

The Factors Affecting Partnership Quality of Information Systems Outsourcing of PACS for Hospital

Yi-Horng Lai

Department of Health Care Administration, Oriental Institute of Technology
New Taipei City, Taiwan
Email: FL006 {at} mail.oit.edu.tw

ABSTRACT—*The purpose of this research is to investigate the determinants of outsourcing partnership between clients and providers in outsourcing projects. Furthermore, the relationship between the quality of outsourcing partnership and the success of outsourcing was also investigated in this research. Survey methodology was utilized, and the subjects were the medical centers that involved in PACS projects in Taiwan. A total of 97 valid questionnaires were collected. The collected data was analyzed by the partial least squares to test related hypotheses. The results indicated that shared knowledge is positively associated with mutual benefits, mutual dependency is positively associated with mutual benefits, mutual dependency is positively associated with commitment, mutual dependency is positively associated with predisposition, organizational linkage is positively associated with commitment, organizational linkage is positively associated with predisposition, and commitment is positively associated with outsourcing success.*

Keywords— Outsourcing, picture archiving and communication Systems (PACS), the partial least squares (PLS)

1. INTRODUCTION

The outsourcing was the contracting out of a business process to a third-party. Outsourcing sometimes involves transferring employees and assets from one firm to another, but not always. Outsourcing was also used to describe the practice of handing over control of public services to for-profit corporations. Outsourcing includes both foreign and domestic contracting, and sometimes includes offshoring or relocating a business function to another country. Financial savings from lower international labor rates is a big motivation for outsourcing. The opposite of outsourcing is called insourcing, which entails bringing processes handled by third-party firms in-house, and is sometimes accomplished via vertical integration. However, a business can provide a contract service to another business without necessarily insourcing that business process.

The innovative revolution that has swept through the world of information technology over the last decade has had a profound impact on radiology departments in medical facilities all across the nation. By adopting everything from electronic medical records (EMRs) all the way to picture archiving and communications systems (PACS), medical facilities of every description have seen the efficiency and accuracy of their radiology department's release of information (ROI) processes reach levels that were deemed impossible only a few short years ago [1].

These years, many organizations which had chosen to wait and gauge the results of these developments have also become convinced of the ability of these changes to transform their own radiology release of information procedures. For many facilities already feeling overstretched, their only question is how to transition to a viable outsourced PACS radiology release of information solution that works for them [2].

1.1 Picture Archiving and Communication System

The picture archiving and communication system (PACS) was a medical imaging technology which provides economical storage of and suitable access to, images from clinic machine or client. Electronic images and reports are transmitted digitally through PACS; this eliminates the need to manually file. The common format for PACS image storage and transfer is Digital Imaging and Communications in Medicine (DICOM). The PACS consists of four major components: The imaging modalities such as X-ray plain film, computed tomography (CT), and magnetic resonance imaging (MRI), workstations for interpreting and reviewing images, and archives for the storage and retrieval of images and reports. United with available and emerging web technology, PACS has the ability to deliver timely and efficient

access to images, interpretations, and related data [2].

1.2 The Causal Model of an Outsourcing Partnership

One important study of partnership relationships was by Abdul-Halim, Ee, Ramayah, and Ahmad [3]. They aim at examining the role of service quality in strengthening the relationship between partnership quality and human resource outsourcing success. The results of their study showed that partnership quality variables such as trust, business understanding, and communication had significant positive impact on human resource outsourcing success, whereas in general, service quality was found to partially moderate these relationships.

Teo and Bhattacharjee developed a nomological network of antecedents and outcomes of knowledge transfer and utilization in IT outsourcing relationships [4]. The result of their study showed that the characteristics of outsourcing clients, vendors, and knowledge transferred played important roles in facilitating knowledge transfer; the transferred knowledge in conjunction with the knowledge integration mechanisms affected knowledge utilization in client-firms, and that this made significant operational and strategic performance gains in information technology processes.

In Lee and Kim's study, premises that a proposed model consists of three major parts: behavioral variables, psychological variables, and outsourcing success [5].

To find appropriate variables to describe Lee and Kim's model, partnership-related variables that include mutual benefits, commitment, predisposition, shared knowledge, mutual dependency, and organizational linkage were first identified from the related literature in terms of the social exchange theory, which has been applied to the study of outsourcing partnerships [6].

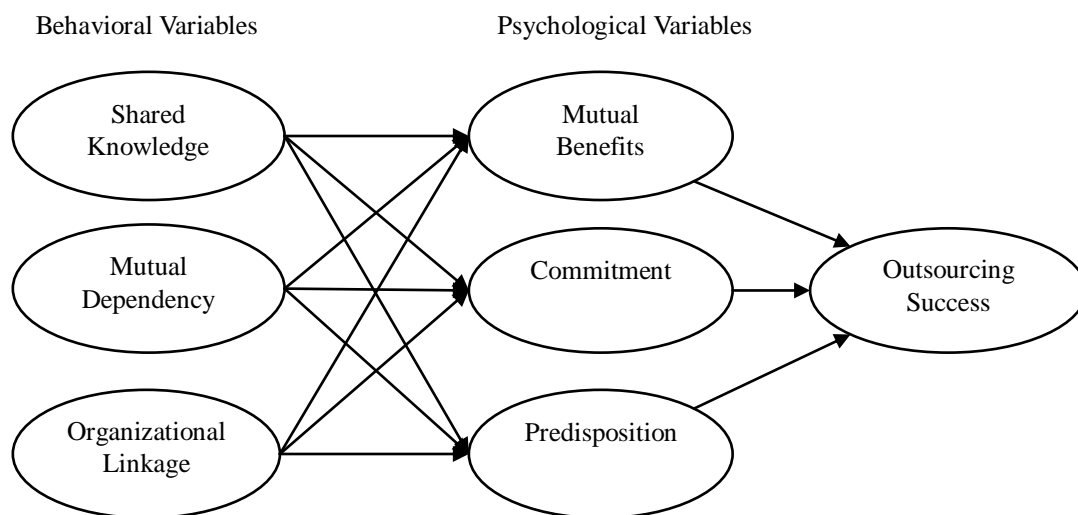


Figure 1: The Causal Model of an Outsourcing Partnership

Many researchers have considered mutual benefit [7], commitment [8], and predisposition [9] as basic variables, which play an important role as intervening variables between behavioral variables and the success of outsourcing. From the previous study, it could be found that shared knowledge [9, 10], mutual dependency [11, 12], and organizational linkage [13] have been considered important factors for the success of outsourcing. According to Park and Lee's study [12], these variables represent the behavioral constructs to create the working relationship rather than to establish the partners' belief in the partnership's sustainability. This indicates that they should be considered as antecedents of the psychological variables.

1.2.1 Mutual Benefits

Schwarz [7] indicate that while clients still seek financial benefits, they also seek a mutually beneficial relationship. This focus on mutual benefits exemplifies the transformation toward the development of a partnership. The new outsourcing arrangement more closely typifies a relationship than a contractual transaction. Because this change has occurred, it becomes necessary to incorporate into our success factors the dimensions that emblemize this shift. For example, flexibility is necessary in a relationship, and outsourcing partners have realized that to be successful, the arrangement should allow the flexibility to accommodate changing circumstances and needs.

1.2.2 Commitment

The human resource practice of training outsourcing has emerged as one of the fastest growing segments of the broader business process outsourcing industry. In spite of the growing popularity in professional practice, training outsourcing continues to be subjected to critical review and ongoing debate with most attention focused on the decision to outsource or not. However, there was a shortage of research on training outsourcing as a human resource development practice and the potential relationships with desired organizational outcomes including employee commitment. Chaudhuri and Bartlett point out that those positive relationships between specific measures of employee perceptions of quality, usefulness and supervisor support for outsourced training with organizational commitment [8].

1.2.3 Predisposition

Francois, Isis, Sergio, and Luis integrated inter-organizational factors, such as trust, knowledge sharing, and quality of outsourcing interfaces in the model [9], and they point out that predisposition play an important role in the relationships in the information system outsourcing in the organization.

1.2.4 Shared Knowledge

Donga and Pourmohamadi focus on innovation matchmaking by online innovation intermediaries that operate as technology outsourcing services [10]. They identify several challenges open innovation intermediaries, employers, and providers face: structuring knowledge to identify providers who can provide solutions beyond the immediate exigencies of the problem, choosing a provider among many potential matches, and choosing an online innovation intermediary when several suitable alternatives exist.

Francois, Isis, Sergio, and Luis integrated inter-organizational factors, such as trust, knowledge sharing, and quality of outsourcing interfaces in the model [9], and they point out that knowledge sharing play an important role in the relationships in the information system outsourcing in the organization.

1.2.5 Mutual Dependency

Realization of benefits may in turn inspire both the service recipient and the service provider to actively engage in further development of mutual dependency to gain further from their mutually beneficial outsourcing relationship. So, Goo, Kishore, Rao, and Nam indicated that foundation characteristics of specific characteristics of service level agreements positively influence mutual dependence [11].

1.2.6 Organizational Linkage

Rajagopal, Zailani, and Sulaiman indicated that firms appear to confirm a positive and significant relationship between the degree of resource sharing and organizational linkage, if they see that scalable partnering efforts as hypothesized are workable [13].

2. METHODOLOGY

With the causal model of an outsourcing partnership, Figure 2 was the summarize the research framework of this study in a model in which shared knowledge (SK), mutual dependency (MD), organizational linkage (OL), mutual benefits (MB), commitment (CM), predisposition (PD), and outsourcing success (OS). The outsourcing success variable includes business perspective, credibility, correlation, correctness, timeliness, integrity, and instant.

The hypothesis in this study were as:

H1: Shared knowledge is positively associated with mutual benefits.

H2: Shared knowledge is positively associated with commitment.

H3: Shared knowledge is positively associated with predisposition.

H4: Mutual dependency is positively associated with mutual benefits.

H5: Mutual dependency is positively associated with commitment.

H6: Mutual dependency is positively associated with predisposition.

H7: Organizational linkage is positively associated with mutual benefits.

H8: Organizational linkage is positively associated with commitment.

H9: Organizational linkage is positively associated with predisposition.

H10: Mutual benefits is positively associated with outsourcing success.

H11: Commitment is positively associated with outsourcing success.

H12: Predisposition is positively associated with outsourcing success.

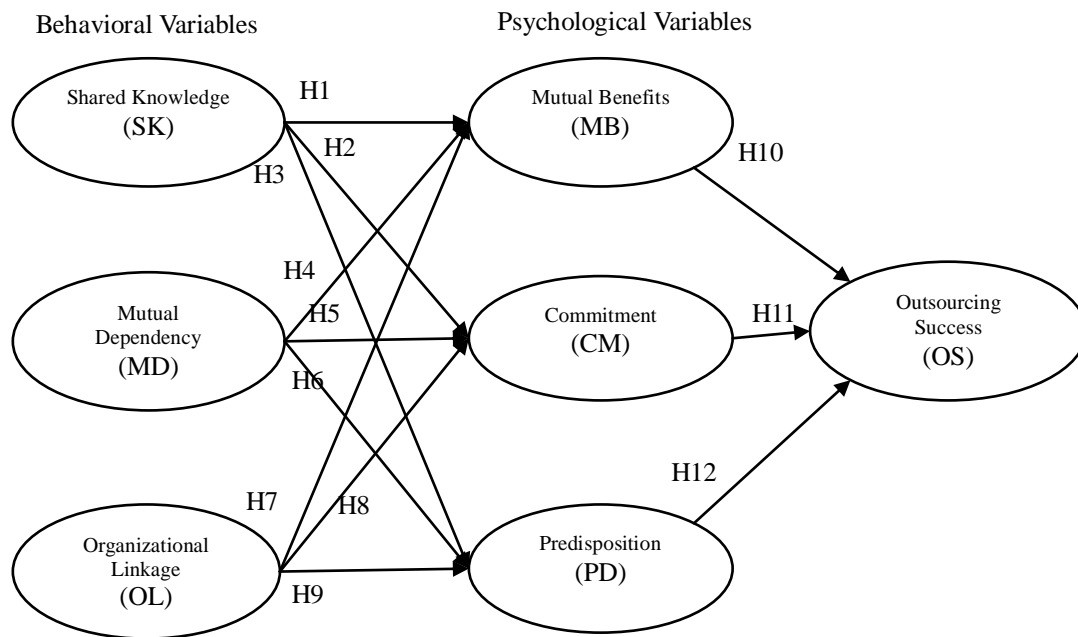


Figure 2: Research Framework

2.1 Research Data

The research data was got from Hwang’s study [14] in the Survey Research Data Archive (SRDA) provided by the Academia Sinica in Taiwan. Wu’s study was finished in November 30, 2009, and built the data of “A Comparative Study of Outsourcing Partnership between Medical and Banking Industries”. The research data was parts of this database. The purpose of Hwang’s study [14] was to investigate the determinants of outsourcing partnership between clients and providers in outsourcing projects. This study focus on the organization that work with outsourcing information in healthcare organizations and banks. For healthcare organizations, a total of 147 valid questionnaires were collected. For bank, a total of 49 valid questionnaires were collected. This study focuses on these data that feedback by medical center with outsourcing PACS.

2.2 Methodology

This study was developed in a way that the model constructs in the causal model of an outsourcing partnership were adapted to the context of using the picture archiving and communication system (PACS). Scale items on the survey include those shared knowledge (SK), mutual dependency (MD), organizational linkage (OL), mutual benefits (MB), commitment (CM), predisposition (PD), outsourcing success (OS) - business perspective, outsourcing success (OS) - credibility, outsourcing success (OS) - correlation, outsourcing success (OS) - correctness, outsourcing success (OS) - timeliness, outsourcing success (OS) - integrity, and outsourcing success (OS) - instant. The questionnaire contains no identifying information about the individual participants. All variables exhibit a high level of reliability with the Cronbach’s alpha values (Table 1) exceeding the recommended 0.6 [15].

Table 1: Scale reliability

| Scale | N of Items | Mean | S.D. | Cornbach’s α | Composite Reliability |
|-------------------------|------------|------|------|---------------------|-----------------------|
| SK | 3 | 3.71 | .42 | .91 | .95 |
| MD | 2 | 3.86 | .56 | .88 | .94 |
| OL | 3 | 3.79 | .43 | .97 | .98 |
| MB | 2 | 3.85 | .59 | .90 | .95 |
| CM | 3 | 3.68 | .40 | .73 | .86 |
| PD | 3 | 3.70 | .54 | .89 | .93 |
| OS-Business Perspective | 9 | 3.72 | .56 | .95 | - |
| OS-Credibility | 5 | 3.98 | .44 | .93 | - |
| OS-Correlation | 5 | 4.17 | .50 | .94 | - |
| OS-Correctness | 5 | 4.19 | .45 | .95 | - |

| | | | | | |
|---------------|---|------|-----|-----|---|
| OS-Timeliness | 5 | 4.17 | .40 | .93 | - |
| OS-Integrity | 6 | 4.14 | .39 | .98 | - |
| OS-Instant | 5 | 4.13 | .42 | .93 | - |

The structural model is investigated using SmartPLS 3.1.3. Path analysis was performed on the model using standardized maximum likelihood estimation. The path analytic method offers the advantage of testing the overall model fit with multiple endogenous variables as in the model as well as individual a priori hypotheses.

The result of correlation coefficient was as Table 2. It could be find that those square of AVE were between .81 and .97. They are larger than most of other ration in the table.

Table 2: Results of correlation coefficient

| | SK | MD | OL | MB | CM | PD | OS |
|----|------|------|------|------|------|------|-----|
| SK | .92 | | | | | | |
| MD | .23* | .94 | | | | | |
| OL | .51* | .04 | .97 | | | | |
| MB | .20 | .24* | .17 | .95 | | | |
| CM | .38* | .36* | .38* | .36* | .81 | | |
| PD | .27* | .26* | .43* | .35* | .59* | .91 | |
| OS | .56* | .41* | .48* | .40* | .57* | .37* | .85 |

*: P-value<.05

3. RESULTS

A total of 97 feedbacks by medical center with outsourcing PACS were in this study. Some basic demographic information is collected, indicating approximately 54 male (55.67%) and 43 female (44.33%) in the sample population. Most of them were under 31~40 years old (59; 60.82%) (Table 3), and most of them of the experience of using PACS were 4~6 years (54; 55.67%).

Table 3: Data summarize

| Variable | | Frequency | Percent (%) |
|--------------------------|--------|-----------|-------------|
| Gender | Male | 54 | 55.67 |
| | Female | 43 | 44.33 |
| Age | ~30 | 22 | 22.68 |
| | 31~40 | 59 | 60.82 |
| | 41~50 | 13 | 13.40 |
| | 51~ | 3 | 3.10 |
| Seniority | ~5 | 30 | 30.93 |
| | 6~10 | 36 | 37.11 |
| | 11~15 | 17 | 17.53 |
| | 16~ | 14 | 14.43 |
| Experience of PACS Using | 1~3 | 25 | 25.77 |
| | 4~6 | 54 | 55.67 |
| | 7~9 | 12 | 12.37 |
| | 10~ | 6 | 6.19 |
| Total | | 97 | 100.00 |

3.1 Structural equation model

Correlations among the variables are illustrated in Figure 3 and Figure 4. This model explains .41 of the factor of outsourcing success (R square) by mutual benefits, commitment, and predisposition. This model explains .09 of the factor of mutual benefits (R square) by shared knowledge, mutual dependency (Figure 5), and organizational linkage. This model explains .29 of the factor of commitment (R square) by shared knowledge, mutual dependency, and organizational linkage. This model explains .25 of the factor of predisposition (R square) by shared knowledge, mutual dependency, and organizational linkage. About the model fit, Standardized root mean square residual (SRMR) of this model is .06.

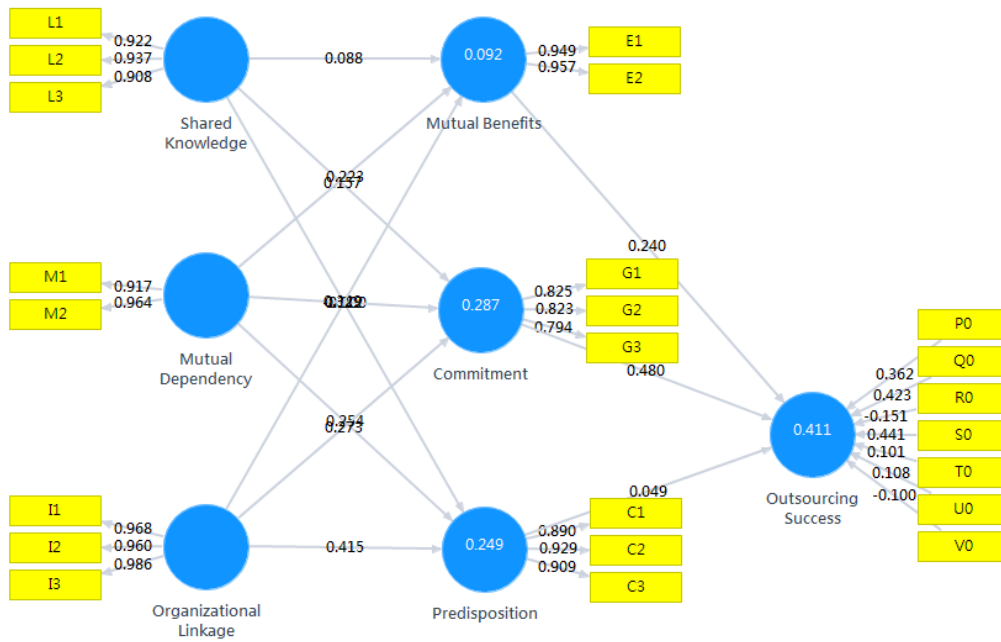


Figure 3: Structural model with inter-construct correlations

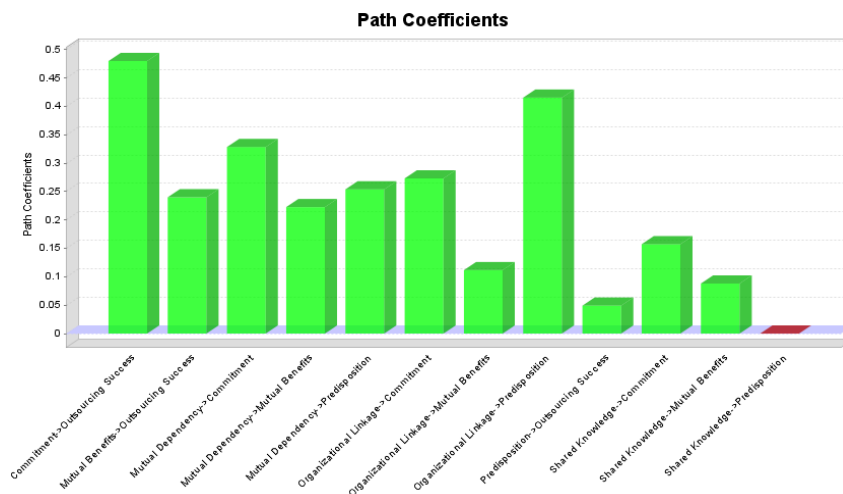


Figure 4: The path coefficients of this study

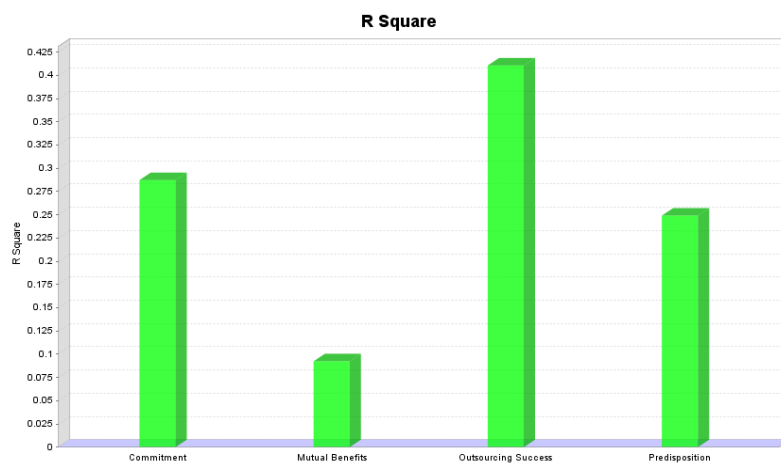


Figure 5: The R square of the research model

The result of hypothesis testing in this study was as Table 4. Shared knowledge is positively associated with mutual benefits. Mutual dependency is positively associated with mutual benefits. Mutual dependency is positively associated

with commitment. Mutual dependency is positively associated with predisposition. Organizational linkage is positively associated with commitment. Organizational linkage is positively associated with predisposition. Commitment is positively associated with outsourcing success.

Table 4: Results of hypothesis testing

| | Path | Estimate | S.E. | t-value | P-Value |
|-----|---------|----------|------|---------|---------|
| H1 | SK → MB | .09* | .13 | 3.64 | <.01 |
| H2 | SK → CM | .16 | .10 | 1.66 | .10 |
| H3 | SK → PD | .01 | .12 | .01 | .99 |
| H4 | MD → MB | .22* | .11 | 1.96 | .04 |
| H5 | MD → CM | .33* | .09 | 3.55 | <.01 |
| H6 | MD → PD | .25* | .11 | 2.43 | .02 |
| H7 | OL → MB | .11 | .13 | .89 | .38 |
| H8 | OL → CM | .27* | .13 | 2.13 | .03 |
| H9 | OL → PD | .42* | .12 | 3.55 | <.01 |
| H10 | MB → OS | .24 | .13 | 1.91 | .06 |
| H11 | CM → OS | .48* | .13 | 3.64 | <.01 |
| H12 | PD → OS | .05 | .16 | .32 | .75 |

*: P-value<.05

4. CONCLUSION

Findings of this study provide evidence that the causal model of an outsourcing partnership was an applicable model in examining partnership influencing the success of outsourcing.

In this study, it could be finding that commitment is positive with outsourcing success, and this result the same as Chaudhuri and Bartlett’s study [8]. Shared knowledge is positive with mutual benefits, and this result the same as Donga and Pourmohamadi’s study [10]. Mutual dependency is positive with mutual benefits, and this result same as Goo, Kishore, Rao, and Nam’s study [11]. Mutual dependency is positive with commitment. Organizational linkage is positive with commitment. Mutual dependency is positive with predisposition. Organizational linkage is positive with predisposition.

Due to high hospital information system usage, PECS had become necessary tools in the healthcare administration, and it is time to make use of clinic system for providing patient service. Based on the advantages of outsourcing, this study considers that it is sufficiently reliable and powerful to build PACS and improve the quality of patient service. In order to increase healthcare service quality, more and more hospital has implemented PACS with outsourcing in Taiwan. The process of PACS with outsourcing was conducted by the relationship with PACS with outsourcing provider.

5. ACKNOWLEDGEMENT

This study is based in part on data from the Survey Research Data Archive (SRDA) provided by the Academia Sinica. The interpretation and conclusions contained herein do not represent those of Survey Research Data Archive (SRDA) or Academia Sinica.

6. REFERENCES

- [1] Tavakol, P., Labruto, F., Bergstrand, L., & Blomqvist, L. “Effects of Outsourcing Magnetic Resonance Examinations from a Public University Hospital to a Private Agent”. *Acta Radiol*, vol. 52, no. 1, pp. 81-85, 2011.
- [2] Bellon, E., Feron, M., Deprez, T., Reynders, R., & Bosch, B. V. “Trends in PACS Architecture”, *European Journal of Radiology*, vol. 78, no. 2, pp. 199-204, 2011.
- [3] Abdul-Halim, H., Ee, E., Ramayah, T., & Ahmad, N. H. “Human Resource Outsourcing Success Leveraging on Partnership and Service Quality”, *SAGE Open*, vol. 4, no. 3, pp. 1-14, 2014.
- [4] Teo, T. S. H., & Bhattacharjee, A. “Knowledge Transfer and Utilization in IT Outsourcing Partnerships: A Preliminary Model of Antecedents and Outcomes”, *Information and Management*, vol. 51, no. 2, pp. 177-186, 2014.
- [5] Lee, J. N. & Kim, Y. G. “Exploring a Causal Model for the Understanding of Outsourcing Partnership”, *Proceedings of the 36th Hawaii International Conference on System Sciences*, 2002.
- [6] Lee, J. N. & Kim, Y. G. “Understanding Outsourcing Partnership: A Comparison of Three Theoretical Perspectives”, *IEEE Transactions on Engineering Management*, vol. 52, no. 1, pp. 43-58, 2005.
- [7] Schwarz, C. “Toward An Understanding of the Nature and Conceptualization of Outsourcing Success”, *Information and Management*, vol. 51, no. 1, pp. 152-164, 2014.
- [8] Chaudhuri, S., & Bartlett, K. R. “The Relationship between Training Outsourcing and Employee Commitment to Organization”, *Human Resource Development International*, vol. 17, no. 2, pp. 145-163, 2014.
- [9] Francois, D., Isis, G. M., Sergio, P. V., & Luis, F. L. R. “IT Outsourcing In the Public Sector: A Conceptual Model. Transforming Government: People”, *Process and Policy*, vol. 8, no. 1, pp. 8-27, 2014.
- [10] Dong, A., & Pourmohamadi, M. “Knowledge Matching In the Technology Outsourcing Context of Online Innovation Intermediaries”, *Technology Analysis and Strategic Management*, vol. 26, no. 6, pp. 655-668, 2014.

- [11] Goo, J., Kishore, R., Rao, H. R., & Nam, K. “The Role of Service Level Agreements in Relational Management of Information Technology Outsourcing: An Empirical Study”, *MIS Quarterly*, vol. 33, no. 1, pp. 115-149, 2009.
- [12] Park, J. G. & Lee, J. “Knowledge Sharing In Information Systems Development Projects: Explicating the Role of Dependence and Trust”, *International Journal of Project Management*, vol. 32, no. 1, pp. 153-165, 2014.
- [13] Rajagopal, P., Zailani, S., & Sulaiman, M. “Benchmarking On Supply Chain Partnering Effectiveness in Two Semiconductor Companies: A Case Study Approach”, *Benchmarking: An International Journal*, vol. 16, no. 5, pp. 671-701, 2009.
- [14] Hwang, H. G. “A Comparative Study of Outsourcing Partnership between Medical and Banking Industries”, Retrieved August 9, 2014 from <https://srda.sinica.edu.tw/search/gensciitem/1196>, 2014.
- [15] Nunnally, J.C. *Psychometric Theory*, New York: McGraw Hill, 1978.