Modeling and Optimizing the Motivation of Workers and Managers for Knowledge-Sharing: A Game-Theoretic Analysis

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http://www.nps.edu/Academics/Centers/CEP/
"Ralph is doing a preliminary study of re-inventing the wheel."
• What are the drivers of knowledge sharing behaviors in organizations?

• What new knowledge taxonomy can be derived from the model of knowledge sharing dynamics and how can we identify and manage different kinds of knowledge?

• What are the model’s implications for the design of knowledge management systems and organizations?
Points of Departure

• Tacit & Explicit knowledge (Nonaka 1994)
Points of Departure

- Knowledge inertia (Nissen 2006)
Points of Departure

- Game tree (Ho et al. 2006)
  - Interaction b/w firm and employee is modeled

![Game tree diagram](attachment:image.png)
Points of Departure

- Knowledge taxonomy (Ho et al. 2009)
  - Core vs. Non-core knowledge

<table>
<thead>
<tr>
<th>Employee's explicit sharing cost, $\gamma_1$</th>
<th>Low $\gamma_1$</th>
<th>High $\gamma_1$</th>
</tr>
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<tbody>
<tr>
<td>Low $\gamma_2$, Simple Knowledge</td>
<td></td>
<td></td>
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<tr>
<td>High $\gamma_2$, Spurious Knowledge</td>
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<td>High $\pi$</td>
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Value to firm, $\pi$

- Low $\pi$
- High $\pi$
Research Design

Ethnographic interviews/ Grounded theory (Eisenhardt 1989) → Game-theoretic model development /Analysis → Implications
<table>
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<tr>
<th></th>
<th>Company A</th>
<th>Company B</th>
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<tbody>
<tr>
<td><strong>Industry</strong></td>
<td>Construction</td>
<td>Construction</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>36,000+</td>
<td>1,000+</td>
</tr>
<tr>
<td><strong>Communities are aligned with</strong></td>
<td>Individual's expertise</td>
<td>Job placement</td>
</tr>
<tr>
<td><strong>Cross-department KS</strong></td>
<td>More</td>
<td>Less</td>
</tr>
<tr>
<td><strong>Company-wide KM system?</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>KS Reward mechanism?</strong></td>
<td>Yes (mostly reputation-related)</td>
<td>No</td>
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</table>
Ethnographic Interviews

- Cost & benefit of knowledge sharing

**Individual-related**
- Benefit from self, $B_{es}$
- Benefit from others, $B_{eo}$
- Time spent & the possibility of losing jobs, $C$
- Self-satisfaction, $A$

**Community-related**
- Social reward, $R_1$
- Social punishment, $R_2$
Model Development and Analysis

- Study subject: Interaction b/w employees
- Analysis tool: Game Theory
  - Nash Equilibrium
  - Type of game
  - Backward Induction
Model Development and Analysis

Player 1

Share

Player 2

Share

\( (B_{es} + B_{eo} - C + R_1 + A, \ B_{es} + B_{eo} - C + R_1 + A) \)

No

\( (B_{es} - C + R_1 + A, \ B_{eo} - R_2) \)

Player 2

Share

\( (B_{eo} - R_2, \ B_{es} - C + R_1 + A) \)

No

(0, 0)
• Contingencies:
  — Company size & Core knowledge type

- Company size
- Core knowledge type
- Cost of KS per employee
- Benefit to knowledge contributors
Model Development and Analysis

Contingencies:
—Company size & Core knowledge type

Contingencies:
—Company size & Core knowledge type

Company A

Company B
Preliminary Results

Explicit, Large] Company A

Share, Share] if $B_{es} - C + R_{1} + A > -R_{2}$

- strong social punishment (large $R_{2}$)

[No, No] if $0 > -R_{2} > B_{es} - C + R_{1} + A$

- small perceived benefit from KS (small $B_{es}$)
- weak social reward (small $R_{1}$)
- low level of self-actualization (small $A$)
Preliminary Results

Tacit, Small] Company B

Share, Share] if
- $B_{es} - C + R_1 + A > - B_{eo}$

- strong social punishment (large $R_2$)
- difficulties to understand KS without interaction (small $B_{eo}$)

[No, No] if
- $- B_{eo} > B_{es} - C + R_1 + A > - R_2$

- high KS cost (large $C$)
- weak social reward (small $R_1$)
- low level of self-actualization (small $A$)
Applications in Practice

Compare associated conditions of NEs
Determine the desired direction
Applications in Practice

Explicit, Large] Company A

Share, Share] if $B_{es} - C + R_1 + A > -R_2$

- strong social punishment (large $R_2$)

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- low level of self-actualization (small $A$)
Applications in Practice

Compare associated conditions of NEs
Determine the desired direction

Identify manipulable variables
(note: not all variables can be manipulated)
Applications in Practice

Explicit, Large] Company A

Share, Share] if
\[ B_{es} - C + R_1 + A > -R_2 \]

- strong social punishment (large \( R_2 \))

[No, No] if
\[ 0 > -R_2 > B_{es} - C + R_1 + A \]

- small perceived benefit from KS (small \( B_{es} \))
- weak social reward (small \( R_1 \))
- low level of self-actualization (small \( A \))
Applications in Practice

Compare associated conditions of NEs
Determine the desired direction

Identify manipulable variables

Develop KM strategies
Applications in Practice

What can managers do?

- Benefit from self, $B_{es}$
  - Education/training

- Self-actualization, $A$
  - Seek high achievers

- Social reward & punishment, $R_1$ & $R_2$
  - Strengthen KS culture: CoPs, SME, competition
## Preliminary Results

### Expected causes and findings

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<th>Behavior</th>
<th>Expected causes</th>
<th>Found?</th>
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Progress on the way

Tacit, Large] & [Explicit, Small] companies
Thank you!
Questions & Comments

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