AN INTEGRATED MODEL FOR EXPLORING THE ANTECEDENTS OF SOFTWARE PROCESS IMPROVEMENT SUCCESS

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Knowledge issues in SPI

- SPI often requires external knowledge, e.g. process reference models such as CMMI, ISO, etc., or implementation know-how from external sources.

- SPI is commonly recognized as an organizational learning process (Dyba, 2005), because firms implementing SPI not only need to acquire external SPI-related knowledge or experiences, but also require employees to internalize these lessons.

External knowledge issue

- External knowledge issue: the firm acquires SPI external knowledge to improve the processes without an effective learning process of acquiring and assimilating the external knowledge to fit a firm's SPI needs under its dynamic IT/IS environments.
- Internal knowledge issue: when a firm's acquired SPI external knowledge or existing knowledge of software development are utilized without the learning ability of using/reusing and proper tailoring in improving processes, resulting in a failure to achieve and sustain the expected SPI goals.
- SPI success: overcoming of external and internal knowledge issues

Organizational learning (OL)

- Organizational learning (OL) is concerned with the organization's ability to create new knowledge and transfer it to where is needed.
- Organizational learning (March, 1991; Dyba, 2005)
  - Exploration (探索學習) emphasizes the experimentation with new alternatives and the acquisition of new knowledge.
  - Exploitation (利用學習) focuses on the refinement and extension of existing knowledge.

Absorptive capacity (AC)

- Absorptive capacity is recognized as a firm's ability to learn from external knowledge through the processes of knowledge identification, assimilation and use (Cohen and Levinthal, 1990).
- AC enables the firm to acquire, internalize, and use or apply external knowledge effectively.
- The roles of AC and OL and their contextual relationship

Knowledge sharing (KS)

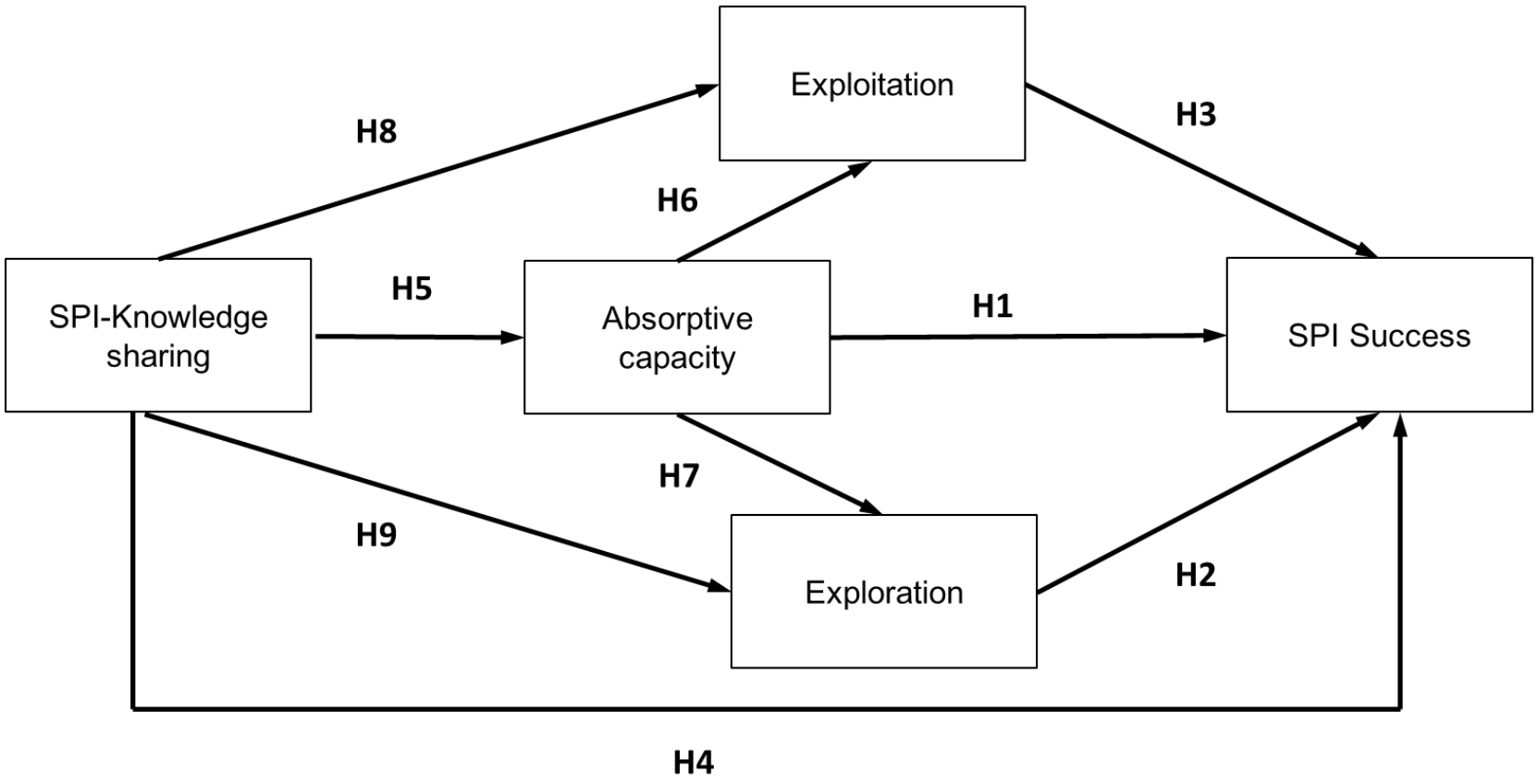
- In SPI where teamwork is intensively involved, knowledge sharing is particularly important (Slaughter & Kirsch, 2006).
- KS significantly helps software processes to be more effective (Meehan & Richardson, 2002; Feher & Gabor, 2006).
- Through KS, the firm gains a better understanding of knowledge in acquiring and creating new useful knowledge and this increase its learning ability (Volberda et al., 2010).

Research Questions

- How do exploration/exploitation and absorptive capacity impact SPI success?

- How does knowledge sharing affect absorptive capacity , exploration/exploitation on the way to SPI success?

Research model



The proposed hypotheses

Hypothesis	Path
H1	Absorptive capacity has a positive influence on SPI success.
H2	Exploration has a positive influence on SPI success.
H3	Exploitation has a positive influence on SPI success.
H4	Knowledge sharing has a positive influence on SPI success.
H5	Knowledge sharing has a positive influence on absorptive capacity.
H6	Absorptive capacity has a positive influence on exploitation.
H7	Absorptive capacity has a positive influence on exploration.
H8	Knowledge sharing has a positive influence on exploitation.
H9	Knowledge sharing has a positive influence on exploration.

Data Collection and Sample

- 163 samples from 56 SPI certified firms
  - The target population was 385 managers and practitioners who are familiar with the topic of this study and directly participate in CMMI implementation work and are willing to answer the questionnaire of 56 CMMI-certified firms.
  - 163/385 =0. 423 response rate
  - All CMMI-certified organizations are recognized and cited the CMMI institute
  - A mail survey was carried out on the sample.

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Results

Table 10. The test results of the proposed hypotheses.

Hypothesis	Path	Result
H1	Absorptive capacity has a positive influence on SPI success.	Accepted
H2	Exploration has a positive influence on SPI success.	Accepted
H3	Exploitation has a positive influence on SPI success.	Accepted
H4	Knowledge sharing has a positive influence on SPI success.	Accepted
H5	Knowledge sharing has a positive influence on absorptive capacity.	Accepted
H6	Absorptive capacity has a positive influence on exploitation.	Accepted
H7	Absorptive capacity has a positive influence on exploration.	Accepted
H8	Knowledge sharing has a positive influence on exploitation.	Accepted
H9	Knowledge sharing has a positive influence on exploration.	Not supported

Theoretical implications

- This study has defined two knowledge issues in the context of SPI implementation.
  - External knowledge issue
  - Internal knowledge issue
- Strengthening SPI knowledge sharing significantly enhances a firm's absorptive capacity, which leads to SPI success.

Theoretical implications

- According to dynamic capability view, AC facilitates firms to be receptive of external valuable SPI knowledge in stimulating improvement opportunities that burst due to the dynamic needs under the changing business environments.
- AC can boost and stimulate organizational learning through superior exploration and exploitation that leads to SPI success.
  - Dynamic capability can motivate organizational learning

Theoretical implications

- Knowledge sharing has a relatively weak positive influence on exploitation (H8).
- KS has insignificant influence on exploration (not supporting H9).
- One possible explanation may link to the issue of the network range theory (Burt, 2009; Reagans & McEvily, 2003)
  - Organizational knowledge boundary
  - Knowledge pool

Practical implications

- Process Asset Library (PAL) is a knowledge repository used to store and make available all the process assets that are useful and sharable to those who define, implement, and manage processes in the organization.
- PAL offers certain advantages, such as
  - Effective transfer of software process knowledge
  - Storing software engineering best practice, reduced documentation
  - Institutionalization of improved processes
  - Fostering of a knowledge-sharing culture

Limitations and Further Research

- Since CMMI samples were collected from Taiwanese firms, the findings of this study possibly lacks generalizability.
- SPI programs include not only CMMI but also other standard SPI programs, for instance, the ISO SPICE model, the ISO9000 series, QIP, etc. Further studies could replicate and enrich this empirical study by examining other SPI programs.

Conclusion

- Based on organizational learning theory and dynamic capability view, this study develops a theoretical model of CMMI-based SPI success.
- The results show that absorptive capacity not only triggers exploration and exploitation but also is a key factor for SPI success.
- Furthermore, this study demonstrates that SPI success depends on firms' knowledge sharing activities and that this relationship is mediated by firms' absorptive capacity.