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Protection of Intellectual Property while Outsourcing

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ABSTRACT

Food and Beverage companies need to share their Intellectual Property (IP) when they outsource production and/or R&D to contract agents. IP sharing can facilitate misappropriation and the contractor may eventually start competing with the client. We design an incentive compatible contract that can protect company IP. A two-pronged strategy is proposed: Companies should share less know-how and give high incentive payments to deter IP misappropriation. Strategies like product differentiation may be highly useful to deter piracy.

OVERVIEW

- Companies are asking themselves - do we need to make “our” products ourselves?
- There are compelling economic benefits from outsourcing production and/or R&D
- However, IP protection may be a significant problem while outsourcing tasks

FB companies outsource different tasks/operations:

-Production (reasons: lack of manufacturing capacity, lower costs)

Example: Whole Bakers developed a healthy Gluten free cookie recipe but the bakery lacked large scale production capacity. Whole Bakers contracted production to Pac-Moore, a contract mixing, blending and packaging specialist.

-R&D (reasons: gain “access to technology/equipment”, lower costs)

-Information Technology

“The outsourcing of our IT infrastructure and outsourcing management has allowed us to concentrate on our core competencies. And in a heated-up marketplace where every advantage counts, the ability to focus on what’s key makes all the difference.”—Domino Foods Inc. CIO Don Whittington

Examples of successful outsourcing by FB companies

- ✓Domino Foods outsource IT to Capgemini
- ✓Kraft outsources certain IT operations to Capgemini
- ✓Dean Foods outsource to Telerx
- ✓Companies work with Nerac to develop innovative R&D

Concerns with Production outsourcing

Outsourcing brings a loss of product control, dilutes/eliminates brand integrity, and opens the door to product recalls

Concerns with R&D outsourcing

Firms that outsource R&D indicate that their most significant problem is loss of intellectual property. Brand identity is also difficult to maintain when there is IP loss.

RESEARCH QUESTIONS

1. In spite of the efficiencies, outsourcing is not favored by all companies. What explains this aversion to outsource among FB companies ?
2. If a company wishes to outsource production and /or R&D, then how should it design an efficient contract that would reduce cost and protect its IP ?

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Model Development: Outsourcing

- A company (Principal) can either do the production / R&D tasks in-house , or may outsource the tasks to an Agent through contracts.

$t=0$
P offers R&D contract,
A accepts or rejects

$\{(C_L, T_H), (C_H, T_L)\}$ and Penalty for breach of contract is β

$t=1$
P decides how much
IP to share with A

$1-e \geq k \geq 0$, incur cost of sharing knowledge $h(k)$

A decides whether to misappropriate IP
and set up a competing firm,
Or
continue with
Contractual relationship with the P

$$E\pi_A^{contract} = (e+k)(T_H) + (1-e-k)(T_L) - \frac{1}{2}e^2 \geq \psi(k) \equiv E\pi_A^{piracy}$$

Participation Constraint of Agent [1]

$t=2$
A exerts effort to produce R&D

$$e \in [0,1] \text{ at } c(e) = \frac{1}{2}e^2$$

R&D result is uncertain

$$Cost = \begin{cases} C_L & \text{with probability } p(e,k) \\ C_H & \text{with probability } 1-p(e,k) \end{cases}$$

$t=3$
Contractual terms realized :
payments made according to quality
of R&D produced

$$E\pi_p^{contract} = (e+k) \left(\frac{1}{4} - C_L - T_H \right) + (1-e-k) \left(\frac{1}{4} - C_H - T_L \right) - h(k) \quad [2]$$

Or
Duopoly competition with Pirate firm

$$p_i = (1 - q_i - \theta q_j) \Rightarrow \begin{cases} E\pi_A^{piracy} = \psi(k) = \frac{1}{(2+\theta)^2} + \frac{(C_H - C_L)^2}{2} + (C_H - C_L)k - C_H - \beta \\ \theta \in [0,1] \end{cases} \quad [3]$$

$$E\pi_p^{piracy} = \frac{1}{(2+\theta)^2} - C_H - h(k) + \beta \quad [4]$$

Important Observations

- Expected profits depend on IP shared (k) by the Principal
- Agent’s outside option $\psi(k)$ is endogenous

First Best Solution: Effort is observable

- Maximize [2] subject to [1]

$$k^{FB} = \frac{1}{2} \quad E\pi_p^{FB} = \beta + \frac{1}{2} - \frac{1}{(2+\theta)^2}$$

$$e^{FB} = C_H - C_L$$

$$T_H^{FB} = T_L^{FB} = T^{FB} = \frac{1}{(2+\theta)^2} - \frac{C_H + C_L}{2} + (C_H - C_L)^2 - \beta \quad E\pi_A^{FB} \equiv \psi(k^{FB}) = \frac{1}{(2+\theta)^2} - \frac{C_H + C_L}{2} + \frac{(C_H - C_L)^2}{2} - \beta$$

The optimal contract payment to the agent must be equal to cost of effort plus the outside option

Second Best Solution: Effort is unobservable

- Maximize [2] subject to [1] and

Incentive Compatibility Constraint: $\arg \max_e E\pi_A^{contract} = (e+k)(T_H) + (1-e-k)(T_L) - \frac{1}{2}e^2 \quad [5]$

$$T_H^{SB} = \frac{1}{(2+\theta)^2} - C_L - \beta > T_L^{SB} = \frac{1}{(2+\theta)^2} - C_H - \beta \quad k^{FB} = k^{SB} \quad e^{FB} = e^{SB}$$

When effort is unobservable, the optimal contract payment should be contingent upon R&D result

In-House Approach

- If tasks are done in-house then the Principal would have higher control over production/ R&D.
- Higher control entails higher cost compared to outsourcing.

$$\pi_p^{in-house} = S(q) - C_H = \frac{1}{4} - C_H \quad [6]$$

$$Loss \text{ from piracy} = \pi_p^{inhouse} - E\pi_p^{piracy} = (C_H - C_L) - \beta - \frac{1}{(2+\theta)^2} \quad [7]$$

Loss from piracy would be large if θ is high
low if θ is low

In order to reduce the loss from piracy, companies ought to invest in assets that would reduce θ .

Product differentiation is one such effective strategy.

Produce differentiated product , charge a premium price and sustain an IP theft problem

For Food and Beverage products, the degree of substitutability can be very high.

Therefore our theory suggests that in-house R&D is preferred. This answers our Research Question 1

Strategies to protect Intellectual Property

KEY IDEA: How to reduce the attractiveness of the outside option of the Agent ?

$$\frac{\partial \psi(k)}{\partial k} = C_H - C_L > 0 \quad \text{Company must share less IP with the contract Agent to begin with}$$

$$\frac{\partial \psi(k)}{\partial \beta} < 0 \quad \text{Tasks should be outsourced to regions where legal protection is strong}$$

Companies that outsource and yet protect their brands successfully can do so because of proper management of their contract manufacturers.

Our model suggests that contract Agent must be paid incentive payments so that IP theft can be avoided.

While this is the first line of defense, we argue that the Principal must also invest in product differentiation and customer loyalty.

This answers our Research Question 2.

Conclusions and Suggestions

- ✓ Legal protections may not be enough to protect IP. Hence companies that are willing to outsource operations to contract agents must take appropriate measures to protect their IP.

- ✓ What can companies do in order to mitigate risks of IP loss while outsourcing?

- Share only adequate level of proprietary knowledge with vendors.
- Companies may invest in product-differentiation and brand loyalty