Risk Sharing in Business Process Outsourcing

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Abstract Risk sharing needs of the client has been highlighted in business process outsourcing. In order to get the optimal risk sharing between the client and the vendor, the paper builds a three-stage game model in which both the client and the vendor are risk aversion. The analyses of model results show that the proportion of risk undertaken by the client will increase when uncertainty and difficulty of the outsourced process is higher, but will no more than the risk undertaken by the vendor under situations that they have same risk aversion. Also, we give the criteria to choose a vendor for the client who has the need to share the risks.
Key words Risk sharing; Business rrocess outsourcing; Risk aversion; Game model

1 Introduction

Outsourcing has become very widespread in the last decade and has moved on from limited applications where peripheral business functions are 'outsourced' to much more vital business functions being outsourced today (Quelin and Duhamel, 2003). Business process outsourcing (BPO) is one of the most common forms of outsourcing and is rapidly growing with a projected annual growth rate of 60 percent (Tapper, 2004). BPO phenomenal growth can be attributed to technological advancements, such as the Internet and mobile services, which have reduced communication costs and facilitated the internationalization of business processes (Mahnke et al., 2005). The Gartner Group defines BPO as the delegation of one or more IT-intensive business processes to an external provider that in turn owns, administers and manages the selected process based on defined and measurable performance criteria (Stone, 2004).

The academic literature has identified a number of expected gains that companies can derive from business process outsourcing. They range from the reduction of operational costs (Lacity and Hirschheim, 1993) to the ability to focus on core competencies (Quinn and Hilmer, 1994) while having access to the industry-leading external competencies and expertise (Kakabadse and Kakabadse, 2002). Also an emerging literature that highlights risk sharing needs associated with business process outsourcing (Doh, 2005).

In many industries, the output quantity of a business process is not deterministic and is influenced by many factors. Increasingly BPO has resulted in business risks being shared with providers on account of reduced need for capital expenditure on infrastructure- and manpower development. BPO clients are very much part of today's business environment that is dynamic and uncertain in several ways (Garg et al., 2003) and calls for the need to be less prone to risks. Risk sharing refers to the clients' realization that they may not ever need full in-house ownership of a particular activity. For example, the decision of Swiss International Airlines and Austrian Airlines to outsource revenue and traffic accounting, passenger interlines billing, and frequent flyer program administration to AFS was meant to share business risks (World Investment Report, 2006).

Our paper is organized as follows. In the next section, we describe the assumptions and setup a game model in which the client devises risk sharing contract to the vendor and get the payoff function of the client and the vendor. In section 3, we solve the models based on the participation constraint and incentive constraint. In section 4, we analyze the optimal risk sharing between the client and the vendor. The final section concludes the research findings of the paper.

2 Model Setup

Assumption 1. The client has outsourced one business process to the vendor and expected risk sharing benefits at the same time.

Assumption 2. The production function of the business process is linear, $X = pa + \theta$ where a is the efforts level of the vendor, p is the productivity of the vendor and θ is the uncertainty of outsourced process faced in the external environment. θ is normally distributed with zero mean and variance σ^2, that is $\theta \sim N(0, \sigma^2)$.

Assumption 3. The vendor's efforts cost function is $C(a)=1/2ba^2$, where b is cost coefficient of the efforts. The function means the more efforts the vendor put into, the more negative utility the vendor has and the negative utility isn't diminishing.

Assumption 4. The client is risk aversion and the client's utility function is $u_c(x)=-e^{-\rho_c x}$, where ρ_c is the client's coefficient of absolute risk aversion. The vendor is risk aversion and the vendor's utility function is $u_v(x)=-e^{-\rho_v x}$, Where ρ_v is the vendor's coefficient of absolute risk aversion.

Assumption 5. The client devises a linear contract to get risk sharing with the vendor $w=\alpha+\beta X$, α is the fixed pay and β is the incentive pay.

According to the above assumptions, the expected utility function of the client and the vendor is

$$\pi_c = X-(\alpha+\beta X)-\frac{1}{2}\rho_c \operatorname{var}[X-(\alpha+\beta X)] \tag{1}$$

$$\pi_v = (\alpha+\beta X)-\frac{1}{2}\rho_v \operatorname{var}(\alpha+\beta X) \tag{2}$$

Where $\frac{1}{2}\rho_c \operatorname{var}[X-(\alpha+\beta X)]$ is the risk cost of the client and $\operatorname{var}[X-(\alpha+\beta X)]$ is variation of the client's payoff, where $\frac{1}{2}\rho_v \operatorname{var}(\alpha+\beta X)$ is the risk cost of the vendor and $\operatorname{var}(\alpha+\beta X)$ is variation of the vendor's payoff.

3 Model Solution

We use backward induction to solve the game model and begin from the final stage to get the risk undertaken by the vendor and by the client.

3.1 The third stage

In this stage the vendor will decide a to satisfy the incentive constraint. The incentive constraint of the vendor is to choose a to maximize his payoff, that is $\underset{a}{Max}\ \pi_v$.

According to the first order condition, that is $\frac{\partial[(\alpha+\beta X)-\frac{1}{2}\rho_v \operatorname{var}(\alpha+\beta X)]}{\partial a}=0$, putting $\operatorname{var}(\alpha+\beta X)=\frac{1}{2}\rho_v\sigma^2$ into it, then

$$\frac{\partial(\alpha+\beta pa-\frac{1}{2}\rho_v\beta^2\sigma^2)}{\partial a}=0 \tag{3}$$

We get the optimal efforts of the vendor is

$$a=\frac{\beta p}{b} \tag{4}$$

3.2 The second stage

In this stage the vendor will choose to accept the contract or not, that is the contract should satisfy the participation constraint. Let $\overline{w}$ be the vendor's minimum utility level. If the vendor's payoff is below $\overline{w}$, it won't accept the contract. So the vendor's participation constraint is represented as: $\pi_v \geq \overline{w}$. Under optimal conditions, the client needn't pay more than the minimum, so the vendor's participation constraint is:

$$(\alpha+\beta X)-\frac{1}{2}\rho_v \operatorname{var}(\alpha+\beta X)=\overline{w} \tag{5}$$

3.3 The first stage

The optimal incentive problem of the client is to design a contract to induce the vendor to choose the action most beneficial to the client, that is

$$\underset{\beta}{Max}\ \ \pi_c$$

$$\text{s.t} \quad (\alpha+\beta X)-\frac{1}{2}\rho_v \operatorname{var}(\alpha+\beta X)=\overline{w} \tag{6}$$

$$a=\frac{\beta p}{b}$$

Putting the two constraints into $\frac{\partial \pi_c}{\partial \beta}=0$, then

$$\frac{\partial[\frac{\beta p^2}{b}-\frac{\beta^2 p^2}{2b}-\frac{\rho_v \beta^2 \sigma^2}{2}-\frac{\rho_c(1-\beta)^2\sigma^2}{2}]}{\partial \beta}=0 \tag{7}$$

We get the vendor's risk sharing is

$$\beta=\frac{1}{1+\frac{b\rho_v\sigma^2}{p^2+b\rho_c\sigma^2}} \tag{8}$$

The client's risk sharing is

$$1-\beta=\frac{b\rho_v\sigma^2}{p^2+b\rho_c\sigma^2+b\rho_v\sigma^2} \tag{9}$$

The risk sharing between the client and the vendor is

$$\frac{1-\beta}{\beta}=\frac{b\rho_v\sigma^2}{p^2+b\rho_c\sigma^2} \tag{10}$$

4 Model Analyses

We get from equation (10) that the optimal risk sharing between the client and the vendor is determined by σ^2, b, ρ_v, ρ_c and p. The risk sharing is the incremental function of b, ρ_v and σ^2. The risk sharing is the decreasing function of p and ρ_c.

$\partial(\frac{1-\beta}{\beta})/\partial b>0$ can be explained as the more difficult the outsourced process is, the higher proportion of risk will be undertaken by the client. $\partial(\frac{1-\beta}{\beta})/\partial \rho_v>0$ can be explained as the higher risk aversion the vendor is, the higher proportion of risk will be undertaken by the client. $\partial(\frac{1-\beta}{\beta})/\partial \sigma^2>0$ can be explained as the higher risk the outsourced process faces, the higher proportion of risk will be undertaken by the client.

$\partial(\frac{1-\beta}{\beta})/\partial p>0$ can be explained as the higher productivity the vendor has, the lower proportion of risk will be undertaken by the client. $\partial(\frac{1-\beta}{\beta})/\partial \rho_c>0$ can be explained as the higher risk aversion the client is, the lower proportion of risk will be undertaken by the client.

Moreover, we get from equation (10) that when $\rho_c=\rho_v$, $\frac{1-\beta}{\beta}<1$ and even when $\rho_c<\rho_v$, a higher p can make $\frac{1-\beta}{\beta}=1$. It can be explained as the client will undertake no more risk than the vendor if the vendor is not more risk aversion than the client.

5 Conclusion

In this paper, we aim at the emerging drivers in BPO that the clients need risk sharing with their vendor and get the optimal risk sharing contract between the client and the vendor. This paper builds a three-stage dynamic game model in which both the client and the vendor are risk aversion to study risk

sharing in business process outsourcing. The main findings of the research are as followed. 1) Under situations that the outsourced process is facing high risks or the outsourced process is difficult to complete, the proportion of risk undertaken by the client will increase. 2) The client has higher risk aversion can effectively reduce its risk by choosing a vendor with higher productivity and lower risk aversion. 3) The client can devise a risk-sharing contract to have the vendor taken more risk when it has the same risk aversion as the vendor. Extension of the research includes the risk sharing problem considering the output of outsourced process cannot be verified by the third party.

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