

# Impacts of Hospitals' Innovativeness on Information System Outsourcing Decisions

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**Objectives:** The purpose of this study was to identify the effects of hospitals' innovativeness on outsourcing decision-making regarding four information system (IS) functions, namely, software programs, network maintenance, hardware systems, and PC/printer maintenance. **Methods:** Using the 2011 roster of the Korean Hospital Association, this study selected 311 general hospitals as a study population. After identifying the managers who were in charge of outsourcing, this study administered questionnaires. A total of 103 hospitals responded. **Results:** Of the responding hospitals, 55.34% outsourced at least one IS function, whereas 88.35% outsourced at least one managerial function. IS outsourcing was motivated by the need for outside experts, but other managerial functions were outsourced for cost savings. Innovative and early adopter hospitals were 4.52 and 4.91 times more likely to outsource IS functions related with work processes (i.e., software and network maintenance) than early and late majority hospitals, respectively. IT outsourcing effectiveness significantly influenced the outsourcing decisions regarding four IS functions. Hospitals that had perceived more risks of outsourcing significantly preferred non-outsourcing on their hardware systems, but the risks of outsourcing were not significant for outsourcing decisions regarding the other IS functions. Hospitals' innovativeness also significantly explained the quantity of innovation adoptions. Innovative and early adopter hospitals did more outsourcing than early and late majority hospitals. **Conclusions:** Hospitals' innovativeness influences decision-making regarding outsourcing. Innovative hospitals are more likely to outsource their work-process-related IS functions. Thus, organizational traits, especially hospitals' innovativeness, should be considered as a key success factor for IS management.

**Keywords:** Hospitals, Outsourced Services, Information Systems, Organizational Innovation

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## I. Introduction

Generally, all organizations try to acquire innovative tools to increase their competitive advantages in their market environment. It is apparent that an organization with an innovative way of maximizing value for its customers may achieve business goals more easily than others. Healthcare organizations are no exception in using innovative managerial techniques and technologies, although the social norm is to treat them as non-profit organizations. Healthcare organizations have not utilized full aspects and levels of management strategies of for-profit organizations since our society has emphasized social responsibility and non-profit motivations

for hospitals. Even with these restrictions, healthcare organizations have tried to adopt new innovative solutions to solve their business problems. One of the best examples of innovation adoptions in the healthcare field is the use of Electronic Medical Record (EMR), which helps clinical workers to assure quality of care.

Organizations may have difficulty achieving an innovation if they have experienced a lack of managerial resources, experts, and complex knowledge for innovations. Additionally, most organizations may not have enough managerial ability to cope with risks that might appear in the process of adopting innovations [1]. To overcome these problems, some types of alliances or networks with other organizations may produce the good results they want to achieve. This approach can be called administrative innovation [2]. However, the adoption of EMR systems can be considered as the adoption of a technical innovation in a hospital. Damanpour [2] classified the types of innovations as technical, administrative, and ancillary.

Expanding managerial networks can be defined as an administrative innovation. Outsourcing strategies also expand hospitals managerial networks to outside organizations to achieve business goals. Thus, outsourcing innovations can enable hospitals to share professional knowledge and managerial resources after building a wide network [1]. The management strategy of outsourcing has been widely diffused among all industrial fields, and it is continually evolving into new concepts in terms of co-sourcing, contract manufacturing, and network power outsourcing [1].

Hospitals have accepted outsourcing to achieve managerial efficiency, though it is often applied in relatively limited management areas. Some studies [3-5] have tried to understand the factors that influence outsourcing decisions or what determines acceptance status. Noh et al. [5] studied the current outsourcing acceptance rates of 58 large general hospitals in terms of seven managerial aspects, including information system (IS) outsourcing. Their results showed that 72.4% of these hospitals outsourced their IS functions. Choy et al. [3] identified 20 facilitators and 19 inhibitors of

outsourcing through interviews with experts in this domain.

Kim and Park [4] studied seven large hospitals to understand the current status of information development. Three hospitals considered in the study had outsourced all functions of IS management. The study also suggested six strategies of information systems development, including IS outsourcing as a main strategy. The study also identified two drawbacks of outsourcing. First, it is hard to maintain information security after outsourcing, which can lead to employees' anxiety regarding their job security, from an inner organization perspective. Secondly, there is a lack of high-quality contractors with a reasonable cost, so there is a possibility of that the expected effectiveness from outsourcing will not be met, and there could be dependency problems in outsourcing functions to a contractor.

This study considered the adoption of outsourcing as accepting an innovation and tried to identify how hospitals' innovativeness influences decision-making regarding outsourcing. There have been few studies on identifying the role of healthcare organizations' innovativeness on managerial decision-making, especially hospitals' IS management, even though healthcare is considered a more innovative and technologically advanced field compared to many other fields. Therefore, the purposes of this study were to identify the role of hospitals' innovativeness in IS outsourcing decision-making. Moreover, this study also investigated how the IS outsourcing effectiveness, achievement, and risks of overall outsourcing decision-making determines IS outsourcing decisions after controlling for organization characteristics.

## II. Methods

The study population included the general hospitals that were listed on the 2011 roster of the Korean Hospital Association. Out of the 311 general hospitals, 103 responded to the survey. The response rate was 33.1%. The study subject hospitals were contacted by telephone, and those who were in charge of actual outsourcing management, such as chief healthcare administrators and outsourcing managers were

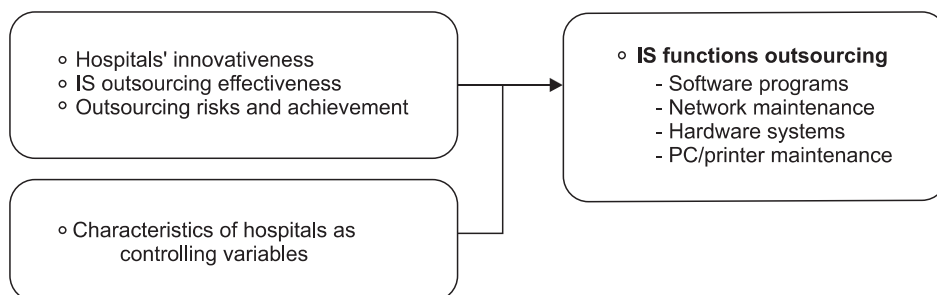


Figure 1. Study model. IS: information system.

identified. Before questionnaires were sent to the participants, the representative managers were asked to select their preferred method for receiving the questionnaires among the options of mail delivery, site visit, e-mail, and telephone response; this was intended to produce a higher response rate. For statistical analyses, chi-square test, logistic regression, regression analysis, an internal reliability test, and factor analysis were used. This study used two construct variables, outsourcing achievement and risks measurement. Eight outsourcing achievement scales were derived from Grover et al. [6] and Klaas et al. [7], and five risks measurement scales from Loh and Venkatraman [8] and Earl [9].

The internal reliabilities of the two constructs were acceptable. The Cronbach's  $\alpha$  values of outsourcing achievement and risks measurement scales were 0.82 and 0.85, respectively. In the test of construct validity, factor analysis identified two constructs successfully, as we intended, although one item of the outsourcing achievement scales was deleted because it lacked factor loading score to its designated factor (Appendix 1).

For a study model, this study hypothesized that hospitals' innovativeness, IS outsourcing effectiveness, and outsourcing risks directly determined the outsourcing status of four IS functions after controlling for the general characteristics of hospitals, such as business years, legal bed size, labor costs, location, and foundation type (Figure 1).

### III. Results

#### 1. General Characteristics and Outsourcing Status

The repose rate of the hospitals located in Busan, Ulsan, Gyeongsangnam-do was 40.78%, which was a higher rate than those of other regions; we divided all hospitals locations into four wide areas. Of the subject hospitals, 26.31% were located around the capital region, and 55.34% were had legal beds size between 200 and 400. The dominant type of foundation was the medical corporation, and 46.46% of the

hospitals answered that the labor cost proportion of overall cost ranged from 41% to 50% (Table 1).

Regarding the overall status of outsourcing, 88.35% of the responding hospitals outsourced more than organization function including IT management fields. The most important

Table 1. General characteristics of sample hospitals (n = 103)

Variable	Freq. (%)
Location	
Capital area <sup>a</sup>	27 (26.31)
South east <sup>b</sup>	42 (40.78)
South middle <sup>c</sup>	12 (11.65)
Middle east west <sup>d</sup>	11 (10.68)
South west <sup>e</sup>	11 (10.68)
Legal beds number	
<200	13 (12.62)
200–399	57 (55.34)
400–599	20 (19.42)
>599	13 (12.62)
Corporation type	
Educational	11 (10.68)
Foundation	11 (10.68)
Medical	39 (37.86)
Government <sup>f</sup>	8 (7.76)
Special/Social <sup>g</sup>	11 (10.68)
Others	23 (22.33)
Labor cost (%)	
<41	28 (28.28)
41–50	46 (46.46)
51–60	22 (22.22)
>60	3 (3.03)

<sup>a</sup>Seoul, Incheon, Gyeonggi-do, <sup>b</sup>Busan, Ulsan, Gyeongsangnam-do, <sup>c</sup>Daegu, Gyeongsangbuk-do, <sup>d</sup>Daejeon, Chungcheong-do, Gangwon-do, <sup>e</sup>Jaeju, Gwangju, Jeolla-do, <sup>f</sup>national/local government, <sup>g</sup>special or social welfare.

Table 2. Overall outsourcing acceptance status and preferences (n = 103)

Acceptance status	Preferred type	Description	Freq. (%)
Non-acceptor	-	-	12 (11.65)
Acceptor	-	-	91 (88.35)
The most important reason for acceptances	Cost saving	Outsourcing unimportant functions for saving cost	85 (82.52)
	Separate corporation	Separating the functions as a new independent organization	2 (1.94)
	Networking	Outsourcing all functions except core business areas and making a network with their suppliers for achieving synergy effects	3 (2.91)
	Core areas outsourcing	Outsourcing a core business function to the outsourcing markets that may produce more competitive advantages of their organizations	1 (0.97)

motive for adopting outsourcing was cost reduction by outsourcing non-core business functions to other organizations. A few hospitals chose other outsourcing types (Table 2).

### 2. The Status of Hospital IS Outsourcing

To identify the status of IS outsourcing, this study specified four major IS functional areas and one miscellaneous part. It was found that 44.66% of the study hospitals did not outsource one of their IS management functions, whereas 55.34% outsourced more than one function. Three hospitals had totally outsourced, including the miscellaneous part, all functions of IS management (Table 3).

The study subject hospitals have adopted IS outsourcings in the range of from about 30% to 38%. Moreover, a few hospi-

tals expect to adopt IS outsourcing sooner or later. Hospitals' major motive for IS outsourcing was to expanding their workforce by using outside experts, whereas that of overall outsourcing decisions was monetary savings. More specifically, software programs (87.18%) and network management (87.50%) took relatively higher rates for demanding outside experts, compared to the rate of PC/printer maintenance functions (62.85%), which was the highest (28.57%) for cost saving motives across the four IS functions (Table 4). A miscellaneous part among IS functions was excluded because of the small number of responses.

### 3. Organizational Innovativeness and Outsourcing Status

Using Roger's innovativeness categories [10,11], this study tried to classify organizational innovativeness. The percent of innovative organizations among the study hospitals was 4.85%. Early adopter and early majority organization were 51.49% and 27.18%, respectively. Late majority organizations were 17.48%. The specific traits of these groups are described in Appendix 2.

The types of organization innovativeness were differently distributed across the four IS functions outsourced, except PC/printer maintenance. The rates of outsourcing of hardware systems by innovativeness types were significantly different at  $\alpha = 0.01$ . Software programs and network maintenance were at  $\alpha = 0.001$ , respectively. The outsourcing rates of innovative organizations and early adopter organizations

**Table 3. Number of information system (IS) functions outsourced (n = 103)**

The number of IS outsourcing functions	Freq. (%)	Cumulative freq. (%)
0	46 (44.66)	46 (44.66)
1	12 (11.65)	58 (56.31)
2	21 (20.39)	79 (76.70)
3	07 (6.80)	86 (83.50)
4	14 (13.59)	100 (97.09)
5	03 (2.91)	103 (100.00)

**Table 4. IS outsourcing status and reasons (n = 103)**

	IS management function			
	Software program	Network maintenance	Hardware system	PC/printer maintenance
IS outsourcing status				
Accepting	39 (37.87)	31 (30.10)	35 (33.98)	38 (36.89)
To accept it sooner or later	2 (1.94)	4 (3.88)	2 (1.94)	0 (0.00)
Not accepting	62 (60.19)	68 (66.02)	66 (64.08)	65 (63.11)
Total	103 (100.00)	103 (100.00)	103 (100.00)	103 (100.00)
IS functions outsourcing reasons of accepting hospitals				
Cost savings	2 (5.13)	0 (0.00)	2 (5.88)	10 (28.57)
Using outside experts	34 (87.18)	28 (87.50)	29 (85.30)	22 (62.86)
Focusing on core works	2 (5.13)	3 (9.38)	2 (5.88)	2 (5.71)
Scattering financial risks	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Getting organization flexibility	1 (2.56)	1 (3.12)	1 (2.94)	1 (2.86)
Total	39 (100.00)	32 (100.00)	34 (100.00)	35 (100.00)

Values are presented as number (%).  
IS: information system.

Table 5. Outsourcing acceptance status by innovativeness types

Organization type	Total <sup>b</sup>	Software program <sup>a</sup>			Network maintenance <sup>a</sup>			Hardware system <sup>a</sup>			PC/printer maintenance <sup>a</sup>		
		None <sup>c</sup>	Adopter	$\chi^2$	None <sup>c</sup>	Adopter	$\chi^2$	None <sup>c</sup>	Adopter	$\chi^2$	None <sup>c</sup>	Adopter	$\chi^2$
Innovative organization	5	2 (0.40)	3 (0.60)		4 (0.80)	1 (0.20)		2 (0.40)	3 (0.60)		3 (0.60)	2 (0.40)	
Early adopter organization	52	26 (0.50)	26 (0.50)	13.08***	28 (0.54)	24 (0.46)	13.16***	32 (0.62)	20 (0.38)	3.29**	28 (0.54)	24 (0.46)	4.28
Early majority organization	28	25 (0.89)	3 (0.11)		25 (0.89)	3 (0.11)		21 (0.75)	7 (0.25)		21 (0.75)	7 (0.25)	
Late majority organization	18	11 (0.61)	7 (0.39)		15 (0.83)	3 (0.17)		13 (0.72)	5 (0.28)		13 (0.72)	5 (0.28)	
Total	103	64 (0.62)	39 (0.38)	-	72 (0.70)	31 (0.30)	-	68 (0.66)	35 (0.34)	-	65 (0.63)	38 (0.37)	-

Values are presented as frequency (%).

<sup>a</sup>Fisher exact test due to lacks of expected values, <sup>b</sup>all categories are 100%, <sup>c</sup>it includes the organizations that have a plan for accepting outsourcing.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

groups were distinctly higher than those of early and late majority organizations across all functions (Table 5).

#### 4. The Determinants of IS Outsourcing Decisions

IS outsourcing status was affected by organizational innovativeness, IT outsourcing effectiveness, multi-hospital situations, and corporations types. For all IS functions, IT outsourcing effectiveness significantly determined the status of outsourcings.

Innovative/early adopter organizations were 4.52 and 4.91 times more likely to outsource their software programs and network maintenance functions, respectively, than early and late majority organizations, which were statistically significant at  $\alpha = 0.05$  (Table 6). This study aggregated four innovativeness groups into two groups because of small numbers of observations in some categories. When the four functions were classified into the two categories of work process-related areas and non-work process-related areas, hospitals innovation categories were significant only for the IS functions related to work processes (Tables 6, 7).

In the tests of overall achievements and risk factors of outsourcing, they were not significant for the all IS functions except hardware systems. Increasing one unit of overall outsourcing risks, the odds of no outsourcing was 5.88 (1/0.17) times larger than the odds of outsourcing acceptance, which was statically significant at  $\alpha = 0.01$ . This study also used the variables of organizational traits as control variables to identify the unique effects of the variables that were considered. However, multi-hospital status was significant at  $\alpha = 0.01$  for hardware systems outsourcing. Educational foundations were 39.86 and 34.97 times more likely to outsource their software programs ( $p < 0.05$ ) and PC/printer maintenance ( $p < 0.01$ ) than other types of corporations, respectively (Tables 6, 7).

To identify confounding effects after controlling for organizational traits, this study compared three regression models, which used the aggregated numbers of outsourcing acceptance as the dependent variable. These regression models also allow us to test the effects of organizations' innovativeness on the rate of innovation adoption as Kessler and Chakrabarti [12], and Downs and Mohr [13] explained. There were no confounding effects on innovations categories, and innovation traits determined the quantity of innovation adoption. This means that regardless of other effects on outsourcing decisions, hospitals' innovation characteristics have a stable effect on outsourcing decisions (Table 8). This study also used a partial *F*-test to select the best regression model (Table 9). The full regression model was not statistically different from model I, but it was statistically different from model II. Model I was statistically different from model II.

**Table 6. Outsourcing determinants of work process IS functions (n =103)**

Variable	Software program		Network maintenance	
	$\beta$ (SE)	OR	$\beta$ (SE)	OR
Innovative/early adopt organization <sup>a</sup>	1.51 (0.72)	4.52*	1.59 (0.63)	4.91*
IT outsourcing effectiveness	1.13 (0.29)	3.08***	0.57 (0.19)	1.77**
Overall outsourcing achievement	0.38 (0.43)	1.46	0.03 (0.35)	1.03
Overall outsourcing risk	-0.42 (0.46)	0.66	-0.01 (0.33)	0.99
Business year	-0.04 (0.02)	0.96*	-0.03 (0.02)	0.97 <sup>†</sup>
Legal beds number	0.00 (0.00)	1.00	0.00 (0.00)	1.00
Labor cost	-0.86 (0.51)	0.42	-0.15 (0.38)	0.86
None multi-hospital <sup>b</sup>	0.09 (0.80)	1.10	0.11 (0.67)	1.11
Capital area <sup>c</sup>	1.05 (0.96)	2.85	-0.54 (0.75)	0.58
Educational foundation <sup>d</sup>	3.69 (1.47)	39.86*	-0.21 (1.41)	0.81
Foundation corporation <sup>d</sup>	0.66 (1.21)	1.94	0.53 (0.03)	1.69
National/local government corporation <sup>d</sup>	2.13 (1.51)	8.42	-0.52 (1.18)	0.59
Medical corporation <sup>d</sup>	0.83 (0.91)	2.30	-0.38 (0.69)	0.68
Special corporation <sup>d</sup>	0.78 (2.06)	2.19	-0.84 (1.54)	0.43
Intercept	-1.04 (1.99)	0.35	-1.34 (1.72)	0.26

Values are presented as frequency (%).

IS: information system, SE: standard error, OR: odds ratio.

<sup>a</sup>Early and late majority organization, <sup>b</sup>multi-hospitals (more than two hospitals in their foundation), <sup>c</sup>non-capital area, and <sup>d</sup>other types.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , <sup>†</sup> $p = .07$ .

**Table 7. Outsourcing determinants of IS functions related with equipment (n = 103)**

Variable	Hardware system		PC/printer maintenance	
	$\beta$ (SE)	OR	$\beta$ (SE)	OR
Innovative/early adopt organization <sup>a</sup>	-0.36 (0.84)	0.70	1.06 (0.62)	2.88
IT outsourcing effectiveness	1.87 (0.51)	6.49***	0.36 (0.17)	1.43*
Overall outsourcing achievement	0.12 (0.56)	1.13	0.84 (0.43)	2.31 <sup>†</sup>
Overall outsourcing risks	-1.80 (0.64)	0.17**	0.09 (0.34)	1.09
Business year	0.02 (0.02)	1.02	-0.02 (0.02)	0.98
Legal beds number	0.00 (0.00)	1.00	0.00 (0.00)	1.00
Labor cost	-0.37 (0.52)	0.69	-0.30 (0.38)	0.74
None multi-hospitals <sup>b</sup>	3.25 (1.20)	25.87**	-0.98 (0.68)	0.38
Capital area <sup>c</sup>	1.29 (1.10)	3.62	-0.59 (0.77)	0.55
Educational foundation <sup>d</sup>	-2.73 (3.11)	0.07	3.78 (1.51)	34.97**
Foundation corporation <sup>d</sup>	-0.84 (1.36)	0.43	-0.75 (0.98)	0.47
National/local government corporation <sup>d</sup>	2.63 (1.59)	13.91	-1.34 (1.12)	0.23
Medical corporation <sup>d</sup>	0.15 (0.99)	1.16	-1.45 (0.72)	2.88
Special corporation <sup>d</sup>	-0.59 (2.08)	0.56	-0.80 (1.29)	1.43*
Intercept	-3.70 (2.29)	0.02	-2.37 (2.06)	2.31 <sup>†</sup>

Values are presented as frequency (%).

IS: information system, SE: standard error, OR: odds ratio.

<sup>a</sup>Early and late majority organization, <sup>b</sup>non-capital area, <sup>c</sup>multi-hospitals (more than two hospitals in their foundation), and <sup>d</sup>other types.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , <sup>†</sup> $p = .06$ .

Table 8. Regression analysis of the number of IS outsourcing functions

Variable	Full model	Model I	Model II
	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)
Innovative/Early adopt organization <sup>a</sup>	0.48 (0.23)*	0.51 (0.23)*	0.96 (0.28)**
IT Outsourcing effectiveness	0.47 (0.07)***	0.44 (0.06)***	-
Overall outsourcing achievement	0.06 (0.14)	-	-
Overall outsourcing risks	-0.25 (0.14) <sup>‡</sup>	-	-
Business years	-0.01 (0.01) <sup>†</sup>	-0.01 (0.01)	-0.01 (0.01)
Legal beds number	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Labor costs	-0.22 (0.16)	-0.22 (0.15)	-0.39 (0.19)*
None multi hospitals <sup>b</sup>	0.10 (0.26)	-0.05 (0.23)	-0.07 (0.30)
Capital areas <sup>c</sup>	0.27 (0.31)	0.17 (0.26)	0.13 (0.32)
Educational foundation <sup>d</sup>	0.64 (0.47)	0.68 (0.47)	-0.02 (0.59)
Foundation corporation <sup>d</sup>	-0.29 (0.43)	-0.33 (0.42)	-0.37 (0.53)
National/local government corporation <sup>d</sup>	-0.14 (0.48)	-0.11 (0.48)	0.11 (0.61)
Medical corporation <sup>d</sup>	-0.15 (0.29)	-0.15 (0.29)	-0.10 (0.37)
Special corporation <sup>d</sup>	-0.04 (0.48)	-0.12 (0.49)	-0.37 (0.61)
Intercept	1.70 (0.64)	1.63 (0.61)	2.71 (0.75)***
	$F = 7.07^{***}$	$F = 7.77^{***}$	$F = 2.30^*$
	$R^2 = 0.54$	$R^2 = 0.52$	$R^2 = 0.23$
	$Adj R^2 = 0.46$	$Adj R^2 = 0.45$	$Adj R^2 = 0.13$

<sup>a</sup>Early and late majority organization, <sup>b</sup>multi-hospitals (more than two hospitals in their foundation), <sup>c</sup>none-capital area, and <sup>d</sup>other types. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , <sup>‡</sup> $p = 0.07$ , <sup>†</sup> $p = 0.06$ .

Table 9. Model comparisons

Comparison	Statistic <sup>a</sup>	p-value
Test 1: Full model → Model I	$F = 1.88$	$p = 0.159$ $F(1.88, 2,84)$
Test 2: Full model → Model II	$F = 19.22$	$p = 0.000$ $F(19.22, 3,84)$
Test 3: Model I → Model II	$F = 52.82$	$p = 0.000$ $F(52.82, 1,12)$

$F = ([Reg. SS \text{ of a larger model} - Reg. SS \text{ of a smaller model}] / [Reg. d.f. \text{ of a larger model} - Reg. d.f. \text{ of a smaller model}]) / [MS \text{ residual of a larger model}]$ .

<sup>a</sup>Statistic comes from the results of Table 8.

Thus, assuming that a simple model is the better model than a complex model, we can conclude that model I is the best model among three models.

## IV. Discussion

This study investigated how the traits of organizations' innovativeness determine managerial decision-making. Specifi-

cally, this study selected the IS outsourcing decision-making of hospitals to test the roles of organizational innovativeness as well as the effectiveness of IS outsourcing, and the risks and achievement of outsourcing. To measure organizations' innovativeness, this study used Roger's innovation categories [10,11].

This study found that 55.34% of the study hospitals had outsourced more than one IS function, whereas 88.35% had outsourced at least one part of among all managerial functions. The outsourcing motivations were different. Costs saving purposes were dominant in the outsourcing of managerial functions, but the need for outside experts was a crucial element for IS outsourcing decisions. The former totally conforms with the results of studies by Ryu et al. [14] and Noh et al. [5], and the latter partially agrees with the results of these studies.

Ryu et al. [14] explained acceptance stages from an ordinal perspective. Cost saving was the first reason, coping with changing IT technologies was second, and enhancing core ability was the final stage. In healthcare fields, Noh et al. [5] also found that cost saving motivation ranked first, and the need for outside experts was third for all general outsourc-

ing decisions. Although the previous studies identified the motives of outsourcing, these studies were not focused on IS outsourcing. This study tried to identify IS outsourcing motivations and found that the main motivation is the need for outside experts. This result implies that either healthcare organizations may not have enough resources to hire extra experts, or the current experts of their organizations may lack the ability to cope with changes in IS technologies. We might say that IS management is not a matter of cost because it is a crucial factor, and it intrinsically produces work efficiency in the provision of healthcare services. Thus, cost problems would be indirectly alleviated by work efficiency due to the work of additional experts. Choy et al. [3] also found that cost reduction was not related with IS outsourcing decisions.

Regarding IS outsourcing decisions, the effects of organizations' innovativeness were identified. Based on Roger's innovations categories [10,11], this study classified hospitals' innovativeness into four groups. Of the hospital considered in this study, 4.85% and 51.49% were innovative and early adopter organizations, respectively. These rates are quite different from the rates of Roger's study. He estimated that 3% and 14% of a population might be categorized as innovators and early adopters, respectively. Thus, we would think that healthcare organizations have more innovative traits compared to other types of organizations because the line of distribution is far above the normal expectation. This is at the organization level, not a personal level; originally, Roger's innovativeness categories were intended to be used to measuring personal innovativeness, not the innovativeness of organizations. This study modified Roger's categories to measure organizational innovativeness. However, the outsourcing acceptance rates of innovative and early adopter organizations were higher than those of other groups across all IS functions.

Comparing early and late majority hospitals, innovative/early adopter hospitals were 4.52 and 4.91 times more likely to outsource software programs and network maintenance, respectively. There were no significant effects on decisions to outsource hardware and PC/printer maintenance. These results partially conform with those of the study of Park and Kim [15], although the level of observation was different, namely, a personal level rather than an organizational level. They tried to understand the roles of personal innovativeness on IT adoption behavior in two IT technologies, namely, GPS and e-purchasing systems. The major finding was the invariance effects of innovation traits on adoption behaviors because there were no confounding and moderating effects with IT types and demographic variables.

This study did not find the invariant effect of innova-

tions across IS functions but another invariant variable, IT outsourcing effectiveness. Most organizations would want maximized results of their managerial decisions for IS usages. If an organization expected very positive results from outsourcing, the organization would be willing to adopt outsourcing regardless of the nature of IS function areas. However, this study found that the innovativeness of hospitals was related with the intrinsic traits of IS functions. When we consider software and network maintenance as more dynamic areas than the other functions because these would support more work processes related areas, innovative and early adopter hospitals were more likely to adopt outsourcing for dynamic and works process areas than early and late majority hospitals. Thus, more innovative hospitals might rapidly cope with changes in IT technologies and try to achieve an optimal IS managerial strategy that could result in outsourcing decisions. Moreover, innovative group hospitals are more likely to realize that they lack the ability to cope with either changing or complex work processes in healthcare environments. Thus, they need more outside experts for their business success.

Outsourcing risks significantly explained acceptance decisions regarding hardware systems outsourcing, but it was not significant for the other IS functions. This result shows partial agreement with the results of the study of Choy et al. [3], although there are some differences. This study considered information securities as one scale for measuring outsourcing risks, but Choy et al. [3] used it as one factor. Choy et al. [3] defined 5 facilitators and 5 inhibitors of IS outsourcing. Consumer satisfaction as a facilitator and security risk as an inhibitor were significant for outsourcing decisions. They made IT outsourcing acceptance as one dependent variable, but this study specified four IS outsourcing areas. Thus, this study can contribute to a more in-depth understanding of how IS outsourcing decision-making is affected by outsourcing risks.

In this study, the subject hospitals that had perceived more managerial risks from outsourcing did not want to outsource their hardware systems. They thought that their hardware systems were more strongly related with security issues compared to the other IS functions. For the other IS functions except hardware, it was not necessary to seriously take into account outsourcing risk problems because of the need for more flexible managerial options to achieve organizational efficiency, even though there could be potential risks.

Moreover, this study considered the outsourcing acceptance status of four IS functions as one variable and analyzed it in multiple regression models. This allowed us to test the effects of hospitals' innovativeness on the rate of IS function



outsourcing. The quantity of innovation was studied by Kesler and Chakrabarti [12], and Downs and Mohr [13]. These studies showed that innovation has to be measured in terms of quantity, quality, and speed of innovation. This study found that the level of innovation can be explained by hospitals' innovation traits and IT outsourcing effectiveness. In the regression model comparisons, the aggregated numbers of outsourced functions were used as a dependent variable. The regression model with innovations traits and IT outsourcing effectiveness was the best model among 3 models. In a future study, that speed and quality of innovation should be examined. Additionally, further studies should be carried out using different classifications of IS functions rather than the four IS functions of this study, which may provide a deeper understanding of the roles of outsourcing on IS functions.

In conclusion, this study found that the motives for IS outsourcing were different from those for the outsourcing of other managerial functions. IS outsourcing was based on the need for outside IS experts, whereas other managerial functions were outsourced for cost savings. Hospitals' innovativeness strongly determined outsourcing decision-making regarding software and network maintenance that were more related with work process functions of hospitals than the others. Moreover the rate of innovation adoption was determined by the innovation traits of hospitals. Thus, one of the organization traits, hospitals' innovativeness, should be considered as a key managerial success factor for IS management.

## Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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**Appendix 1. Factor analysis for the constructs**

Construct	Item	Factor 1	Factor 2
Outsourcing risk	Loss of managerial controls	0.69	-0.32
	Declining service quality of outsourced functions	0.83	-0.16
	Difficulties for keeping information security	0.81	-0.10
	Knowledge/skills accumulating problems	0.66	-0.05
	Employees anxiety on the loss of their jobs	0.64	0.03
Outsourcing achievement	Getting organizations flexibility	0.19	0.59
	Concentrating their core businesses	-0.02	0.71
	Using outside experts	-0.15	0.72
	Turning fixed costs to flexible costs	-0.10	0.50
	Getting a new idea	-0.44	0.68
	Resulting in raised work quality	-0.47	0.60
	Synergy effects from a partnership	-0.20	0.74

**Appendix 2. The traits of innovative organizations types**

Innovativeness type	Characteristic
Innovative organization	Your organization buys into a new product's concepts very early in its life cycle. Your organization finds it easy to imagine, understand, and appreciate the benefits of a new technology and base buying decisions upon this belief. Your organization does not base these buying decisions on well-established references, preferring instead to rely on your own intuition and vision.
Early adopter organization	Your organization shares some of the previous category's ability related to technology but is ultimately driven by a strong sense of practicality. Your organization knows that many newfangled inventions end up as passing fads, so you are content to wait and see how other people are making out before you buy in yourself. Your organization wants to see well-established references before investing substantially.
Early majority organization	Your organization does not buy unless comfortable with your ability to use the technology. As a result, your organization waits until something has become an established standard, and even then you want to see lots of support.
Late majority organization	Your organization is very cautious about new technology. Your organization will only purchase when you feel it has become a necessity.