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**CHOOSING PERFORMANCE MEASURES FOR INCENTIVE
COMPENSATION**

By

Freddy Coronado

A DISSERTATION

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

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ABSTRACT

CHOOSING PERFORMANCE MEASURES FOR INCENTIVE COMPENSATION

By

Freddy Coronado

Choosing performance measures (PMs) for incentive compensation is frequently performed subjectively by individuals who are not compensation experts (e.g., first-line supervisors, branch managers, small-business owners). Prior research finds that choosing PMs can be a complex decision. In response to this decision complexity, psychology literature indicates that boundedly rational individuals will simplify the choice of PMs by using heuristics which vary in their cognitive demands and can influence decision performance. Consequently, identifying characteristics of decision tasks that influence individuals' use of heuristics can help to explain individuals' decision performance when choosing PMs for incentive compensation. Based on contingent-decision-behavior literature in psychology, I identify two task characteristics that are expected to influence which heuristics individuals use to choose PMs, and as a result, explain their decision performance: PM attribute conflict and difference between PM attribute differences. The experiment's results provide support for the hypothesized two-way interaction between these two task characteristics affecting individuals' decision performance. Overall, the experimental evidence suggests that individuals who are not compensation experts, while using high-complexity heuristics (i.e., require high cognitive effort), can choose an incorrect PM when PM attribute conflict is present and the difference between PM

attribute differences is small. When PM attribute conflict is absent or PM attribute conflict is present and the difference between PM attribute differences is large, however, even these unsophisticated individuals can choose the best PM because the available heuristics, while requiring low cognitive effort, lead them to the same solution as the solution derived from the agency-based model in Feltham and Xie (1994). I also study goal commitment and empathic concern as individual differences expected to explain individuals' decision in the low-performance condition. The experimental evidence supports the expected effect of goal commitment, but not the expected effect of empathic concern, on decision performance when individuals use these high-complexity heuristics. Individual with high goal commitment are more likely to make the correct choice than individuals with low goal commitment, not because they follow Feltham and Xie's (1994) optimal analysis, but because they focus more on the PMs' goal congruence than on the PMs' noise when making tradeoffs between the conflicting PMs' attributes.

Dedicated to my inspiring wife and best friend, Paula,
to my wonderful children, Felipe and Diego,
and to my loving and supportive parents, Pedro y Lula.
This dissertation is also dedicated to the friendship and memory
of my grandfather, Sergio Coronado.

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CHAPTER 1: INTRODUCTION

Agency theory predicts that the choice of performance measures (PMs) for incentive compensation depends on how informative the PMs are about agents' actions and how congruent the PMs are with the principal's welfare (Banker and Datar 1989; Feltham and Xie 1994; Datar et al. 2001). However, archival studies that test associations between PM choices and proxies for informativeness and congruity have reported mixed results (Bushman et al. 1995; Ittner et al. 1997; Ittner et al. 2003). The purpose of my dissertation is to provide a partial explanation for the mixed archival results by developing and experimentally testing psychology theory-based predictions about how individuals' choice of PMs for incentive compensation can diverge from agency-theory based predictions of the choice of PMs depending on the PMs' attributes.

Empirical research shows that the choice of a PM can be a complex decision (Davila and Simons 1997; Ittner et al. 2003), which is often subjectively made by individuals who are not compensation experts, such as first-line supervisors, branch managers, or small-business owners (Baker et al. 1994; Ittner and Larcker 1998; Banker et al. 2000; Ittner et al. 2003; Gibbs et al. 2004). When a choice task is complex (e.g., high demand of cognitive resources) or when knowledge is limited, boundedly rational individuals use heuristics which, while simplifying their decision process, can sometimes decrease their decision performance (Payne et al. 1993; Gigerenzer and Todd 1999). Psychology literature suggests that individuals' use of heuristics is highly contingent on the task characteristics (Einhorn and Hogarth 1981; Payne et al. 1993). Consequently, identifying characteristics of decision tasks that influence individuals' use of heuristics

can help to explain their decision performance when choosing PMs for incentive compensation.

Based on contingent-decision-behavior literature in psychology, I identify two task characteristics that are expected to explain individuals' use of heuristics, and as a result, their decision performance. The PM choice requires individuals to process PMs' attributes (informativeness and congruity), therefore, the task characteristics of interest are the attributes of the PMs being considered.

Conflict between PMs' attributes is expected to influence individuals' use of decision heuristics. For example, suppose a firm is designing incentive compensation for a plant manager. Using market value of the firm as a PM in the plant manager's incentive compensation captures the principal's expected gross payoff more directly than does a measure of manufacturing cost. However, while market value is a more congruent (or relevant) measure, it is less controllable by the plant manager (i.e., less precise (or more noisy)) compared to manufacturing cost. Individuals' use of heuristics is also expected to be influenced by the difference between PM attribute differences. Under the agency-based optimal incentive compensation, in order for the more precise PM (e.g., manufacturing cost) to be preferred over a more congruent PM (e.g., market value), the difference in precision must be of a much larger magnitude than is the difference in congruity. This is because the economic effect of congruity and precision are asymmetrical (i.e., changes in congruity usually have a larger effect on a principal's expected gross payoff than do changes in precision).¹

¹ Based on Felthman and Xie (1994), mathematical examples of this asymmetry are presented in the literature review section.

This dissertation develops psychology theory-based predictions and provides experimental evidence on the effect of these two task characteristic on individuals' decision performance. When PM attribute conflict is absent or when PM attribute conflict is present and the differences between PM attribute differences is large, even individuals who are not compensation expert are likely to use heuristics which, while requiring low cognitive effort (e.g., choosing the dominant PM or the PM that has a decisive advantage) lead them to the same PM choice as the solution derived from the agency-based model in Feltham and Xie (1994). However, when PM attribute conflict is present and the difference between PM attribute differences is small, the heuristics available require high cognitive effort but do not necessarily lead individuals to an optimal PM choice, and thus individuals' decision performance decreases. Specifically, high-complexity heuristics require individuals to make judgments about the PM attributes' relative importance in order to tradeoff PMs' attributes (i.e., compensatory heuristics) and thus, individual differences are expected to explain individuals' decision performance.

This dissertation identifies two individual differences that are expected to influence individuals' judgment about PM attributes' relative importance when using compensatory heuristics. Specifically, individuals' goal commitment is expected to increase the importance of congruity to their PM choice and, as a result, it is expected to increase the likelihood of individuals choosing the most congruent PM. Individuals' empathic concern is expected to increase the importance of precision to their PM choice, and consequently it is expected to increase the likelihood of individuals choosing the most precise PM. The experimental evidence supports the predicted effect of goal commitment, but not the predicted effect of empathic concern, on decision performance.

This dissertation is intended to make three contributions to the accounting literature. First, it identifies heuristics that individuals are likely to use when choosing PMs for incentive compensation. Second, it develops predictions and provides experimental evidence on two task characteristics that influence individuals' use of heuristics, and as a result, explain their decision performance. Third, it provides evidence that individual differences can affect individuals' PM choice performance when tradeoffs between PMs' congruity and precision are required.

The remainder of this dissertation is structured as follows. Chapter 2 reviews literature from accounting, economics, and psychology as the basis to develop three hypotheses. Chapter 3 describes the experimental method and Chapter 4 presents results of hypothesis testing. Finally, Chapter 5 provides a discussion of the results, limitations, and implications of this dissertation.

CHAPTER 2: LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

This section has three parts which review accounting and psychology literature as the basis for developing three hypotheses about individuals' choice of PMs for incentive compensation. In the first part, choosing and weighting PMs are represented as two separate decisions. The second part introduces Feltham and Xie's (1994) agency-based model to provide an optimal solution to the choice of PMs for incentive compensation. In the third part, based on psychology literature, three hypotheses are developed to explain when and how individuals' PM choices are expected to deviate from economically optimal decisions.

Choosing and Weighting Performance Measures

Agency models represent choosing and weighting PMs as a single decision in which, after analyzing the properties of the available PMs, all informative PMs are given nonzero weight, i.e., they are chosen (Holmstrom 1979; Feltham and Xie 1994). In practice, however, this decision can be cognitively too complex for individuals. Thus, in order to reduce this complexity, the decision is likely to be split into two decisions: first, choosing a smaller set of PMs from a set of available PMs (e.g., a few PMs for each dimension of a Balanced Scorecard) and then weighting the chosen PMs.

Practice and research literature provides evidence consistent with the single decision being split into two decisions. For example, Lyons and Ben-Ora (2002), compensation experts at what was Arthur Andersen's Human Capital Practices, explicitly propose first selecting PMs and then deciding how much they should be weighted. Ittner et al. (2003) provide archival evidence that choosing and weighting PMs are temporally separated. Banker et al. (2000) and Bol and Moers (2006) provide anecdotal evidence on

how these decisions are separated and made by different individuals. Based on this evidence, to understand individuals' decision performance when designing incentive compensation, we must study how individuals make each decision separately. This dissertation focuses on how and how well individuals make the first decision when designing incentive compensation: the choice of PMs.

Theoretical Economic Model for Performance Measure Choice

Feltham and Xie's (1994) model is a mathematical representation of a multiple-action multiple-PM agency that explains and predicts the optimal weights on PMs. In this section, Feltham and Xie's (1994) model is used to derive the optimal choice of PMs. I first introduce the PMs' attributes to be considered in designing incentive compensation and then explain how these attributes should be combined to make an economically optimal choice.

Performance Measures' Attributes

Agency-based analytical research indicates that any PM that provides incremental information about actions that a principal wants to motivate should be used for incentive compensation (Holmstrom 1979). In Feltham and Xie's (1994) model, PM informativeness and, as a result, its optimal weight depends on two PM attributes: congruity and precision.

PM *congruity* is the degree of congruence between the impact of an agent's (e.g., manager) action on the PM and on the principal's expected gross payoff. PM congruity can be decomposed into PM *sensitivity* and *action congruity*.² While PM sensitivity is the

² Feltham and Xie (1994) do not explicitly decompose PM congruity, but their congruity formula has two parts which I label action congruity and PM sensitivity.

expected effect of an agent's action on the PM, action congruity is the expected effect of an agent's action on the principal's expected gross payoff (Banker and Datar 1989; Feltham and Xie 1994; Datar et al. 2001). To illustrate, using Feltham and Xie's (1994) model (Appendix A provides a description of Feltham and Xie's [1994] model),³ suppose there are two actions (a_1 and a_2) that an agent can implement. If a_1 and a_2 are not publicly observable, then incentive compensation is assumed to be based on publicly reported PMs. If there are two PMs (PM_1 and PM_2), then they can be represented as the following linear functions of the agent's actions:

$$PM_1 = \mu_{11}a_1 + \mu_{12}a_2 + \varepsilon_1 \quad (1)$$

$$PM_2 = \mu_{21}a_1 + \mu_{22}a_2 + \varepsilon_2 \quad (2)$$

where μ_{ij} is the sensitivity of a PM_i (i.e., the change in PM_i for an incremental change in the agent's actions a_i and a_j).⁴ Suppose the principal's expected gross payoff (X) can also be represented as a linear function of the two actions:

$$X = b_1a_1 + b_2a_2 + \varepsilon_x \quad (3)$$

In Equation (3), b_i is the action congruity of a PM (i.e., the change in the principal's expected gross payoff for an incremental change in the agent's action a_i).

PM congruity can be expressed as the alignment between μ (PM sensitivity) and b (PM action congruity). All else being equal (e.g., cost of agent's actions, PMs' sensitivities, PMs' precision), PM_1 is more congruent than PM_2 when PM_1 has higher

³ Appendix A provides a full description of the model and its optimal solution. In this section, the equations are only introduced to facilitate understanding of the PMs' attributes.

⁴ Note that PM sensitivity is the slope of the relation between an agent's actions and the PM, not the correlation between these variables. Consequently, PM sensitivity does not capture the strength of the relation between these variables.

action congruity than PM_2 (i.e., when the use of PM_1 motivates the agent to implement actions that increases the principal's expected gross payoff more than does the use of PM_2). Holding action congruity constant, if PM_1 has higher sensitivity than PM_2 , then PM_1 is less congruent than PM_2 because a change of one unit of PM_1 is associated with a lower effect on the principal's expected gross payoff than does a change of one unit of PM_2 .⁵

PM precision refers to the lack of noise in the PM (i.e., the lack of variation in the PM due to factors the agent can not control). In Feltham and Xie (1994), PM's noise is captured by the variance of the error term (ε_i) in Equations (1) and (2). Hence, PM_1 is more precise than PM_2 when the variance of ε_1 is lower than the variance of ε_2 . Because action congruity and precision are more directly related to characteristics of accounting information (i.e., relevance and reliability, respectively), I hold sensitivity constant and examine the decision-performance effects of differences in action congruity and precision.⁶

Performance Measures' Attributes and Optimal Performance Measure Choice

Feltham and Xie's (1994) model assumes that individuals are able to identify the relevant PM attributes and combine them in a complex system of linear equations to

⁵ If PM_1 has higher sensitivity than PM_2 , PM_1 presents a higher expected response to the agent's actions than PM_2 . However, since action congruity is held constant, agent's actions that are intended to affect PM_1 have the same impact on the principal's expected gross payoff than agent's action intended to affect PM_2 . Therefore, the higher expected response in PM_1 , relative to PM_2 , is not associated with a higher expected effect on principal's gross payoff.

⁶ Action congruity is a more important attribute than sensitivity when choosing PMs for incentive compensation. In general, when the PMs are affected by the agent's action (i.e., the PMs are sensitive), it is more important to choose a PM that motivates the agent to perform activities that have a larger effect on the principal's expected gross payoff than to choose a PM that motivates an agent to perform activities that have a larger effect on the PM.

determine the optimal weights (i.e., monetary incentive per unit of PM) on PMs (Equation (4) in Appendix A). By identifying the optimal weights on each PM, the model determines the principal's expected gross payoff. Thus, in order for individuals to choose the optimal PMs, they should choose the PMs that maximize the principal's expected gross payoff. For example, suppose an individual needs to choose a PM from a set of two available PMs, and relies on information about the PMs' attributes to make his or her decision (Panel A of Table 1). To simplify the decision, assume that the agent's absolute risk aversion is equal to one⁷ and that both the agent's actions and the uncontrollable factors that affect one PM do not affect the other PM.⁸

Following Feltham and Xie's (1994) model, Panel B of Table 1 presents the optimal solution. If PM₁ is chosen and optimally weighted (\$0.50), then the principal's expected gross payoff will be \$1,800,000. Instead, if PM₂ is chosen and optimally weighted (\$0.56), then the principal's expected gross payoff will be \$2,500,000. Consequently, an individual should choose PM₂ because it results in the highest expected gross payoff to the principal.

⁷ Feltham and Xie (1994) represented the agent's risk preference as a negative exponential utility function $u(w) = -e^{-rw}$, where r is the agent's absolute risk aversion and w is the agent's compensation minus personal cost. The coefficient of absolute risk aversion (Pratt 1964) is positive if the individual is averse to risk, zero if the individual is risk neutral, and negative if the individual prefers risk. Consistent with a risk-averse agent and the numerical example provided in Feltham and Xie (1994), I assume $r = 1$. The r coefficient is defined as $r = -u''(w)/u'(w)$ and can be interpreted as a measure of the curvature of the agent's utility function (i.e., a measure of the amount of wealth an individual is willing to risk losing as a function of changes in wealth). For example, when $r = 1$ (high risk aversion), an agent will be indifferent between obtaining 0.7 dollars at no risk or a ticket for a lottery in which he or she gains 10 dollars with probability 0.5 or 0 dollars with probability 0.5. In the case of an agent with $r = 0.2$ (low risk aversion), he or she will need a payment of 2.80 dollars at no risk to be indifferent to the same lottery ticket. Empirical studies of individuals' risk attitudes have provided evidence that individuals' absolute risk aversion coefficients are positive but lower than one (Gertner 1993; Metrick 1995; Brunello 2002; Kirkwood 2004; Cohen and Einav 2007).

⁸ Consequently, the optimal weight on one PM does not depend on the other PM's characteristics.

TABLE 1

PERFORMANCE MEASURES' ATTRIBUTES AND OPTIMAL SOLUTION

PANEL A: Performance Measures' Attributes

PMs' Attributes ¹	PM₁	PM₂
Action Congruity ²	\$2,000	\$2,500
Precision ³	\$1,200	\$1,800
Sensitivity ⁴	\$3,600	\$3,600

PANEL B: Optimal Solution

Optimal Solution ^{5, 6}	PM₁	PM₂
Weights	\$0.50	\$0.56
Principal's Expected Gross Payoff	\$1,800,000	\$2,500,000

TABLE 1 (continued)

NOTES TO TABLE 1:

- ¹ I generated the PM attributes' values for expositional convenience as opposed to reference to a specific setting in which these values are in effect.
 - ² Expected effect on a firm's economic (market) value when the agent implements one unit of action that is intended to affect PM_i .
 - ³ Standard deviation of PM_i due to factors the agent can not control. Although Feltham and Xie (1994) use variance as a measure of precision, consistent with Krishnan et al. (2005), I use standard deviation. While both measures provide economically the same information it may be easier for individuals to understand values in dollars than in dollars squared. The use of standard deviation also helps to experimentally control for differences in the scale among PMs' attributes.
 - ⁴ Expected effect on PM_i when the agent implements one unit of action that is intended to affect PM_i .
 - ⁵ In order to simplify the choice, assume that both the agent's actions and the uncontrollable factors that affect a PM do not affect the other PM.
 - ⁶ The optimal solution assumes a agent's absolute risk aversion, r , is equal to one.
-

Contingent-Decision Behavior and Performance Measure Choice

Although agency-based models can be used to guide the choice of PMs, boundedly rational individuals are not likely to use the complex systems of linear equations proposed by Feltham and Xie's (1994) model to subjectively combine PMs' attributes when choosing PMs. Psychology literature indicates that the complexity of a decision can exceed the cognitive capacity of boundedly rational individuals (Payne et al. 1993; Bonner 1994). Contingent-decision-behavior literature provides evidence that

when making decisions, individuals use heuristics to reduce their cognitive effort (Payne et al. 1993).

Individuals have available a set of heuristics for making decisions, with each heuristic having benefits and costs (e.g., expected decision performance and cognitive effort), and individuals use these heuristics contingent on task characteristics (Payne et al. 1993). In the case of the choice between two PMs for incentive compensation, individuals are expected to combine PM attributes' values to make a decision (e.g., numerical values presented in Panel A of Table 1). Consequently, they are expected to use heuristics contingent on the attributes' values for the PMs being considered. The subjective complexity of the choice of a PM and decision performance in choosing a PM depend on the PMs' attributes (e.g., precision and action congruity) and the heuristic used to make the choice.

In this section, two task characteristics, which represent PM attributes' values, are identified as influencing individuals' use of heuristics: PM attribute conflict and difference between PM attribute differences. Then, the set of available heuristics is identified. Finally, based on contingent-decision-behavior literature, three hypotheses are developed to explain individuals' decision performance.

Determinants of Individuals' Use of Heuristics

Performance Measure Attribute Conflict

PMs usually differ on more than one attribute and these differences can result in conflicts between the attributes and thus cognitive conflict in choosing a PM. PM attribute conflict occurs when one PM is superior on one attribute and another PM is superior on another attribute. In the case of two PMs that differ only with respect to

action congruity and precision (i.e., sensitivity is held constant), PM attribute conflict is present when one of the two PMs is superior on action congruity and the other PM is superior on precision. Table 2 presents two examples of a two-PM setting with their optimal solutions as modeled by Feltham and Xie (1994).

TABLE 2
PERFORMANCE MEASURES' ATTRIBUTES AND OPTIMAL SOLUTION:
ATTRIBUTE CONFLICT ABSENT VS. PRESENT

PANEL A: PM Attribute Conflict Absent

PMs' Attributes	PM ₁	PM ₂	Optimal Solution	PM ₁	PM ₂
Action Congruity	\$2,500	\$2,000	Weights	\$0.63	\$0.44
Precision	\$1,200	\$1,800	Principal's Expected Gross Payoff when Only PM _i is Used	\$2,812,500	\$1,600,000
Sensitivity	\$3,600	\$3,600			

PANEL B: PM Attribute Conflict Present

PMs' Attributes	PM ₁	PM ₂	Optimal Solution	PM ₁	PM ₂
Action Congruity	\$2,000	\$2,500	Weights	\$0.50	\$0.56
Precision	\$1,200	\$1,800	Principal's Expected Gross Payoff when Only PM _i is Used	\$1,800,000	\$2,500,000
Sensitivity	\$3,600	\$3,600			

In Panel A, PM attribute conflict is absent because the values of PM action congruity and PM precision indicate that PM_1 is superior on both attributes and thus is economically preferred to PM_2 . In Panel B, PM attribute conflict is present because PM_1 has higher PM precision and PM_2 has higher PM action congruity. As indicated by the optimal solution, perfectly rational individuals would choose PM_2 for the example in Panel B. While PM attribute conflict should not affect the decision performance of perfectly rational individuals, it is expected to influence boundedly rational individuals' use of heuristics and thus their decision performance (Tversky et al. 1988; Bonner 1994).

Difference Between Performance Measure Attribute Differences

The economic effects of PM action congruity and PM precision on the principal's expected gross payoff are asymmetrical, in ways that also can affect individuals' use of heuristics. Table 3 presents two examples of PM attribute conflict and their optimal solutions. In Panel A, the agency-based optimal solution supports the choice of the PM_2 because it has higher action congruity. The superiority of PM_2 on action congruity (difference in action congruity between PM_1 and PM_2 is \$500) is enough to compensate for the superiority of PM_1 on precision (difference in precision between PM_1 and PM_2 is \$600).⁹ In Panel B, in contrast, the more precise PM is the economically preferred PM: PM_1 has a large superiority on precision (difference in precision is \$2,400) which compensates for the superiority of PM_2 on action congruity (difference in action congruity is \$500). This is because a unit of improvement in congruity usually has a

⁹ As explained in Table 1 (first example), precision has been described as the standard deviation of PM_i due to factors the agent can not control. Thus, PMs' attributes values are provided in a common scale (i.e., dollars).

larger effect on a principal's expected gross payoff than does a unit of improvement in precision.

Figure 1 presents the principal's expected gross payoff as a function of the change on action congruity and precision respectively. The example assumes the following initial values for a PM's attributes: (1) action congruity = \$2,500; (2) precision = \$3,600; and (3) sensitivity = \$3,600. The slope of each line represents the impact on the principal's expected gross payoff of a unit of improvement of each PM's attribute. The contrast between slopes indicates that the effect on the principal's expected gross payoff of a unit of improvement in action congruity is almost three times larger than the effect of a unit of improvement in precision.¹⁰

¹⁰ The slope contrast is not qualitatively different when the other PMs in Tables 1, 2, and 3 were used as the baseline. In addition, the asymmetric effects of PM action congruity and PM precision on the principal's expected gross payoff is valid for a wide range of absolute risk aversion values. For example, when $r = 2$, the effect on the principal's expected gross payoff of a unit of improvement in action congruity is more than two times larger than the effect of a unit of improvement in precision. As r get closer to zero (i.e., an individual's absolute risk aversion decreases), the asymmetric impact of action congruity and precision on the principal's expected gross payoff increases (i.e., the lower the agent's absolute risk aversion, the lower the cost of motivating him or her by using a low-precision PM and thus, the lower the impact of changes in PM precision on the principal's expected gross payoff relative to changes on action congruity). For example, when $r = 0.5$, the effect on the principal's expected gross payoff of a unit of increase in action congruity is almost five times larger than is the effect of a unit of increase in precision.

TABLE 3

**PERFORMANCE MEASURES' ATTRIBUTES AND OPTIMAL SOLUTION
WHEN PERFORMANCE MEASURE ATTRIBUTE CONFLICT IS PRESENT**

PANEL A: Small Difference Between the Difference for Precision and the Difference for Action Congruity

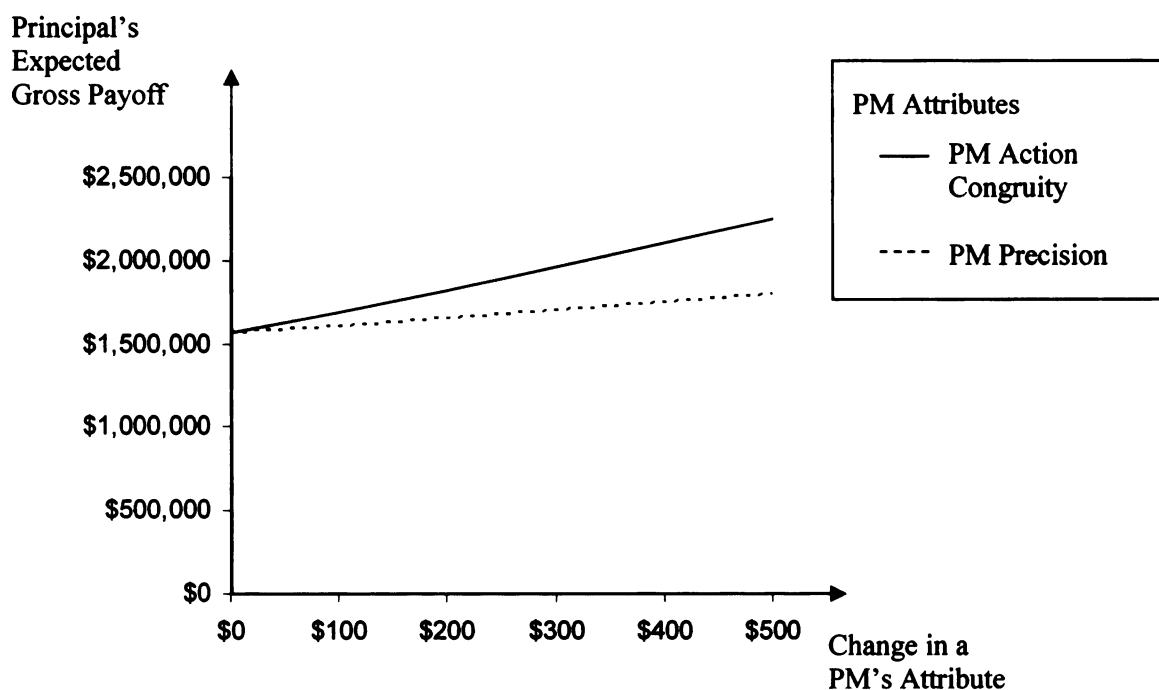
PMs' Attributes	PM ₁	PM ₂	Difference	Optimal Solution	PM ₁	PM ₂
Action Congruity	\$2,000	\$2,500	\$500	Weights	\$0.50	\$0.56
Precision	\$1,200	\$1,800	\$600	Principal's Expected Gross Payoff when Only PM _i is Used	\$1,800,000	\$2,500,000
Sensitivity	\$3,600	\$3,600	\$0			
Difference Between PM Attribute Differences			\$100			

PANEL B: Large Difference Between the Difference for Precision and the Difference for Action Congruity

PMs' Attributes	PM ₁	PM ₂	Difference	Optimal Solution	PM ₁	PM ₂
Action Congruity	\$2,000	\$2,500	\$500	Weights	\$0.50	\$0.35
Precision	\$1,200	\$3,600	\$2,400	Principal's Expected Gross Payoff when Only PM _i is Used	\$1,800,000	\$1,562,500
Sensitivity	\$3,600	\$3,600	\$0			
Difference Between PM Attribute Differences			\$1,900			

FIGURE 1

ASYMMETRICAL EFFECT OF PRECISION AND ACTION CONGRUITY
ON PRINCIPAL'S EXPECTED GROSS PAYOFF ¹



NOTE TO FIGURE 1:

¹ This graph presents changes in the principal's expected gross payoff due to a unit of change in a PM's attribute. The example assumes the following initial values for a PM's attributes: (1) action congruity = \$2,500; (2) precision = \$3,600; and (3) sensitivity = \$3,600.

Available Heuristics

Three heuristics are expected to be used by individuals when choosing a PM from a set of two available PMs.¹¹ Although these heuristics represent simplifications of the choice of a PM as modeled by Feltham and Xie (1994), they also vary in terms of their complexity (e.g., cognitive demands required to process the PMs' attributes).

As a first step in choosing a PM, individuals look for a *dominant* PM (Tversky et al. 1988). If one PM measure is superior on both action congruity and precision, then this measure is chosen. This is a relatively low-complexity heuristic, because individuals only need to know whether a higher or lower PM attribute is preferred but they are not required to make a judgment about the PM attributes' relative importance. However, this heuristic can only be used when PM attribute conflict is absent.

If no dominant PM is present due to PM attribute conflict, then individuals may examine whether a PM has a *decisive advantage* -- that is, whether the difference in one attribute far outweighs the difference in the other attribute for most plausible values of the PM attributes' relative importance (Tversky et al. 1988). Consequently, this is also a relatively low-complexity heuristic because individuals have to compare the magnitudes of the PM attribute differences, but they do not necessarily require making assessments of the PM attributes' relative importance.

¹¹ Although the contingent-decision-behavior literature identifies more heuristics, I present the heuristics most likely to be used in this decision. Some heuristics, such as lexicographic (e.g., choose the PM that is superior on the most important attribute), are more likely to be used when there are either a larger number of alternatives PMs or a large number of PM attributes. Other heuristics either are simplifications of the heuristics presented in this section or require that individuals develop acceptable standards for at least one attribute (e.g., sets a cutoff value for an attribute; Payne et al. 1993). Non-compensation-expert individuals though are unlikely to develop these standards due to their lack of knowledge and/or expertise.

If neither PM is dominant nor has a decisive advantage, then individuals are likely to use a *compensatory heuristic*. These decision strategies require individuals to make judgments about the PM attributes' relative importance in order to resolve the conflict by making tradeoffs between PMs' attributes (Appendix B provides a mathematical representation of these heuristics).¹² Research in psychology provides evidence that making such tradeoffs increases subjective decision complexity (Shepard 1964; Payne et al. 1993; Bonner 1994; Shah and Oppenheimer 2008). Consequently, although compensatory heuristics are simplifications of the decision as modeled by Feltham and Xie (1994), they are more complex than the dominant and decisive-advantage heuristics because they require individuals to make judgments about the PM attributes' relative importance.

Hypotheses

Three hypotheses are developed in this section. The first hypothesis provides theoretical analysis on the expected frequency of correct decisions resulting from the interaction between PM attribute conflict and difference between PM attribute differences. The next two hypotheses provide theoretical analysis on the role of individual differences when individuals are expected to use compensatory heuristics.

Based on contingent-decision-behavior literature, I predict a two-way interaction between PM attribute conflict and difference between PM attribute differences on individuals' decision performance. Figure 2 presents the form of the expected interaction and predictions (Panels A and B respectively). When PM attribute conflict is absent (1

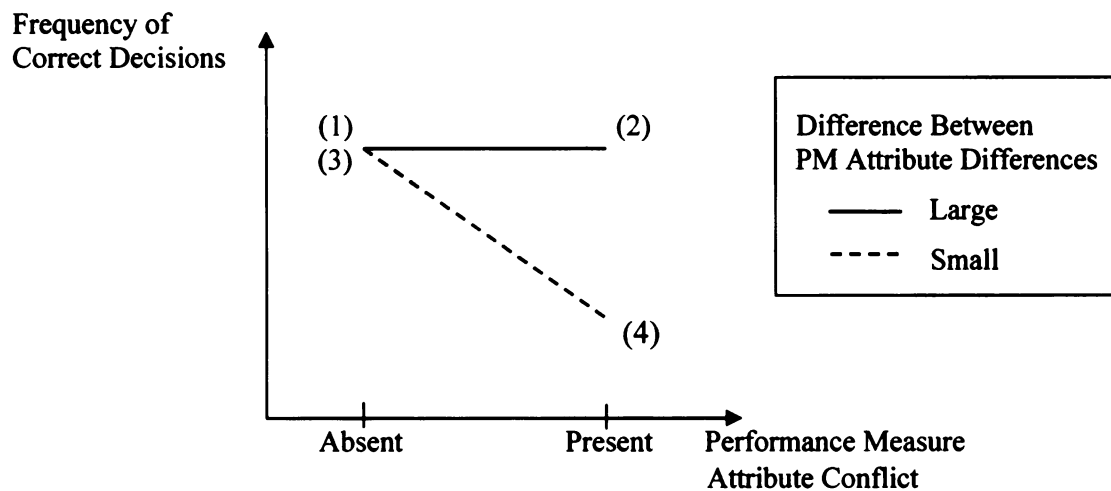
¹² Previous research indicates that compensatory heuristics provide a very good approximation to ratings of evaluative alternatives under the presence of attribute conflict, especially in situations where alternatives are described by only a two or three attributes (e.g., Fisher 1976).

and 3 in Figure 2), individuals are expected to use the dominant heuristic which will lead them to choose the PM that is superior on both attributes, thus individuals are expected to make optimal PM choices. Consequently, the frequency of correct decisions is expected to be high and not affected by the difference between PM attribute differences ($1 = 3$). When PM attribute conflict is present, however, the difference between PM attribute differences is expected to affect individuals' decision performance. When this difference is large (2 in Figure 2), individuals are likely to use the decisive-advantage heuristic and make correct choices (e.g., choose the more precise PM in panel B of Table 3). As a result, the frequency of correct decisions should not differ from the conflict-absent conditions ($1 = 2, 2 = 3$). When this difference is small (4 in Figure 2), however, individuals are expected to use compensatory heuristics and thus their PM choice is expected to be a function of their judgment about the PM attributes' relative importance. In this condition, due to individual differences, some individuals are expected to make correct decisions but others are expected to make incorrect decisions; as a result, the frequency of correct decisions is expected to be lower than in the other three conditions ($1, 2, 3 > 4$).

H1: Frequency of correct decisions is a two-way ordinal interactive function of PM attribute conflict and difference between PM attribute differences.

FIGURE 2
HYPOTHESIS 1

PANEL A: Form of the Expected Interaction Between Performance Measure Attribute Conflict and Difference Between Performance Measure Attribute Differences on Individuals' Decision Performance



PANEL B: Summary of Predictions

- 1) $1 = 3$
 - 2) $1 = 2$
 - 3) $2 = 3$
 - 4) $1 > 4$
 - 5) $2 > 4$
 - 6) $3 > 4$
-

Individual differences are only expected to affect individuals' decision performance when they use compensatory heuristics (4 in Figure 2). If Hypothesis 1 is supported, then the test for no effect of individual differences on individuals' decision performance in the other three conditions (1, 2 and 3 in Figure 2) is trivial due to no (or no difference in) incorrect choices. Consequently, the following two hypotheses address the role of individual differences when individuals face PM attribute conflict and the difference between PM attribute differences is small.

Individual differences are assumed to affect individuals' judgments about the PM attributes' relative importance. Specifically, individuals' goal commitment is expected to increase the importance of action congruity relative to precision, and their empathic concern is expected to increase the importance of precision relative to action congruity. As a result, individual differences are expected to explain the decision performance of individuals using compensatory heuristics.

Psychology theory suggests that a task goal is expected to affect individuals' behavior through the psychological process of directing attention and effort to their decision (Locke and Latham 1990). The effect of the task goal on effort, however, is not likely to lead boundedly rational individuals to solve the system of equations described by Feltham and Xie (1994) because is too cognitively complex. Task goal is expected to affect individuals' attention to PMs' attributes and their judgment about the PM attributes' relative importance. This judgment is not expected to be free of bias and, individuals are expected to simplify the agency problem by focusing on (i.e., considering relatively more important) the PM attribute that is more directly related to the task goal. The following hypotheses explain how individuals' goal commitment (H2) and empathic

concern (H3) are expected to affect this judgment and consequently, individuals' decision performance.

Goal Commitment and Individuals' Decision Performance

Assume that individuals designing incentive compensation have the specific goal of choosing the PM that maximizes their firm's economic value (e.g., principal's expected gross payoff). The effect of the firm's goal on individuals' choices is expected to depend on their commitment to the firm's goal (i.e., the extent to which individuals try to maximize their firms' goal; Locke and Latham 1990). I argue that individuals who are more committed to the firm's goal will pay more attention to action congruity than to precision because action congruity seems to be more directly related to the firm's goal than precision. Action congruity is a direct measure of how congruent a PM is with the goal of maximizing the firm's economic value. In contrast, the link between PM precision and the economic value of the firm is expected to be indirect because it requires individuals to think about how uncontrollable factors affect a risk-averse agent, how the firm should pay this agent for the risk imposed by the incentive compensation on him or her, and how the agent will act based on this risk-adjusted incentive. In summary, goal commitment is expected to positively affect the importance of action congruity relative to precision on individuals' PM choice. As a result, individuals' goal commitment is expected to be positively associated with the choice of the most action congruent PM and thus positively associated with individuals' decision performance.

H2: When PM attribute conflict is present and the difference between PM attribute differences is small, individuals' goal commitment is expected to be positively associated with their decision performance.

Empathic Concern and Individuals' Decision Performance

The choice of PM is not free from a social context. Individuals need to understand the agent's strategy to make correct decisions in an agency context (first-order reasoning in Wilks and Zimbelman 2004). Consequently, they are expected to make attributions about the mental states (desires, beliefs, intentions) of the agent by playing the agent's role and sharing the agent's feelings and emotions (i.e., by empathizing with the agent). Literature in social psychology and social neuroscience suggests that empathy is a major determinant of voluntary behavior intended to benefit others (i.e., prosocial behavior in Eisenberg and Miller 1987; other-regarding behavior in Singer and Fehr 2005). This process is automatic and individuals are likely to represent the goals of others in terms of their own goals without even being aware of it (Singer and Fehr 2005).

Research indicates that there are individual differences in empathy (Singer et al. 2004). Therefore, individuals with high-empathic concern are more likely to have prosocial behavior than are individuals with low-empathic concern (Singer and Fehr 2005). I argue that individuals with high-empathic concern will pay more attention to PM precision than to action congruity because precision seems to be more directly related to the agent's goal than action congruity (prosocial behavior). PM precision directly captures the effect of uncontrollable factors on the risk-averse agent's compensation. The link between action congruity and agent's goal is expected to be indirect because it requires individuals to think about how much the firm's economic value will increase and how much the firm is expected to compensate the agent for a unit of increases on the PM (i.e., the PM weight) considering the risk imposed by the PM precision. In summary, empathic concern is expected to positively affect the importance of PM precision relative

to action congruity on individuals' PM choices. As a result, individuals' empathic concern is expected to be positively associated to their choice of the most precise PM and thus negatively associated to their expected decision performance.

H3: When PM attribute conflict is present and the difference between PM attribute differences is small, individuals' empathic concern is expected to be negatively associated with their decision performance.

CHAPTER III: EXPERIMENTAL METHOD

Participants

Seventy-six MS Accounting students volunteered to participate in the experiment.¹³ The participants were paid performance-contingent compensation, as described below.

Experimental Materials and Procedure

Participants received introductory materials explaining the task in terms consistent with Feltham and Xie's (1994) model (e.g., multiple-action, multiple-PMs, risk-averse and effort-averse managers, risk-neutral firm owners, one-period decision setting). Appendix C presents the content of the experimental materials. Participants assumed the role of a manager at the headquarters of a large firm, and their job was to choose a PM that will be used for incentive compensation to motivate a manager. The objective of the owner of the firm, which their choice should support, was to maximize the economic (market) value of the firm, net of the cost of the manager's total compensation. The manager had a one-year non-renewable employment contract to implement a performance-improvement program that would maximize the economic (market) value of the firm. Participants were told that for each available PM, they will receive information on its three attributes that would help them in making their PM choice. In order to ensure that participants understood the setting, definitions and examples were provided (Table C1 of Appendix C).

¹³ In a similar task, decision performance in Krishnan et al. (2005) did not differ significantly between MBA and MS students. Their findings provide support for the use of only one type of student in this study.

Participants were asked to choose one of two available PMs and their performance-contingent compensation was explained. “You will receive fixed pay of \$10 for completing this accounting simulation, regardless of your performance in choosing a performance measure. You will also receive variable pay up to \$10 in addition, depending on how well you choose a performance measure. That is, the closer your choice is to the choice that would maximize the expected economic (market) value of your firm, the higher your total pay will be, up to a maximum of \$20 (= \$10 + \$10)”.¹⁴

Before participants received information on the PM attributes’ values to make their choices, and in order to capture their beliefs about each attribute-decision relation, they were asked to provide their beliefs about how each attribute should directionally affect their decision (Table C2 of Appendix C). Next, participants were asked to return their answers to the administrator and told they could keep the introductory materials until the end of the simulation.

Participants then received information about the attributes’ values for the two available PMs (PM₁ and PM₂) and were asked to choose one of them (Table C3 of Appendix C). Because labels affect cognition (Muchinsky and Dudycha 1975; Sniezek 1986; Broniarczyk and Alba 1994), generic names were used for both PMs so that participants’ decisions were influenced only by the PMs’ attributes and not by their labels (e.g., percent of defects units, cost per unit).

In order to deter possible concerns that a lower expected incentive compensation would result in compensation below the plant manager’s reservation utility, participants

¹⁴ Performance-contingent compensation is intended to align participant’s goal with their firm’s goal. In natural settings, individuals designing incentive compensation are supposed to make decisions that maximize their firm’s expected wealth.

were told that their PM choice only determined how dependent the manager's annual bonus was on these two PMs: "Your firm's human resources department will design the managers' total compensation packages to be competitive in the managerial labor market".

Participants self-paced their way through the experimental materials. After they finished the task, they turned in the materials to the administrator and received post-experiment questions (Table C4 of Appendix C).

Variables

Independent and Control Variables

A 2x2 (independent variables) x 2x2 (control variables) between-subjects experimental design was used to test the hypotheses. The manipulated independent variables were PM attribute conflict (absent or present) and the difference between PM attribute differences (small or large). The PM attributes' values for the four cells resulting from the interaction between these independent variables are in Table C5 of Appendix C. To control for the order in which the PMs were provided, participants were randomly assigned to one of two possible column orders in which the two PMs were presented. Finally, to control for the row order in which PMs' attributes were presented, participants were randomly assigned to one of the following two orders of presentation: (1) action congruity, sensitivity, and precision; or (2) sensitivity, precision, and action congruity.

Two additional independent variables were measured in post post-experimental questions. Consistent with prior literature in accounting (Kadous et al. 2003), Klein et al.'s (2001) five-item instrument was used to measure goal commitment (Panel A of Table C4). Empathic concern was measured by using Davis' (1980, 1994) seven-item

instrument (Panel B of Table C4). Post-experimental questions were also intended to measure control variables for participants' understanding of the materials (Panel C of Table C4), their experience, and their knowledge of accounting, calculus, finance, incentive compensation plans, microeconomics, and statistics (Panel D of Table C4). Finally, four post-experimental questions were included to measure participants' judgments about the PM attributes' relative importance (Panel E of Table C4).

Dependent Variable

The dependent variable was decision performance. Decision performance was measured as a dichotomous variable coded 0 or 1 depending on whether a participant's choice was inconsistent or consistent, respectively, with the agency-based prediction. The optimal choices were obtained by plugging the PM attributes' values into the Feltham and Xie's (1994) model (Appendix A). The optimal decisions for the four cells of the manipulated independent variables are in Table C6 of Appendix C.

CHAPTER IV: RESULTS

Descriptive Statistics

Prior research indicates that directional errors in the use of PMs' attributes are relatively frequent (Krishnan et. al 2005).¹⁵ To ensure that individuals responded to the experimental manipulation of PM attribute conflict, they were required to have at least a minimum understanding of how each attribute is directionally related to their goal. Consequently, eighteen participants were excluded because they reported agency-inconsistent beliefs about how each PM attribute should directionally affect their choice.¹⁶ In addition, to control for a minimum understanding of the decision task, 15 participants were excluded because they answered incorrectly one or more questions related to the information provided about the task and their firm, such as their firm's goal and the risk preferences of both the manager and principal. Thus, 43 of the 76 participants (57%) were retained for hypotheses testing.¹⁷

The participants had completed a mean of 8.39 three-credit semester accounting courses (S.D. = 1.66, range 4-12), 1.78 finance courses (S.D. = 1.33, range 1-6), 1.41 microeconomics courses (S.D. = 0.71, range 1-4), 1.90 statistics courses (S.D. = 0.49, range 1-4), and 1.14 calculus courses (S.D. = 0.69, range 0-3). Their work experience as a manager or an accountant ranged from zero to 25 months, with a mean of 4.53 months (S.D. = 6.21). None of them had any experience designing incentive compensation.

¹⁵ In their study, only 15 participants out of 32 (47%) made correct decisions about how a PM's precision should affect the PM's weight on the incentive compensation.

¹⁶ For example, if there are two available PMs which differ only with respect to action congruity (precision), then they should choose the more action congruent (precise) PM.

¹⁷ None of the variables intended to capture participants' characteristics (GPA, experience, age, goal commitment, empathic concern) explained this sample selection process.

TABLE 4
FACTOR ANALYSIS: MEASURED INDEPENDENT VARIABLES

PANEL A: Goal Commitment Factor

Item^{1, 2}	Standardized Loading	Eigenvalue	Variance Extracted	Cronbach's Alpha
1 (R)	0.757	3.095	62%	0.837
2 (R)	0.902	0.969		
3	0.892	0.511		
4 (R)	0.794	0.282		
5	0.530	0.144		

PANEL B: Others Concern Behavior Factor

Item^{2, 3}	Standardized Loading	Eigenvalue	Variance Extracted	Cronbach's Alpha
1	0.800	3.557	51%	0.824
2 (R)	0.689	0.904		
3	0.596	0.770		
4 (R)	0.784	0.663		
5 (R)	0.664	0.497		
6	0.727	0.335		
7	0.710	0.273		

TABLE 4 (continued)

NOTES TO TABLE 4:

- ¹ Panel A of Table C4 presents the five-item instrument used to measure goal commitment.
- ² Denotes that item was reverse-scored before analysis.
- ³ Panel B of Table C4 presents the seven-item instrument used to measure empathic concern.
-

With respect to the participants' goal commitment and empathic concern, the results of a confirmatory factor analysis for each variable are presented in Table 4 (Panels A and B respectively). The results indicated that, for each variable, all of its items loaded in a common factor. Participants' goal commitment and empathic concern scores were calculated by using the standardized factor loading as weights to aggregate the respective standardized items.¹⁸ The two scales had acceptable reliabilities with coefficients greater than .70 (Cronbach 1951; Nunnally 1978). Descriptive statistics for these two variables are presented in Table 5.

¹⁸ The results of hypotheses testing when the independent variables (goal commitment and empathic concern) were calculated by using an equal (unit) weights aggregation of items were not qualitatively different than those when the items were aggregated by using standardized factor loading as weights. Consistent with prior literature (Klein et al. 2001; Kadous 2003), the reported results are based on the weighted aggregation of items for each independent variable.

TABLE 5
DESCRIPTIVE STATISTICS: MEASURED INDEPENDENT VARIABLES

PANEL A: Mean Goal Commitment Factor (Standard Deviation)[n]

		PM Attribute Conflict		Overall
		Absent	Present	
Difference Between PM Attribute Differences	Large	1 0.128 (1.188) [11]	2 -0.419 (1.137) [8]	-0.102 (1.168) [19]
		3 -0.242 (0.847) [15]	4 0.620 (0.599) [9]	0.081 (0.862) [24]
	Small			
	Overall	-0.086% (1.000) [26]	0.131 (1.015) [17]	0.000 (1.000) [43]

PANEL B: Mean Empathic Concern Factor (Standard Deviation) [n]

		PM Attribute Conflict		Overall
		Absent	Present	
Difference Between PM Attribute Differences	Large	1 0.129 (1.155) [11]	2 0.596 (0.934) [8]	0.326 (1.066) [19]
		3 -0.235 (0.999) [15]	4 -0.296 (0.705) [9]	-0.258 (0.883) [24]
	Small			
	Overall	-0.081 (1.061) [26]	0.123 (0.916) [17]	0.000 (1.000) [43]

Prior literature indicates that goal commitment and empathic concern are likely to be affected by task characteristics (Eisenberg and Miller 1987; Klein et al. 2001). Thus, the experimental manipulation of task characteristics (action congruity and precision) may have had an effect on participant's answers to post-experimental questions intended to measure their goal commitment and empathic concern. The hypotheses are intended to test the effect of ex ante individual differences and not those individual differences resulting from the experimental manipulations. Therefore I eliminated the effect of the manipulated independent variables on the measured independent variables by using as measures of goal commitment and empathic concern for hypothesis testing the standardized residuals of the linear regressions of each individual difference variable on the two manipulated independent variables and their interaction term.¹⁹

To test whether differences across participants other than the measured independent variables may have driven results, measures of participants' knowledge (such as undergraduate GPA and GPA in courses related to accounting, calculus, finance, microeconomics, and statistics) were included as both the dependent variable in a 2 (PM attribute conflict) x 2 (difference between PM attribute difference) ANOVA and independent variables in a logistic regression on decision performance. The results of the ANOVAs indicated that (1) participants' GPAs in calculus, microeconomics, and statistics did not significantly differ ($p > .05$) across the manipulated experimental

¹⁹ Consistent with results documented by Klein et al. (2001), the interaction term had a statistically significant effect ($p < .05$) on the goal commitment factor score such that participants on the most complex task (cell 4) reported higher goal commitment than participants in the other tasks (cells 1, 2 and 3). With respect to the regression on empathic concern, the results indicated a statistically significant effect ($p < .05$) of the difference between PM attribute differences such that the larger the difference the higher the reported empathic concern. Although no prior research has reported such an effect, this finding is consistent with individuals being more concerned about others when the effect on others is expected to be higher. The tests of H2 and H3 using the original factor scores provided qualitatively the same results as those reported.

conditions; and (2) a main effect of PM attribute conflict on undergraduate GPA, accounting GPA and finance GPA such that participants in the conflict-present condition reported significantly ($p < .05$) higher GPAs than participants in the conflict-absent condition. However, results of the logistic regressions indicated that none of these variables was significantly associated ($p > .05$) with the likelihood of participants making a correct decision. Thus, although random assignment may not have been completely successful in equalizing all of the participants' demographic characteristics across experimental conditions, these differences across experimental conditions did not explain the participants' decision performance.

The Pearson correlations between measures of the participant's characteristics and two measured independent variables are presented in Table 6. Most of the participants' knowledge measures were significantly correlated ($p < .05$). More importantly, neither goal commitment nor empathic concern was significantly ($p < .05$) correlated with any of the participants' knowledge measures. Thus, differences across participants on the two measured independent variables were not likely to be driven by participants' prior knowledge.

TABLE 6

**PEARSON CORRELATION MATRIX: PARTICIPANTS' CHARACTERISTICS
(TWO TAILED P-VALUES) [N = 43]**

	Goal Commit- ment	Empathic Concern	Overall GPA	Accoun- ting GPA	Calculus GPA	Finance GPA	Microe- conomics GPA	Statistics GPA
Goal Commit- ment	1.00	0.34 (0.02)	0.03 (0.84)	0.151 (0.333)	-0.08 (0.62)	-0.00 (0.96)	-0.11 (0.47)	0.12 (0.45)
Empathic Concern		1.00	-0.00 (0.98)	0.18 (0.26)	-0.01 (0.97)	0.18 (0.26)	0.17 (0.28)	0.260 (0.09)
Overall GPA			1.00	0.64 (0.00)	0.39 (0.02)	0.61 (0.00)	0.37 (0.02)	0.60 (0.00)
Accoun- ting GPA				1.00	0.43 (0.01)	0.52 (0.00)	0.36 (0.02)	0.53 (0.00)
Calculus GPA					1.00	0.17 (0.32)	0.49 (0.00)	0.40 (0.01)
Finance GPA						1.00	0.12 (0.29)	0.36 (0.02)
Micro- economics GPA							1.00	0.33 (0.03)
Statistics GPA								1.00

Hypothesis Testing

Hypothesis 1 predicted a two-way interaction between PM attribute conflict and difference between PM attribute differences, such that decision performance will be relatively low when PM attribute conflict is present and the difference between PM attribute differences is small (point 4 in Figure 2); otherwise predicted decision performance is higher and equal for the other three conditions (points 1, 2 and 3 in Figure 2). Participants' decision performance is presented in Panel A of Table 7. Overall, 86 percent of the participants made correct decisions (37 of 43 participants). The pattern of the frequency of correct decisions was consistent with the form of the hypothesized interaction such that the frequency of correct decisions was 100% in cells 1, 2 and 3, but only 33% in cell 4.

Hypothesis 1 was tested by a set of six planned contrasts based on the predicted pattern of cell frequencies in Figure 2. Since small sample size and lack of incorrect decisions in cells 1, 2 and 3 precluded the use of either a chi-square test or logistic regression for testing differences in frequencies across cells, Fisher's exact test was used to determine the significance of each planned contrast. A Bonferroni adjustment was used to control the family-wise error at $p < .05$ for the overall test of the interaction hypothesis; thus, the critical p-value level for each contrast was .008. Results for each planned contrast are presented in Panel B of Table 7.²⁰

²⁰ Each contrast refers to predictions presented in Panel B of Figure 2 and the respective difference between cells in Panel A of Table 7.

TABLE 7

**PARTICIPANTS' DECISION PERFORMANCE AND
HYPOTHESIS TESTING RESULTS**

PANEL A: Frequency of Correct Decisions (Number of Participants)

		PM Attribute Conflict		Overall
		Absent	Present	
Difference Between PM Attribute Differences	Large	1 100% (11)	2 100% (8)	100% (19)
		3 100% (15)	4 33% (9)	75% (24)
	Small			
	Overall	100% (26)	65% (17)	86% (43)

PANEL B: Fisher's Exact Test (H1)

Planned Contrast ¹	Fisher's p-value (one tailed)	Contrast Supported? (yes/no)
1) 1 = 3	1.00	yes
2) 1 = 2	1.00	yes
3) 2 = 3	1.00	yes
4) 1 > 4	0.001	yes
5) 2 > 4	0.007	yes
6) 3 > 4	0.002	yes

TABLE 7 (continued)

PANEL C: Kendall's Rank Correlation (H2 and H3) [n = 9]

	Goal Commitment	Empathic Concern
Correct Decision	0.707 $p = 0.01$	-0.236 $p = 0.24$

NOTE TO TABLE 7:

¹ Each contrast refers to predictions presented in Panel B of Figure 2 and the respective difference between cells in Panel A of Table 7.

When PM attribute conflict was absent, results of contrast 1 indicated that participants' decision performance was not significantly affected ($p = 1.00$) by the difference between PM attribute differences. However, when PM attribute conflict was present, the difference between PM attribute differences affected participants' decision performance. When this difference was large (cell 2), results of contrasts 2 and 3 indicated that the frequency of correct decisions did not significantly ($p = 1.00$) differ from the conflict-absent conditions (cells 1 and 3). However, when this difference was small (cell 4), results of contrasts 4, 5 and 6 indicated that the frequency of correct decisions was significantly ($p < .008$) lower than in the other three conditions (cells 1, 2 and 3). Overall, each of the six contrast tests provided support for H1.

Hypotheses 2 and 3 predicted that when there is PM attribute conflict and a small difference between PM attribute differences (cell 4), the likelihood of a correct decision would be positively associated with participants' goal commitment and negatively associated with their empathic concern, respectively. Since perfect separation of the data and small sample size precluded the use of a logistic regression²¹ or a point-biserial correlation,²² the nonparametric Kendall's rank correlation was used to test the association between correct decision and each of the two individual difference variables.²³ The Kendall's rank correlations are presented on Panel C of Table 7. While H2 was supported by a positive and statistically significant correlation between correct decision and goal commitment ($p < .05$), H3 was rejected due to the lack of a significant correlation ($p > .05$) between correct decision and empathic concern.²⁴

Supplementary Evidence

Sample size

In order to address concerns about small sample size I performed two analyses. I first conducted ex post power calculations for each hypothesis, and then, based on

²¹ Perfect separation occurs if all of the observations having unique covariate profiles have the same response outcome. For example, in cell 4, all of the participants that made correct decisions reported higher goal commitment than did all of the participants that made incorrect decisions. If perfect separation is present, then the use of logistic regression results in infinite parameter estimates (Allison 1999).

²² The point-biserial correlation is a special case of the Pearson correlation in which one variable is dichotomous and the other is continuous.

²³ While spearman rank correlation is more frequently used in research, Kendall's rank correlation includes an adjustment to account for ties in the data (Kendall 1976). The use of dichotomous variable as dependent variable guarantees the presence of several ties when testing H2 and H3, and thus, Kendall's rank correlation is the most appropriate test.

²⁴ The results of hypotheses testing when point-biserial correlation was used to test the association between individual differences and decision performance were not qualitatively different than when Kendall's rank correlation was used (point-biserial correlation for H1 was 0.77 and $p = .005$; point-biserial correlation for H2 was -0.05 and $p = .88$).

Hollenbeck et al. (2006), I analyzed parameter stability for the significant Kendall's rank correlation between individuals' goal commitment and their decision performance (i.e., test of H2).

H1 was tested by using Fisher's exact test to test for differences in proportion. Based on the estimated proportions (100% vs. 33%), for a conventional power of 80% (Cohen 1988) and the probability of rejecting the null hypothesis at $\alpha = .008$, nine participants per cell were required. While cell 2 had only 8 participants, the other cells had nine or more participants. Thus, power for the test of H1 appeared to be satisfactory.²⁵ H2 and H3 were tested using Kendall's rank correlation. Based on a conventional power of 80% and the probability of rejecting the null hypothesis at $\alpha = .05$ (one tailed), 34 and 14 participants were required to detect a medium and a large effect size respectively (i.e., correlations of 0.3 and 0.5 respectively; Cohen 1988). While the test of H2 and H3 only included nine participants, the actual Kendall's rank correlations were 0.707 and -0.236 for the test of H2 and H3 respectively. As a result, the power for the test of H2 appeared to be satisfactory but the power for the test of H3 was extremely low.²⁶

Since only nine participants were included in the test of H2 (participants of cell 4), the estimated Kendall's rank correlation ($r_k = 0.707$; $p < .05$) may have been impacted significantly by sampling error, and as a result it may be unstable. In order to address this concern, I analyzed the parameter stability of the test of H2 by using the "exclusion/inclusion of a single data point" procedure suggested by Hollenbeck et al.

²⁵ The observed power of contrasts 4, 5, and 6 (Panel B of Table 7) was 84%, 73% and 91% respectively.

²⁶ The observed power for the test of H2 and H3 was 85% and 22% respectively.

(2006). I calculated nine Kendall's rank correlations between individuals' goal commitment and their decision performance. Each of these correlations was calculated by excluding one participant from the sample (i.e., sample size = 8 for each correlation). The results were robust to the removal of any of the nine participants. Each of the nine Kendall's rank correlations was significantly positive ($p < .05$) and not significantly different than 0.707 ($p > .05$).

Considering the results of power analysis and stability test, the small sample size used in testing H1 and H2 did not seriously impair the statistical validity of the conclusions. In the case of H3, however, the lack of significant correlation and the low power of the test provided two competing conclusions: 1) the null hypothesis of no effect of individuals' empathic concern on decision performance is actually true; and (2) the null hypothesis of no effect is actually false, but a combination of some or all of small effect size, measurement error, and small sample sizes prevent the test from being able to detect this effect.

Performance Measure Attributes' Relative Importance

Hypothesis 2 predicted that, because goal commitment was expected to increase individuals' attention to action congruence, individuals with higher goal commitment were more likely to chose the more action congruent PM, and as a result were more likely to make correct decisions. Therefore, H2 assumed that PM attributes' relative importance mediated the relation between individuals' goal commitment and decision performance.

To provide evidence on the validity of the mediating role of PM attributes' relative importance, I used Holmbeck's (1997) four criteria to establish a mediating relationship. The links tested under the Holmbeck (1997) approach are presented in Panel

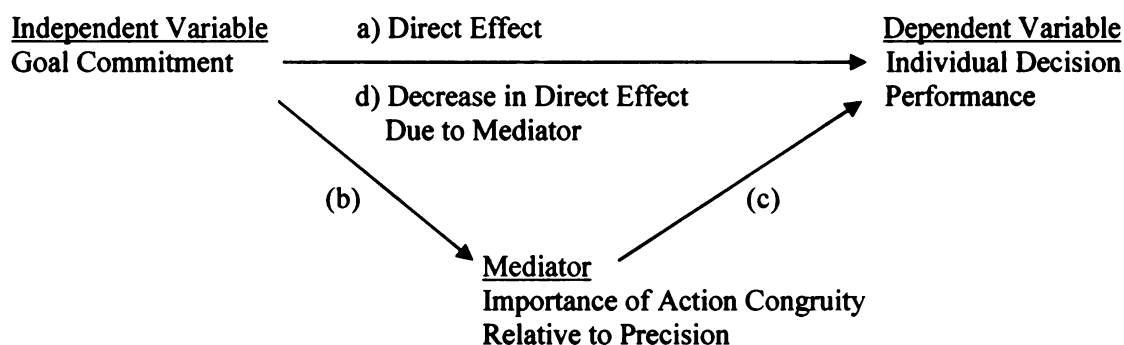
A of Figure 3. Four questions in the post-experimental questionnaire were used for measuring PM attributes' relative importance (Panel E in Table C4 of Appendix C). While, questions 1 and 4 were intended to directly measure the PM attributes' relative importance, a third measure of their relative importance was constructed by dividing the answer to question 3 by the answer to question 2.

Correlation results for the four criteria (a, b, c and d) for each of the three measures of the mediator variable (question 1, question 4, and question 3 /question 2) are presented in Panel B of Figure 3. While Pearson correlation was used to test criteria a, b, and c, partial correlation was used to test criterion d. The last row of Panel B indicated whether the test of the four criteria supported the mediating role of the PM attributes' relative importance. A complete mediation model should result in significant correlations for criteria a, b and c and a non-significant correlation for criterion d. The test of Holmbeck's (1997) four criteria supported a complete mediation model for two of three measures used (question 4, and question 3/question 2). For question 1 (first column on Panel B of Figure 3), the results for criterion b indicated that the independent variable was not significantly ($p > .05$) associated with the mediator variable, and thus, it did not provide support for the mediation model. Because question 1 was more specific than the other questions, it required individuals to describe a higher-order mental operation relative to the other questions. Consistent with prior literature in psychology (Nisbett and Wilson 1977), question 1 may be an unreliable construct due to the individuals' limited ability to ex post describe their higher-order mental operations. Overall, the results provided some support for the complete mediation of goal commitment on decision performance by PM attributes' relative importance.

FIGURE 3

MEDIATOR ROLE OF PERFORMANCE MEASURE ATTRIBUTES' RELATIVE IMPORTANCE WHEN PERFORMANCE MEASURE ATTRIBUTE CONFLICT IS PRESENT AND THE DIFFERENCE BETWEEN PERFORMANCE MEASURE ATTRIBUTE DIFFERENCES IS SMALL

PANEL A: Examining How Goal Commitment Affects Individual Decision Performance



PANEL B: Test to Establish the Mediating Role of Performance Measure Attributes' Relative Importance.

	Correlation (two tailed p-value) [n= 9]		
	q1	q4	q3/q2
a) the effect of independent variable on dependent variable	0.87 (0.002)	0.87 (0.002)	0.87 (0.002)
b) the independent variable is associated with the mediator	0.64 (0.085)	0.92 (0.001)	0.79 (0.020)
c) the mediator is associated with the dependent variable	0.791 (0.020)	0.88 (0.004)	0.85 (0.007)
d) the mediator causes the direct effect (a) to decrease	0.80 (0.029)	0.41 (0.365)	0.66 (0.103)
<i>Mediating Role Supported (yes/no)</i>	<i>no</i>	<i>yes</i>	<i>yes</i>

Since hypothesis 3 was rejected, empathic concern was not likely to explain the behavior of individuals choosing the more precise PM when PM attribute conflict was present and the difference between PM attribute differences was small. In order to investigate an alternative explanation, I studied judgment about PM attributes' relative importance of those individuals who made incorrect decisions. T-test results indicated that their answers to questions 1 and 4 (on scale 1 to 9) were not significantly ($p > .05$) different than five and that question 3/question 2 is not significantly ($p > .05$) different than one. These results suggested that, when PM attribute conflict was present and the difference between PM attribute differences was small, the incorrect choices may be explained by the use of a compensatory heuristics with equal weights.

CHAPTER V: DISCUSSION

Many individuals who are not compensation experts choose PMs for incentive compensation. Boundedly rational individuals are likely to, contingent on the characteristics of the task, use heuristics to simplify the choice of PMs. This dissertation identifies PM attribute conflict and difference between PM attribute differences as two task characteristics that influence individuals' use of heuristics, and as a result, explain their decision performance.

The experimental results provide support for two of the three hypotheses. First, decision performance was explained by a two-way ordinal interactive function between PM attribute conflict and difference between PM attribute differences such that that decision performance was relatively low when PM attribute conflict was present and the difference between PM attribute differences was small; otherwise decision performance was 100% and equal for the other three experimental conditions (H1). Second, goal commitment explained differences in decision performance when PM attribute conflict was present and the difference between PM attribute differences was small.

Supplementary evidence supported the assumption that this relation was fully mediated by the PM attributes' relative importance such that individuals with higher goal commitment were more likely to consider action congruity more important to their decision relative to PM precision; as a result, they were more likely to choose the better PM (H2). Finally, the expected negative effect of empathic concern on individuals' decision performance when individuals' use compensatory heuristics was not supported (H3). While power analysis indicated that the sample size for the test of H3 was insufficient, there are other two potential reasons for the lack of significance of this

result. First, although participants reported different levels of empathic concern, the social context may not have been strong enough to activate prosocial behavior. Second, empathic concern does not explain individuals' choice of PMs. Supplementary evidence, consistent with the second reason, suggested that the incorrect PM choices of individuals using compensatory heuristics may have been explained by the use of equal weights.

Although

This dissertation has three limitations arising from choices made in the design of the experiment. The first and most important limitation is small sample size; the second is characteristics of the participants; and the third is the information about PM attributes provided to the participants to make their PM choice. First, significant effort was made to include a larger sample size in this dissertation, but only 76 individuals participated. In addition, 43% of the participants (33 of 76) were not retained for hypotheses testing due to lack of understanding of the task. While the sample size across cells was sufficient to test H1, the small sample in cell 4 ($n = 9$) forced the use of a nonparametric test for testing H2 and H3. Although the observed power for the test of H2 appears to be satisfactory, the power for the test of H3 was extremely low. As a result, the small sample affected the validity of the evidence regarding H3.

The participants were a relatively homogenous group of students from an M.S. in Accounting program, and the information provided to them was exactly what they needed for making their PM choices. In natural settings, decision makers' characteristics and the information provided to make PM choices may differ considerably. Individuals' prior experience in designing incentive compensation may allow them to make appropriate judgments about the PM attributes' relative importance. Consequently, the conclusions of

this dissertation are restricted to situations where individuals choosing a PM do not have prior experience in deciding PM-based incentive compensation with these particular tradeoffs. With respect to the information provided, although PM-based reports are common managerial practices, individuals are not likely to receive detailed information about the numerical value of each PM attribute. Instead, they are likely to make subjective assessments about these attributes' values. For example, in the case of PM precision, they may try to determine the extent to which a PM reflects factors outside the manager's control. After individuals complete the subjective assessment of each attribute's value for the available PMs, however, they are likely to face PM attribute conflict and difference between PM attribute differences. Therefore, results of the effect of these two task characteristics on individuals' decision performance presented in this dissertation are not experimental artifacts.

There are two important lessons learned from this dissertation. First, when the number of participants is limited and the sample selection process is expected to decrease the number of participants retained for hypotheses testing, then the participants should be strategically allocated to cells in order to ensure enough sample size for the most interesting hypotheses. Particularly in the case of this dissertation, I should have allocated more participants to cell 4 where H2 and H3 were tested instead of trying to ensure equal sample size across cells. Second, the agency situation described in the experimental materials did not necessarily provide a strong manipulation of the social context. If social context is expected to drive individuals' behavior, then it is recommended to ensure a strong manipulation of the social context by, for example, designing an initial activity in which two participants interact with each other, and then

they are told that their counterpart is the agent that they need to motivate by designing the incentive compensation.

This dissertation provides several opportunities for future research. First, identifying omitted variables can lead to new and interesting testable predictions. For example, a stronger social context can stimulate individuals' empathic concern and/or goal commitment and thus explain individuals' performance when PM attribute conflict is present and the difference between PM attribute differences is small. On the one hand, knowing the manager can increase individuals' empathic concerns and, as a result, increase the likelihood of individuals choosing the more precise PM. On the other hand, accountability can increase the effect of goal commitment and, as a result, increase the likelihood of individuals choosing the more action congruent PM. Second, future research may address how individuals change their PM choices in response to feedback over time. Although feedback in natural settings can be difficult to understand due to a incorrect initial PM choice (Krishnan et al. 2002) or changes in an environment (e.g., uncontrollable factors, delegation), feedback may still provide learning opportunities. Finally, this dissertation provides a starting point for understanding how individuals put weights on PMs (second step on PM-base incentive compensation design). The variables identified in this dissertation are likely to affect individuals' use of heuristics when weighting PMs, and as a result, they are expected to explain individuals' performance on the PM weighting decisions.

APPENDICES

APPENDIX A

FELTHAM AND XIE (1994) MODEL

Table 1 shows a baseline version of the information participants received. The parameter values in this table are linked to the Feltham and Xie's (1994) model as follows. Performance measures (here PM_1 and PM_2 , y_1 and y_2 , respectively) are modeled as linear functions of the agent's actions (one action of dimension A and one action of dimension B, a_1 and a_2 , respectively).

$$y_1 = \mu_{11}a_1 + \mu_{12}a_2 + \varepsilon_1, \text{ and} \quad (1)$$

$$y_2 = \mu_{21}a_1 + \mu_{22}a_2 + \varepsilon_2 \quad (2)$$

Each action is weighted by a sensitivity parameter (μ_{ij}) that indicates the effect of a agent's action j on performance measure i . An error term (ε_i) represents effects on the performance measure i other than the plant agent's actions. The variances and covariances of these ε_i 's are represented in a matrix Σ , with the diagonal terms indicating the variance of the error term in each individual measure and the off-diagonal terms indicating error covariance. The principal's expected gross payoff (x) is also affected by the two types of agent's actions:

$$x = b_1a_1 + b_2a_2 + \varepsilon_x, \quad (3)$$

where b_j = effect of a agent's action j on the principal's expected gross payoff (a component of congruity) and ε_x = error term representing effects of other influences on the principal's expected gross payoff.

Optimal performance-measure weights are calculated using the parameters given in Panel A of Table 1 and Equation (7) in Feltham and Xie (1994):

$$v^+ = [\mu\mu^t + r\Sigma]^{-1} \mu b, \quad (4)$$

where:

v^+ = a vector of incentive weights;

μ = matrix of sensitivity coefficients (expected change in PMs associated with a one-unit effort allocated to actions associated to those PMs);

r = agent's absolute risk aversion (value assumed to be 1, as in numerical example presented in Table 1 by Feltham and Xie 1994);

Σ = variance-covariance matrix representing error variance and error covariance of the PMs;

b = vector of action congruity coefficients (expected effects of the agent's actions associated to each PM on the principal's gross payoff).

The agent's actions resulting from the optimal weight is calculated using the results of Equation (4) on Equation (6) in Feltham and Xie (1994):

$$a = \mu^t v \tag{5}$$

Finally, the principal's expected gross payoff resulting from this optimization is calculated using the result of Equation (5) on Equation (3).

APPENDIX B

COMPENSATORY HEURISTICS

Two compensatory heuristics available for choosing PMs are weighted additive (WADD) and additive differences (ADDIF) (Payne et al. 1992). When individuals use the WADD heuristic, they make an overall evaluation of one PM by considering both the values of all of its attributes and the attributes' importance. The same procedure is repeated for the other PM, and the PM choice is made by comparing the overall evaluations of the two PMs and then choosing the PM with higher overall evaluation. For example, Equations (1) and (2) represent the use of WADD to make evaluations of PM₁ and PM₂:

$$\text{Evaluation of PM}_1 = W_P P_1 + W_{AC} AC_1 \quad (1)$$

$$\text{Evaluation of PM}_2 = W_P P_2 + W_{AC} AC_2 \quad (2)$$

where P_i and AC_i represents the values of precision and action congruity for the PM_i, and W_P and W_{AC} represents how subjectively important precision and action congruity are to the decision.

When individuals use the ADDIF heuristic, they first determine the difference between PMs on each attribute. Then a subjective weight, based on the attributes' importance, is applied to each difference and the weighted differences are summed over all of the attributes to obtain an overall evaluation of the difference between the two PMs, which will be the basis for the decision. Using the same parameters of equation (1) and (2), Equation (3) represents the use of ADDIF heuristic:

$$\text{Evaluation of PM}_1 \text{ vs. PM}_2 = W_P (P_1 - P_2) + W_{AC} (AC_1 - AC_2) \quad (3)$$

As modeled in Equations (1), (2), and (3), when individuals use compensatory heuristics, their PM choice depends on their judgments about the importance of each attribute (W_P and W_{AC}). Thus, consistent with physiology literature (Shah and

Oppenheimer 2008), WADD and ADDIF are expected to be equivalent in terms of cognitive demand (i.e., complexity). In addition, since the Equation (3) is mathematically equivalent to the difference between Equation (1) and Equation (2), the use of ADDIF is expected to lead individuals to the same choice as the use of WADD. Consequently, this dissertation refers to compensatory heuristics, and not to the two specific compensatory heuristics.

APPENDIX C

EXPERIMENTAL MATERIALS

BACKGROUND INFORMATION

Assume you are a manager working at the headquarters of a large, diversified, publicly owned firm with many stockholders. Your firm wants to improve its overall economic performance, and it is planning to hire a manager on a one-year employment contract to implement a performance-improvement program. Your job is to design an incentive bonus plan for this manager. Below is information that can help you in designing this manager's incentive bonus plan:

1. The one-year contract starts on January 1, 2007 and ends on December 31, 2007. This manager has no chance of future employment with your firm. The manager will be rewarded at the end of 2007 for his or her performance in 2007. The manager does not have any incentive to “game” the incentive bonus plan in order to tradeoff rewards in one year against rewards in future years, because he or she will not be employed by your firm after 2007.
2. Your firm's policy about incentive contract design for this type of managers has two steps:
 - *Choice of a performance measure*: select a performance measure from a set of two available performance measures to be included in the manager's incentive bonus plan.
 - *Weighting performance measures*: put a weight on the previously selected measure in the manager's incentive bonus plan. For example, if a performance measure is weighted as \$5, it means that for every unit of that measure, the manager will receive \$5 as an incentive bonus. Thus, if measured performance at the end of 2007 is 100, then the manager will receive an annual

incentive bonus of \$500 ($= \$5/\text{unit of measure} \times 100 \text{ units of measure}$).

3. Your job is to choose one of the two available performance measures to be included in this manager's incentive bonus plan. Another manager at your firm's headquarters will make the best possible weighting decision based on the performance measure that you have selected, in order to complete the design of this manager's incentive bonus plan.
4. Your firm's human resource department will design the manager's total compensation package to be competitive in the managerial labor market. If you choose a performance measure, then this only means that the manager's annual incentive bonus will be more or less dependent on that particular measure. You do not need to be concerned about whether your choice of a performance measure will make the manager's total compensation package uncompetitive in the labor market.
5. The objective of the owners of your firm, which your choice should support, is to maximize the economic (market) value of your firm, net of the cost of the manager's total compensation.
6. The owners of your firm are risk neutral. They are well-diversified and therefore they care only about the expected economic (market) value of your firm and not about unpredictable uncontrollable variation around this expected economic (market) value.
7. The manager for whom you are designing an incentive bonus plan can implement a wide variety of actions that are intended to maximize the economic (market) value of your firm by affecting one dimension of your firm's performance (e.g., reducing costs, increasing quality, increasing innovation, increasing market share). These actions require time and effort from the manager, however. The more actions the

manager is *already* implementing to affect this dimension of your firm's performance, the more difficult (personally costly) it is for him or her to identify and implement additional actions to affect this dimension of your firm's performance. The manager expects to receive a larger annual incentive bonus when he or she implements more actions to affect this dimension of your firm's performance. The smaller the annual incentive bonus that he or she expects to receive for his or her actions that affect this dimension of your firm's performance, the less motivated he or she will be to implement actions that affect this dimension.

8. The manager for whom you are designing the incentive bonus plan is risk averse. That is, the more uncertainty he or she has about his or her expected incentive bonus, the less motivating the expected incentive bonus will be to him or her.
9. The cost of collecting data and reporting a performance measure is the same for both available performance measures.
10. No performance measure is a perfect indicator of how the manager's actions can affect your firm's economic (market) value, and therefore no performance measure is a perfect basis for an incentive bonus that is intended to motivate the manager to maximize your firm's economic (market) value. However, one performance measure may be better than the other for this purpose. Three attributes of a performance measure, common to both available performance measures, can help you to design the manager's incentive bonus plan.

These attributes are defined by relating the performance measure to the actions that the manager can implement as a part of his or her job activity during 2007. In order to

describe a variety of possible managerial actions in common terms, we use the term “a unit of action”.

- (A) How much does a manager’s unit of action that is intended to change a particular performance measure also increase the economic (market) value of your firm, on average?

For example, implementing a unit of action that is intended to increase measured market share could be expected to add more to the economic (market) value of your firm than implementing a unit of action that is intended to increase a measure of employee skill, or vice versa.

- (B) How much does a manager’s unit of action change a performance measure, on average (that is, in a year without unusually good or bad uncontrollable events)?

For example, in an average year, a unit of action intended to increase market share might be expected to increase it by 2%, or a unit of action intended to increase customer satisfaction might be expected to increase it by one point on an 11-point scale.

- (C) Given the manager’s choice of actions, how much unpredictable variation in the measured performance is caused by factors the manager can not control (e.g., competitors’ actions)?

For example, if the manager chooses to implement actions that are expected to increase market share by 2% in an average year, then the measured market share increase might be somewhere between 1.5% and 2.5% if this unpredictable

uncontrollable variation in the measured performance is small and somewhere between 0% and 4% if this unpredictable uncontrollable variation is large.

The larger the unpredictable uncontrollable variation in the performance measure used for the incentive bonus plan, the more uncertain the manager will be about the expected amount of the incentive bonus that he or she will receive for implementing a unit of action.

General description of your job

Your job is to design an incentive bonus plan for a manager who will work under a one-year employment contract to implement a performance-improvement program during 2007. In order to meet your firm's policy about incentive bonus plans, your job is to choose one of two available performance measures for the dimension of your firm's economic performance that is expected to be affected by this manager. Another manager at your firm's headquarters will make the best possible weighting decision based on the performance measure that you have selected in order to complete the design of this manager's incentive bonus plan.

For each performance measure, your firm has provided you with estimates that are intended to capture the values of the three attributes (A, B and C) of the performance measures described in point 10 on the prior page. The following table provides a description of what each of these estimates means.

TABLE C1
DESCRIPTION OF PERFORMANCE MEASURES' ATTRIBUTES¹

Performance Measures' Attributes	Definition	Description of Attribute Meaning
(A) <i>Action Congruity</i>	Expected effect on your firm's economic (market) value when the agent implements one unit of action that is intended to affect PM_i .	The higher this attribute value, the larger the expected effect of a unit of action on the economic (market) value of your firm.
(B) <i>Sensitivity</i>	Expected effect on PM_i when the agent implements one unit of action that is intended to affect PM_i .	The higher this attribute value, the larger the expected effect of a unit of action on the performance measure.
(C) <i>Precision</i>	Standard deviation of PM_i due to factors the agent can not control.	The higher this attribute value, the higher the unpredictable variation in this performance measure that is due to factors the manager can not control.

NOTE TO TABLE C1:

¹ Participants received the descriptions shown below, but *without the names which are in italics* that identify attributes in terms of Feltham and Xie (1994) model.

PM₃ and PM₇ refer to the two available performance measures for the dimension of your firm's performance that is expected to be affected by the manager. The specific names of the two performance measure have been replaced by generic names so that you make your choice of a performance measure based on their attribute values only and not on their names. The numbers used to identify the two measures were randomly chosen and do not represent any order of importance.

The estimates of the performance measures' attribute values provided by your firm are based on experience with similar one-year employment contracts. Your firm's accounting and human resources departments agree that all of the estimates you will receive for the manager are accurate. In addition, the manager also is aware of these estimates and agrees with them.

Your pay

You will receive fixed pay of \$10 for completing all of this accounting simulation, regardless of your performance in choosing a performance measure. You will also receive variable pay up to \$10 *in addition*, depending on how well you chose a performance measure. That is, the closer your choice is to the choice that would maximize the expected economic (market) value of your firm, the higher your total pay will be, up to a maximum of \$20 (= \$10 + \$10).

If you do not complete the accounting simulation, you will not be penalized. You will not be paid, however, for an uncompleted accounting simulation.

Task

Your firm will provide you with two performance measures, PM_3 and PM_7 , for the dimension of your firm's performance that is expected to be affected by this manager.

Based on the information provided, your job is to choose one of these two performance measures to be included in this manager's incentive bonus plan.

TABLE C2
BELIEFS ABOUT EACH ATTRIBUTE-DECISION RELATION

-
1. If there are two available performance measures which differ *only with respect to attribute (A)*:
 - a. I would choose the performance measure with a **higher** value on attribute (A).
 - b. I would choose the performance measure with a **lower** value on attribute (A).
 - c. I would be indifferent between choosing one or the other performance measure.

 2. If there are two available performance measures which differ *only with respect to attribute (B)*:
 - a. I would choose the performance measure with a **higher** value on attribute (B).
 - b. I would choose the performance measure with a **lower** value on attribute (B).
 - c. I would be indifferent between choosing one or the other performance measure.

 3. If there are two available performance measures which differ *only with respect to attribute (C)*:
 - a. I would choose the performance measure with a **higher** value on attribute (C).
 - b. I would choose the performance measure with a **lower** value on attribute (C).
 - c. I would be indifferent between choosing one or the other performance measure.
-

TABLE C3

SAMPLE OF PM ATTRIBUTES PROVIDED TO PARTICIPANTS

Performance-Measure Attributes	PM ₃	PM ₇
(A) Expected effect on your firm's economic (market) value when the manager implements one unit of action that is intended to affect PM _i .	2,500	2,000
(B) Expected effect on PM _i when the manager implements one unit of action that is intended to affect PM _i .	3,600	3,600
(C) Standard deviation of PM _i due to the effect of factors the manager can not control.	1,200	1,800

TABLE C4
POST-EXPERIMENTAL QUESTIONNAIRE ¹

PANEL A: Goal Commitment ²

1. It was hard to take my firm's goal seriously. (R)
 2. Quite frankly, I didn't care if I achieved my firm's goal or not. (R)
 3. I was strongly committed to pursuing my firm's goal.
 4. It wouldn't take much to make me abandon my firm's goal. (R)
 5. I think my firm's goal was a good goal to shoot for.
-

PANEL B: Empathic Concern ²

1. I often have tender, concerned feelings for people less fortunate than me.
 2. Sometimes I don't feel very sorry for other people when they are having problems.
(R)
 3. When I see someone being taken advantage of, I feel kind of protective towards them.
 4. Other people's misfortunes do not usually disturb me a great deal. (R)
 5. When I see someone being treated unfairly, I sometimes don't feel very much pity for them.(R)
 6. I am often quite touched by things that I see happen.
 7. I would describe myself as a pretty soft-hearted person.
-

TABLE C4 (continued)

PANEL C: Understanding of the Materials

1. The objective of the owner of your firm, which your performance-measure choice should support, was described in the background information as:
 - a) Maximizing sales
 - b) Minimizing cost
 - c) Maximizing profit
 - d) Maximizing the economic (market) value of your firm, net of the cost of the manager's total compensation.
 - e) None of the above

 2. The owner of your firm is:
 - a) Risk averse
 - b) Risk seeking
 - c) Risk neutral
 - d) I don't know

 3. The manager for whom you are choosing PM for an incentive bonus plan is:
 - a) Risk averse
 - b) Risk seeking
 - c) Risk neutral
 - d) I don't know
-

TABLE C4 (continued)

PANEL D: Experience and Knowledge

1. How many months of full-time work experience do you have as a manager or an accountant?
2. Have you have any experience choosing performance measures for incentive bonus plans? (yes or no)
3. Please complete the following table about your undergraduate and/or graduate coursework you have completed before today. Please be sure to provide the total number of credits for each alternative and indicate whether your credits are from a quarter or semester term.

	Number of Credits	Course Length		Average GPA in these courses
Accounting		Quarter	Semester	
Calculus		Quarter	Semester	
Finance		Quarter	Semester	
Microeconomics		Quarter	Semester	
Statistics		Quarter	Semester	

TABLE C4 (continued)

PANEL E: PM Attributes' Relative Importance

1. How important to your choice was \$100 of attribute A relative to \$100 of attribute C?
 2. How important to your choice did you think the difference on attribute C between PM₃ and PM₇
 3. How important to your choice did you think the difference on attribute A between PM₃ and PM₇ was?
 4. In comparing PM₃ and PM₇, how important to your choice did you think the difference on attribute A was relative to the difference on attribute C?
-

NOTES TO TABLE C4

- ¹ Responses to Panels A and B were on a scale 1 (strongly agree) to 9 (strongly disagree). Responses to Panel E were on scale 1 (extremely less important) to 9 (extremely more important).
 - ² Items followed by (R) indicate that the item was reverse-scored before analysis
-

TABLE C5

**PM ATTRIBUTES' VALUES PROVIDED FOR
PERFORMANCE MEASURE CHOICE**

		PM Attribute Conflict					
		Absent			Present		
Difference Between PM Attribute Differences	Large	PMs' Attributes	PM ₁	PM ₂	PMs' Attributes	PM ₁	PM ₂
		Action Congruity	\$2,500	\$2,000	Action Congruity	\$2,000	\$2,500
		Precision	\$1,200	\$3,600	Precision	\$1,200	\$3,600
		Sensitivity	\$3,600	\$3,600	Sensitivity	\$3,600	\$3,600
	Small	PMs' Attributes	PM ₁	PM ₂	PMs' Attributes	PM ₁	PM ₂
		Action Congruity	\$2,500	\$2,000	Action Congruity	\$2,000	\$2,500
		Precision	\$1,200	\$1,800	Precision	\$1,200	\$1,800
		Sensitivity	\$3,600	\$3,600	Sensitivity	\$3,600	\$3,600

TABLE C6
OPTIMAL SOLUTIONS

		PM Attribute Conflict					
		Absent			Present		
Difference Between PM Attribute Differences	Large	PMs' Attributes	PM ₁ [*]	PM ₂	PMs' Attributes	PM ₁ [*]	PM ₂
		Weights	\$0.63	\$0.28	Weights	\$0.50	\$0.35
		Principal's Expected Gross Payoff	\$2.8 mills.	\$1.0 mills.	Principal's Expected Gross Payoff	\$1.8 mills.	\$1.6 mills.
	Small	PMs' Attributes	PM ₁ [*]	PM ₂	PMs' Attributes	PM ₁	PM ₂ [*]
		Weights	\$0.63	\$0.44	Weights	\$0.50	\$0.56
		Principal's Expected Gross Payoff	\$2.8 mills.	\$1.6 mills.	Principal's Expected Gross Payoff	\$1.8 mills.	\$2.5 mills.

NOTE TO TABLE C6

* Economically preferred PM.

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