was based on both the quality and quantity of output typical of the average professor and the value of this output to the university.

We would now like you to consider the gain resulting from the addition of a superior professor. Let us define a superior professor as one who is at the 85th percentile. That is, his or her performance is better than that of 85% of his or her fellow professors, and only 15% turn in better performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a superior professor to be ____________ dollars per year.

Finally, we would now like you to consider the gain resulting from the addition of a low performing professor. Let us define a low performing professor as one who is at the 15th percentile. That is, 85% of all professors turn in performances better than the low performing professor, and only 15% turn in worse performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly gain to the university resulting from the addition of a low performing professor to be ____________ dollars per year.

Instructions to Subjects -- Negative Frame Feedback Scenarios

Negative Frame

Many factors make up the contribution of a professor to the university. In the questions on the next page, you will be asked to provide two estimates about the overall loss to the university, stated in dollars, if various professors professors were to leave. Base your estimates on your perception of the value of the contribution of professors to the university. To assist you in your estimation, an initial value will be provided for you to use as a starting point in your estimation. In making your estimates, imagine a university which is currently operating in a steady state condition (i.e., is presently neither overstaffed nor understaffed). In answering these questions, you will have to make some very difficult judgments. We realize that they are difficult and that they are judgments or estimates. There is probably no way that you can be absolutely certain your estimate is accurate when you do reach a decision. We do not expect your estimate to be accurate down to the last dollar, and will be accordingly averaging your estimates with those of other students.

The yearly loss to the university if an average professor were to leave has been estimated to be $51,300. The estimate was based on both the quality and quantity of output typical of the average professor and the value of this output to the university.

We would now like you to consider the loss resulting from the departure of a superior professor. Let us define a superior professor as one who is at the 85th percentile. That is, his or her performance is better than that of 85% of his or her fellow professors, and only 15% turn in better performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a superior professor to be ____________ dollars per year.

Finally, we would now like you to consider the loss resulting from the departure of a low performing professor. Let us define a low performing professor as one who is at the 15th percentile. That is, 85% of all professors turn in performances better than the low performing professor, and only 15% turn in worse performances. Consider both the quality and quantity of output typical of the superior professor and the value of this output to the university.

Based on my experience, I estimate the yearly loss to the university resulting from the departure of a low performing professor to be ____________ dollars per year.

APPENDIX 8

Age	Frequency	Percent
18	19	13.3
19	51	35.7
20	40	28.0
21	19	13.3
22	8	5.6
23	6	4.2

Age of subjects in Experiment 2.

Level	Frequency	Percent
*	1	.
Freshman	47	33.1
Sophomore	41	28.9
Junior	32	22.
Senior	22	15.5

Academic level of subjects in Experiment 2.

Major	Frequency	Percent
*	3	.
Pschology	57	40.7
Sociology	2	1.4
Engineering	31	22.1
Animal Sc.	2	1.4
Education	3	2.1
Hotel Man.	4	2.9
Accounting	5	3.6
Computer Sc.	6	4.3
Gen. Arts & Sc.	29	20.7
Business	1	0.7

Academic major of subjects in Experiment 2.

* Did not respond.

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