IT Outsourcing Contracts and Performance Measurement

**Extended Abstract for WISE 2006**

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## 1. Introduction

The successful outsourcing of IT services in firms has been hampered by the lack of guidance on how to design IT outsourcing contracts to achieve optimal results (Gurbaxani 2006). In particular, theories of the firm have had limited success explaining the choice of particular performance incentives in outsourcing contracts. It remains a puzzle for these theories why so many managers do not use performance incentives even when good, objective performance measures exist and are readily available.

Recent theoretical work on agency problems in organization economics suggests that incentive contracts serve as mechanisms to not only induce effort and allocate risk but also direct the effort allocation among different tasks competing for the agent's time. Anecdotal evidence shows that the unintended consequences of incentive plans that overly motivate one aspect of performance to the detriment of another are as serious as the costs of risk sharing. For example, the perverted effects of piece-rate systems that exclusively reward productivity include reducing or even eliminating efforts on hard-to-measure aspects of performance such as quality.

While the tradeoff between risk and incentive has been extensively studied in the agency literature, the importance of incentive contracts in determining effort allocation across tasks has only recently been recognized. One of the central propositions of this approach is that when firms need to encourage provision of effort towards many activities, the availability of good performance measures for one activity may become useless if appropriate performance measures on competing activities are lacking (Holmstrom and Milgrom, 1994). In these circumstances the optimal (second-best) contract may refrain from providing strong incentives for one type of activity not because good objective performance measures for these tasks do not exist but because incentive provision for competing tasks cannot be efficiently provided. What Steven Kerr (1975) calls the "Folly of Rewarding A While Hoping for B" is prevalent and pervasive in many social, organizational, business and political contexts and one of the most fundamental problems plaguing contracting situations.

Since the use of specific performance measures depends in part on the overall set of objectives that are to be achieved, the characteristics of a contract (and in particular performance measurement) should be tailored to the intended goals. In general, the association between performance measures and objectives should vary with the degree to which these goals are observable, measurable and amenable to inclusion in an incentive contract. This suggests that

heterogeneity in the characteristics of objectives will be systematically related to heterogeneity in the forms of performance measurement.

The primary goal of this paper is to investigate whether multi-task theory can explain the nature and use of performance metrics in IT outsourcing contracts. A secondary goal is to provide empirical support for this theory. We examine the contractual objectives and performance metrics of 60 IT outsourcing contracts. IT outsourcing contracts often involve multiple objectives with varying characteristics (emphasizing either IT-related objectives, business goals, or a combination thereof) and therefore present an ideal setting in which to examine the extent to which incentive provision for one objective is influenced by the availability of incentives for other concomitant objectives. We present a descriptive account of the contractual forms used in IT outsourcing contracts and their relationship to the characteristics of the tasks to which they apply. In the context of IT outsourcing, the agent is the contractor who chooses how much effort and service level to expend on the outsourced IT services. The firm can affect the contractor's choice of effort through performance-contingent metrics that target different aspects of performance. Our analysis thus allows us to examine whether the incentives included in outsourcing contracts are altered when multiple objectives with different measurement characteristics are included in the contract.

## 2. A model of incentives for multi-objective outsourcing contracts

We begin with a basic multi-task principal-agent model of incentives (Holmstrom and Milgrom, 1994, Feltham and Xie, 1996, Baker, 2000) adapted to our particular empirical setting. The model generates predictions about the optimal incentive contract chosen by the principal for different sets of objectives. In particular, we exploit our knowledge of IT outsourcing contracts and the characteristics of the available measures of performance to test implications of the multi-task framework for the design of IT outsourcing contracts. Intuitively, we expect the association between performance measures and objectives to be modulated by the presence or absence of additional objectives, and their characteristics. The model identifies the conditions and the direction of this effect.

An agent (an outsourcing vendor) exerts effort that influences the objective function of a principal (the firm that is outsourcing IT). Objectives for outsourcing IT activities are as diverse as reducing IT costs, reducing business costs, improving business process performance or customer satisfaction. Effort by the outsourcing vendor is multi-dimensional and is represented by a vector e. Effort affects objectives differently; i.e., each objective $V_i$ takes the form:

$$V_i = f_i e$$

where $f_i$ is the marginal productivity of effort $e$ in $V_i$.

The principal cannot observe effort directly[1] and therefore uses instead a series of observable signals as performance measures. Let each performance measure $P_k$ be:

$$P_k = p_k e + \varepsilon_k$$

where $\varepsilon$ is a random disturbance vector with mean zero and variance-covariance matrix $\Sigma$.

[1] Alternatively, effort is observable but not court-enforceable and thus cannot be used in a contract.

We now specialize this general framework to our empirical setting. We first assume that the marginal products of effort are all non-negative. This assumption is not too restrictive but helps in interpreting the results of the model below. In addition, we assume that there are only two types of objective $V_1$ and $V_2$ and that the principal's value is defined as:

$$V = V_1 + V_2$$

The difference between the two objective types $V_1$ and $V_2$ is that for objective $V_1$, there exists a performance measure $P_1$ such that the marginal products of effort in $V_1$ and $P_1$ are equal ($p_1 = f_1$). For objective $V_2$ however, $P_2$ is both a noisy and possibly discordant measure of $V_2$. Let $\sigma_1$ be the variance of $\varepsilon_1$, $\sigma_2$ the variance of $\varepsilon_2$, and $\sigma_{12}$ the covariance between $\varepsilon_1$ and $\varepsilon_2$. When writing the incentive contract the principal maximizes:

$$\max_{\alpha_1,\alpha_2} V_1 + V_2 - \alpha_1 P_1 - \alpha_2 P_2$$

subject to the agent choosing the effort level e that maximizes her expected utility

$$U(\alpha_1 P_1(e) + \alpha_2 P_2(e) - C(e))$$

where *C(e)* is the cost of effort. For an agent with coefficient of risk aversion *r* and CARA utility preferences, this problem is equivalent to maximizing

$$V_1 + V_2 - \alpha_1 P_1 - \alpha_2 P_2 - \frac{1}{2} r Var(\alpha_1 P_1 + \alpha_2 P_2)$$

The solution to this problem (see proof in full paper) yields the following expressions for $\alpha_i$ :

$$\alpha_1 = \frac{r(f_1 + f_2)(f_1\sigma_2 - p\sigma_{12}) + p'p(f_1' f_1 + f_1' f_2) - p' f_1(p' f_1 + p' f_2)}{(r\sigma_2 + p'p)(f_1' f_1 + r\sigma_1) + (p' f_1 + r\sigma_{12})^2}$$

$$\alpha_2 = \frac{r(f_1 + f_2)(p\sigma_1 - f_1\sigma_{12}) + f_1' f_1(p' f_1 + p' f_2) - p' f_1(f_1' f_1 + f_1' f_2)}{(r\sigma_2 + p'p)(f_1' f_1 + r\sigma_1) + (p' f_1 + r\sigma_{12})^2}$$

### 3. Implications and Comparative Statics

The model in the previous section provides interesting insights about how incentives on performance measures vary with different parameters. In this section, we examine some of its implications and derive comparative statics that will be useful for testing hypotheses about the cross-sectional variation in incentive strength for various performance incentives.

First, consider the case when $f_2 = 0$. In this case, the buyer cares primarily about a single objective $f_1$ for which a non-distorted performance measure ($p_1 = f_1$) exists. Notice that even in this case $\alpha_2$ is not necessarily zero: the principal may use additional performance measures even though a good performance measure exists. As can be seen from the expression for $\alpha_1$ and $\alpha_2$, the weight assigned to the second performance measure depends on three parameters: $\sigma_1$, the noise in the performance measure $P_1$, $\sigma_{12}$, the correlation between $P_1$ and $P_2$, and the distortion in $P_2$. The likelihood of using a second performance measure increases the noisier the first performance measure, the less noisy the second performance measure and the less distorted the second performance measure.

Another interesting case arises when $f_2$ is not zero but $p = \varepsilon_2$. In this case, the principal has multiple objectives but the only performance measure sensitive to effort is $F_1$. The expression above shows that in such a case, $\alpha_1$ decreases compared to the case when $f_2 = 0$. Even though a good unbiased performance measure exists for one of the objectives ($V_1$), the buyer will shy away from using this metric intensively in the contract for fear of distorting effort away from the second objective. Notice that if there exists a good performance measure for $V_2$ as well (such that the marginal product of effort in this performance measure approximates the marginal product of effort in $V_2$ reasonably well) the decrease in $\alpha_1$ will be smaller.

## 4. The Data

We examine the relationships between incentive strength and contractual objectives in a novel data set on IT outsourcing gathered through a survey of 42 firms in 2005 (60 outsourcing contracts). The sample consists of firms that have outsourced IT services and includes data on the contracted work, the objectives, the performance metrics used in the contract and the degree to which the outsourcing relationship was successful. For some objectives, there existed performance metrics that directly measured how well this objective had been achieved (for instance, the objective "reduce IT costs" was directly measurable by the performance metric "reduction in IT costs") while other goals (such as "improve alignment of IT with the business") did not have such metrics associated with them. The fact that some objectives were directly measurable provided a proxy for one of the elements of the model above: the marginal product of effort in a direct performance measure was deemed to be close to the marginal product of effort in the principal's value function for these types of objectives. Intuitively, direct performance measures are relatively well-aligned with the goal.

In addition, goals differed in their degree of measurability or whether an "objective" performance measure existed for this goal. For instance, goals such as user satisfaction and service quality were less amenable to measurement than IT costs or market share (consistent with the theoretical literature on multi-task problems that has often seen intangibles such as "quality" as an example of immeasurable aspects of work, see the examples in Holmstrom and Milgrom, 1994). Measurability then provided a proxy for performance metric noise: subjective goals are, from the perspective of the agent, noisier than goals that can be objectively measured. Finally, noise was also related to the degree of exclusive control the agent had over the value of the performance measure. When marginal product of effort is a function of other agents' (unobservable) effort level, the performance measure did not provide appropriate incentives to exert optimal level of effort (Alchian and Demsetz, 1972). This joint production problem could then be seen as increasing the uncontrollable noise in the performance measure.

## 5. Results

We present some of the results of our analysis of the choice of incentives and performance measures for various sets of objectives. A more extensive discussion of these results appears in the full paper.

First, the model suggested that firms would use additional performance incentives when the objectives they seek to attain are intangible even though they are directly measurable. Similarly,

if good performance measures are available for a tangible goal, fewer performance measures should be used in the contract. This implies that contracts with intangible goals would have, on average, a higher number of performance measures. We found preliminary support for this hypothesis. A regression of the number of performance measures in a contract on the importance of the intangible goal "improving IT service quality" shows that on average, contracts that specify this goal as one of their objectives use more performance metrics - 1.6 (if the importance of this objective is ranked as 4) to 2.9 (ranked as 5) more - controlling for the number of objectives in the contract (Table 1).

The model also implies that when hard-to-measure objectives are included in a contract together with objectives for which good performance measures exist, the likelihood of using these good performance metrics to reward these objectives decreases. We tested this hypothesis by running a logistic regression of the probability of using a direct measure, when available, on the importance of the objective that this metric measures, and the importance of three other objectives (that cannot be directly measured) in the contract. The results show that when objectives for which a direct measure exists are important, the probability of choosing this metric is high, but the odds decrease the greater the importance of other, indirect measures (Table 2).

| Variables | Coefficient | Std. Error |
|---|---|---|
| Constant term | 1.38 | 0.72 |
| Number of Objectives in Contract | 0.25 | 0.16 |
| IT service quality (level_4) | 1.67*** | 0.84 |
| IT service quality (level_5) | 2.95** | 1.01 |

Table 1: Dependent Variable: Number of Performance Metrics Used in Contract, **: significant at the 95% confidence level, ***: 99% confidence level

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Table 2: Dependent Variable: Direct Performance Metric Used or Not. *: 90% confidence level

Our results so far provide preliminary support for the theory and interesting insights into some aspects of performance measurement in IT outsourcing contracts that have been overlooked in the current research on IT outsourcing contracts.

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