

# A Study on the Impact of Perceived Risk Factors on Cognitive Trust and Quality Trust in Mobile Payment Systems

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## ABSTRACT

*Recently, the developments in IT technology and the spread of smart phones have made Fin-Tech, which is a combination of financial services and IT technology, a big issue. In accordance with the growth trend of mobile payments in the world, all financial transactions in Korea are gradually shifting to smart phones. In fact, mobile payment system services are not widely used by users. In particular, the risk factors involved when users want to use the service are one of the factors that hinder the expansion of the usage of mobile financial payment service. The risk factors affect the trust of the mobile payment system users. Therefore, this study investigates the risk factors of the mobile payment system and the manner in which it affects a user's trust. We have also examined as how user's trust affects trust in the quality of the mobile payment system. To this end, the trust in overall quality of use was largely divided into trust in system quality, trust in information quality, and trust in service quality. Perceived finance risk, perceived performance risk, and perceived privacy risk have negative effects on cognitive trust. However, perceived time risk did not affect cognitive trust. User's cognitive trust also has an effect on trust in quality.*

**Key words:** *Perceived Risk, Cognitive Trust, Trust in Quality, Mobile Payment Systems.*

## 1. INTRODUCTION

Recently, various services using mobile devices have been rapidly developed and utilized as the spread of mobile terminals and mobile networks spread. Especially, smartphone penetration rate has risen sharply, and according to the KISA(Korea Internet & Security Agency), Korea's smartphone users account for 87.8% of the population aged 3 years or older by 2017. As the number of smartphone users increased, Fin-Tech, which combines financial services and IT technology, became a big issue. 63% of internet users aged 12 years or older use internet banking, and the rate of usage through mobile devices(57.1%) is higher than that of computers(39.7%).

For successful service of mobile payment system, it is important to identify the risk factors of mobile payment system and build trust of users. Mobile payment system users are increasing, but they are in the mobile domain and there are many risks due to the nature of handling money. Users are overly anxious to hear about security incidents and spend time

adjusting to the new system. Therefore, this study examines the risks of financial, performance, privacy and time, which are typical risk factors.

Many researchers have studied trust, and trust in the mobile field was largely a study of overall trust. However, trust in various areas is divided into cognitive trust and affective trust. Cognitive trust is based on the trustworthiness of others, and affective trust is based on emotional relationships with others. In particular, since it has been revealed through various studies that cognitive trust is more important when using financial services that require objectivity, this study on mobile payment systems focuses on cognitive trust. In addition, this study also focused on trust in the quality of mobile payment systems. The quality of mobile payment system can be classified into system quality, information quality and service quality. Therefore, trust in quality can be expressed as trust in system quality, trust in information quality, and trust in service quality. The purpose of this study is to identify the risk factors of mobile payment system related to cognitive trust and to examine the effects on cognitive trust and trust in quality.

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## 2. RESEARCH BACKGROUND

In this study, we suggested the perceived risk, cognitive trust, and trust in quality of use as theoretical background in order to examine the effects of perceived risk factors on cognitive trust and trust in quality of use in mobile payment systems.

### 2.1 Perceived Risk

Studies related to perceived risk were used primarily to describe customer behavior. Most of the customers' purchasing behavior raised risk factors relating use due to the uncertainties and unintended consequences of purchasing decisions. Perceived risk has been analyzed on a multidimensional factors rather than a single factor. In this study, the perceived risk in the mobile payment system is classified into perceived finance risk, perceived performance risk, perceived privacy risk, and perceived time risk. Perceived finance risk is monetary and financial risks, such as monetary losses that may arise when consumers use unfamiliar goods or services. This risk implies a potential economic loss perceived when purchasing or using a product or service [1]. These economic losses include time and effort due to unfamiliar mobile work. It also includes payment time and effort, and the time and effort that occur when the payment is canceled. Perceived performance risk is the risk that the consumer perceives the extent to which the purchased product does not meet consumer expectations. This risk is highly perceived in situations where payments are made, such as mobile payments, rather than direct payments through cash or credit cards [2]. Perceived privacy risk is the risk about using the mobile payment system because of the concern that the sensitive personal information such as telephone number, resident number, user's location, etc [3]. Service providers are exposed to risks related to sensitive personal information such as unauthorized use of sensitive information, selling of personal information to other companies, and hijacking of personal information due to hacking of the mobile payment system. Perceived time risk means time risk or opportunity risk, which means a loss of time to repair or replace when a product or service fails [4]. Perceived time risk can lead to time loss due to behavior when purchasing or using a product or service. In addition, you may waste time returning unsatisfactory products or services or using other services and this can lead to perceived time risks due to various time losses [5].

### 2.2 Cognitive Trust

McAllister [6] classified trust in others into cognitive trust and affective trust. Cognitive trust refers to the trust that is formed based on the competence of the other party or to what extent it can be trusted. Cognitive trust refers to the computational trust that consumers and users depend on the credit and capacity of service and system providers and appear in interrelationships [7]. On the other hand, emotional trust is based on the emotional relationship between the trustee and the object, and is formed by the consideration and concern provided by the other party [8]. This study examines the effect of trust in mobile payment system on trust in use quality, which is more closely related to cognitive trust than emotional trust.

Therefore, this study intends to focus on cognitive trust rather than emotional trust.

Perceived risk factors affect the cognitive trust of mobile payment system users. Perceived risk is formed by the user's experience because it is the risk that the user will feel after using the system directly. Therefore, this perceived risk will negatively affect the user's cognitive trust. For this reason, we have proposed a hypothesis as follows.

*Hypothesis 1. Perceived privacy risk will effect on cognitive trust in mobile payment system.*

*Hypothesis 2. Perceived performance risk will effect on cognitive trust in mobile payment system.*

*Hypothesis 3. Perceived psychological risk will effect on cognitive trust in mobile payment system.*

*Hypothesis 4. Perceived time risk will effect on cognitive trust in mobile payment system.*

### 2.3 Quality in Information Systems

The quality of the information system is recognized as one of the most important factors that lead to economic growth in the world market as the development of information and communication technology (ICT) and the demand of information system are changed [9],[10]. The quality of information system has been studied as system quality and information quality as an important factor for success of information system use. In recent years, research has been conducted by adding service quality factors due to information technology (IT) and information system development and business changes [11], [12]. System quality refers to the quality related to the process of using the system, and is defined as the degree to which the system can be used efficiently and stably. Namely, it means that users can use the mobile payment system safely and freely without inconvenience. Information quality is defined as the advantage or excellence of the information content of the system [13]. Information quality refers to the degree of correspondence between the data value by the system and the actual value that the data represents in reality. Contextual information quality measures the degree to which information helps complete a specific task, such as relevance and completeness [14]. Since the quality of the service that the customer perceives is intangible, it is more difficult to assess the quality of the service than to evaluate the quality of the physical product. Service quality can be perceived as the difference between consumer expectations and actual service performance [15]. The user's perception of service quality is formed during the process of using the service.

*Hypothesis 5. Cognitive trust will effect on trust in system quality of mobile payment system.*

*Hypothesis 6. Cognitive trust will effect on trust in information quality of mobile payment system.*

*Hypothesis 7. Cognitive trust will effect on trust in service quality of mobile payment system.*

In this study, using system quality, information quality, service quality, we propose a model of a successful mobile payment system. In order to investigate the effect of user

perceived risk on cognitive trust and trust in quality factors in the mobile payment system, the study model as shown in Fig. 1.

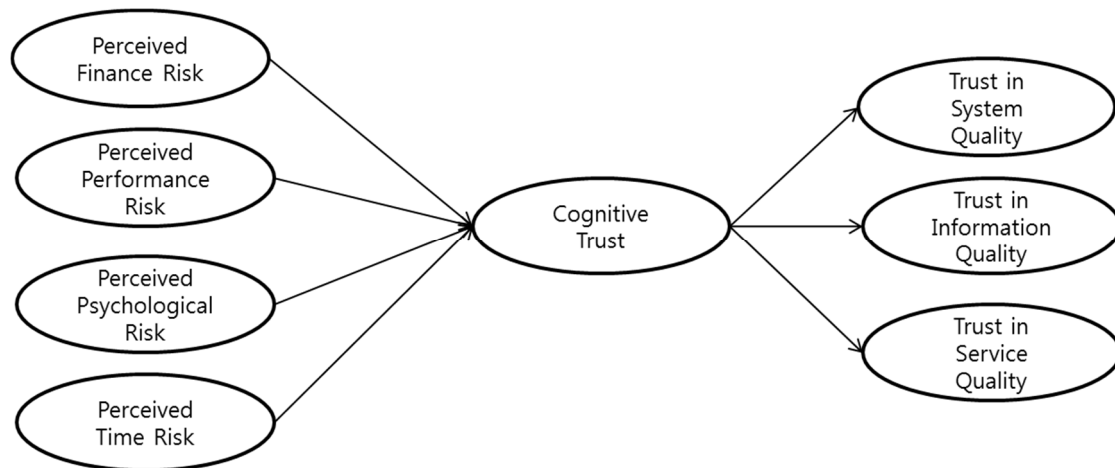


Fig. 1. Research Model

### 3. RESEARCH METHODOLOGY AND RESULTS

#### 3.1 Research Methodology

The purpose of this study is to examine the effect of perceived risk factors on cognitive trust and quality factors in mobile payment system. For achieving our research purpose, we conducted a questionnaire survey on Korean college students who have actually used mobile payment system.

Questionnaires of each factor were measured with multiple items and used in previous studies of risk, cognitive trust and quality in smartphone applications. All questions were rated on a 5-point Likert scale that ranged from 1 for “strongly disagree” to 5 for “strongly agree”. A total of 196 responses were collected, but 173 responses were used for analysis, except for responses with invalid or missing data.

Table 1. Measurements and reference

Construct	Items	Measurement	Reference
Perceived Finance Risk	FinR1	The use of mobile payment would cause the exposure of capital accounts and passwords.	[16], [17]
	FinR2	A careless operation could lead to a surprising loss.	
	FinR3	The use of mobile payment can cause financial risk.	
Perceived Performance Risk	PerfR1	Mobile payment system may be unstable or blocked.	[16], [17]
	PerfR2	It does not work as expected.	
	PerfR3	The performance level may be lower than designed.	
Perceived Privacy Risk	PrvR1	Privacy information could be misused, inappropriately shared, or sold.	[16], [17]
	PrvR2	Personal information could be intercepted or accessed.	
	PrvR3	Payment information could be collected, tracked, and analyzed.	
Perceived Time Risk	TmR1	It may take too much time to learn how to use a mobile payment.	[16], [17]
	TmR2	More time is required to fix payment errors.	
	TmR3	Using a mobile payment may waste time.	
Cognitive Trust	CgT1	I do not doubt of task-related competence of other members.	[18]
	CgT2	I can confidently depend on other members of the mobile payment, since they may not complicate affairs by careless work.	
	CgT3	The more I have knowledge about other members of the mobile payment, the more I can rely on them.	
Trust in System Quality	SQ1	Mobile payment quickly loads all the text and graphics.	[19], [20]
	SQ2	Mobile payment is easy to use.	
	SQ3	Mobile payment is easy to navigate.	
	SQ4	Mobile payment is visually attractive.	
Trust in Information Quality	IQ1	Mobile payment provides me with information relevant to my needs.	[21], [22]

Information Quality	IQ2	Mobile payment provides me with sufficient information.	
	IQ3	Mobile payment provides me with accurate information.	
	IQ4	Mobile payment provides me with up-to-date information.	
Trust in Service Quality	SVQ1	Mobile payment provides on-time services.	[19], [20]
	SVQ2	Mobile payment provides prompt responses.	
	SVQ3	Mobile payment provides professional services.	
	SVQ4	Mobile payment provides personalized services.	

### 3.2 Results

We examined the measurement model to verify reliability and validity for each construct used research model. The adequacy of the measurement model can be assessed by reliability, convergent validity and discriminant validity of constructs for all questions. The results for measurement model showed that composite reliability, convergent validity and discriminant validity well above the threshold value which is 0.60 or above is sufficient [23]. The measurement model results are shown in Table 1. The values of AVE were higher than 0.6, indicating that reliability and convergent validity were acceptable.

Table 2. Measurement Model Results

	Indicator	Factor Loading	Cronbach's $\alpha$	AVE	Composite Reliability
Risk of Finance	FinR 1	0.860	0.862	0.783	0.915
	FinR 2	0.918			
	FinR 3	0.875			
Risk of performance	PerfR 1	0.882	0.835	0.750	0.899
	PerfR 2	0.933			
	PerfR 3	0.775			
Risk of privacy	PrvR 1	0.937	0.927	0.873	0.954
	PrvR 2	0.942			
	PrvR 3	0.924			
Risk of time	TmR 1	0.870	0.774	0.688	0.869
	TmR 2	0.821			
	TmR 3	0.796			
Cognitive Trust	CgT 1	0.826	0.764	0.680	0.864
	CgT 2	0.856			
	CgT 3	0.789			
Trust in System Quality	SQ 1	0.816	0.816	0.639	0.876
	SQ 2	0.828			
	SQ 3	0.759			
	SQ 4	0.793			
Trust in Information Quality	IQ 1	0.840	0.902	0.774	0.932
	IQ 2	0.932			
	IQ 3	0.868			
	IQ 4	0.875			
Trust in Service Quality	SVQ 1	0.894	0.919	0.804	0.942
	SVQ 2	0.832			
	SVQ 3	0.918			
	SVQ 4	0.938			

The data were analyzed via partial least squares (PLS), a multivariate technique used in the analysis of structural equation modeling to test research hypotheses. The empirical results for the structural model are presented in Table 2. We found that all of factors had a significantly negative effect on

cognitive trust except the relationship between risk of time and cognitive trust. And also, we found that cognitive trust had significantly positive effects on quality factors.

Table 3. Path results

Hypotheses	Path	t- value	Results
Risk of Finance → cognitive trust	-0.217	2.121*	Accept
Risk of performance → cognitive trust	-0.177	2.000*	Accept
Risk of privacy → cognitive trust	-0.188	1.974*	Accept
Risk of time → cognitive trust	0.039	0.456	Reject
Trust in cognitive trust → system quality	0.327	5.657**	Accept
Trust in cognitive trust → information quality	0.313	4.241**	Accept
Trust in cognitive trust → service quality	0.412	6.729**	Accept

### 4. CONCLUSION

This paper empirically investigates the effect of perceived risks on cognitive trust and the effect of cognitive trust on quality factors related to mobile payment system. To obtain our research goal, we suggested a research model and conducted surveys to verify our hypotheses empirically. The results indicated that all paths from perceived risks to cognitive trust and from cognitive trust to trust in quality factors were consistent with our expectations and hypotheses except path from perceived time risk to cognitive trust on the mobile payment system.

This study examined the effects of perceived risk factors on cognitive trust and quality trust in mobile payment systems. This study provides some implications as below. First, this study examined the trust in quality rather than the quality itself of the mobile payment system. Most existing studies have examined quality itself. However, this study focuses on trust in quality. This study has contribution in that the trust in quality is further subdivided. Second, this study can provide a basis for activation of the mobile payment system market by identifying the risk factors to improve the trust in the quality of the mobile payment system. Finally, by identifying the main factors that negatively affect the cognitive trust of the mobile payment system users, the guidelines for future mobile payment system development strategies can be suggested. Currently, the mobile

payment market is active, but there is a lack of strategy for system development. Many existing studies have focused on the activation of the mobile payment system. However, this study focused on risk factors and focused on trust formation.

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### REFERENCES

- [1] T. Hirunyawipada and A. K. Paswan, "Consumer Innovativeness and Perceived Risk: Implications for High Technology Product Adoption," *Journal of Consumer Marketing*, vol. 23, no.4, 2006, pp. 182-198.
- [2] K. Mitra, M. C. Reiss, and L. M. Capella, "An examination of perceived risk, information search and behavioral intentions in search, experience and credence services," *Journal of Services Marketing*, vol. 13, no. 3, 1999, pp. 208-228.
- [3] M. S. Featherman and P. A. Pavlou, "Predicting e-service adoption: A perceived risk facets perspective," *International Journal of Human-Computer Studies*, vol. 9, no. 4, Oct. 2003, pp. 451-474.
- [4] N. Lim, "Consumers perceived risk: sources versus consequences," *Electronic Commerce Research and Applications*, vol. 2, 2003, pp. 216-228.
- [5] Y. Y. Yang, H. Liu, and B. Y. Li, "Understanding perceived risks in mobile payment acceptance," *Industrial Management & Data Systems*, vol. 115, no. 2, 2015, pp. 253-269.
- [6] D. J. McAllister, "Affect-and cognition-based trust as foundations for interpersonal cooperation in organizations," *Academy of Management Journal*, vol. 38, no.1, Feb. 1995, pp. 24-59.
- [7] D. Johnson and K. Grayson, "Cognitive and affective trust in service relationships," *Journal of Business Research*, vol. 58, no. 4, Apr. 2005, pp. 500-507.
- [8] J. K. Rempel, J. G. Holmes, and M. P. Zanna, "Trust in close relationships," *Journal of Personality and Social Psychology*, vol. 49, Jul. 1985, pp. 95-112.
- [9] W. H. DeLone and E. R. McLean, "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems*, vol. 19, no.4, Spring, 2003, pp. 9-30.
- [10] D. M. Lee, Y. S. Chae, Y. K. Lee, M. J. Choi, and S. H. Jang, "The Impact of Information System Quality and Media Quality on the Intention to Use IPTV," *Journal of Information and Communication Convergence Engineering*, vol. 10, no. 1, Mar. 2012, pp. 71-77.
- [11] T. Zhou, "An empirical examination of continuance intention of mobile payment services," *Decision Support Systems*, vol. 54, Jan. 2013, pp. 1085-1091.
- [12] R. D. Freeze, K. A. Alshare, P. L. Lane, and H. J. Wen, "IS Success Model in E-Learning Context Based on Students Perceptions," *Journal of Information Systems Education*, vol. 21, no. 2, Summer, 2010, pp. 173-185.
- [13] J. D. Xu, I. Benbasat, and R. T. Cenfetelli, "Integrating service quality with system and information quality: an empirical test in the e-service context," *MIS Quarterly*, vol. 37, no. 3, Sep. 2013, pp. 777-794.
- [14] D. H. McKnight, N. K. Lankton, A. Nicolaou, and J. Price, "Distinguishing the effects of B2B information quality, system quality, and service outcome quality on trust and distrust," *Journal of Strategic Information Systems*, vol. 26, Jun. 2017, pp. 118-141.
- [15] E. Y. Huang, S. W. Lin, and Y. C. Fan, "M-S-QUAL: Mobile service quality measurement," *Electronic Commerce Research and Applications*, vol. 14, Mar. 2015, pp. 126-142.
- [16] X. Luo, H. Li, J. Zhang, and J. P. Shim, "Examining multi-dimensional trust and multi-faceted risk in initial acceptance of emerging technologies: An empirical study of mobile banking services," *Decision Support Systems*, Vol. 49, May. 2010, pp. 222-234.
- [17] Y. Yang, Y. Liu, H. Li, and B. Yu, "Understanding perceived risks in mobile payment acceptance," *Industrial Management & Data Systems*, vol. 115, no. 2, 2015, pp. 253-269.
- [18] S. Kang, H. Suh, and H. Kym, "The Role of Interpersonal Trust in On-line Learning Communities and Application of Knowledge," *Asia Pacific Journal of Information Systems*, vol. 25, no. 4, Dec. 2015, pp. 642-661.
- [19] C. Kim, M. Mirusmonov, and I. Lee, "An empirical examination of factors influencing the intention to use mobile payment," *Computers in Human Behavior*, vol. 26, no. 3. May. 2010, pp. 310-322.
- [20] T. Zhou, "An empirical examination of continuance intention of mobile payment services," *Decision Support Services*, vol. 54, no. 2, Jan. 2013, pp. 1085-1091.
- [21] H. P. Shih, "An empirical study on predicting user acceptance of e-shopping on the Web," *Information & Management*, vol. 41, no. 3, Jan. 2004, pp. 351-368.
- [22] K. C. Lee and N. Chung, "Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean's model perspective," *Interacting with Computers*, vol. 21, no. 5, Dec. 2009, pp. 385-392.
- [23] B. H. Wixom and P. A. Todd, "A Theoretical Integration of User Satisfaction and Technology. Acceptance," *Information Systems Research*, vol. 16. no. 1, Mar. 2005, pp. 85-102.



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