

Factors of Adoption for Integrated Management Centers by Metropolitan Governments for Disaster Resource Operation

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Abstract

This study was conducted with the aim of enhancing the applicability of the Regional Disaster Management Resource Hub Centers (RDMRHC) operated by local governments in Korea, which were planned under the initiative of the central government. The primary purpose of this study is to apply the Technology Acceptance Model (TAM) to increase local governments' acceptance of RDMRHC and to derive implications for the central government's policy implementation for efficient resource management. The analysis results showed that perceived ease of use had a greater impact on the intention to use than perceived usefulness. Several implications can be drawn from these findings. First, it should be clarified that local governments need to find it easy to operate the disaster management resource hub centers, rather than focusing solely on their advantages or efficiency. Second, this study did not verify a complete TAM. It is necessary to investigate the external antecedent variables and explore the factors influencing perceived ease of use to reflect them in the policy.

Key words: regional disaster management resource hub center, local government, perceived ease of use, perceived usefulness, behavioral intention to use

I. Introduction

Recently, Government in Korea has introduced Regional Disaster Management Resource Hub Center (RDMRHC) to enhance the efficiency of disaster resource management during emergencies in 2023. However, the discussion on RDMRHC in Korea was initiated by the central government, and local governments have been compelled to unilaterally accept the central government's decisions. As a result, it is challenging for local governments to understand the disaster response benefits they will gain from operating these hub centers, and there is a lack of understanding of the technology.

In general, disaster relief activities are distributed from the supply point of first aid supplies, food, equipment and search and rescue team to a wide range of geographically dispersed destinations in the disaster area, evacuating the victims from the disaster area, and transfer activities are related to (Barbarosoglu et al., 2002: 118; Adiguzel, 2019: 213). Especially, Natural disasters lead to extended damage and the onset of extremely high demands for certain supplies. These aspects must be addressed as quickly as possible. The latter needs the coordination among relief suppliers and transportation providers to assist victims in a timely manner (Akkihal, 2006; Garrido, 2020: 2374). And the needs of vulnerable people in need and to ensure that both products and materials and the relevant information are storage and origin point, needed for efficient streaming to the last point planning, implementation and control of activities is necessary. This constitutes disaster logistics (Thomas and Kopczak, 2005: 2; Börühan, Ersoy, 2013:3; Adiguzel, 2019: 213).

But logistics management is a complex task, even in the absence of anomalous conditions. It is so because it aims to satisfy demands in the best possible way considering different aspects such as time and budget constraints, unexpected demands, shortages, to mention a few elements. Emergency logistics finds an even more complicated environment to perform its duties. In fact, it must deal with deep uncertainty, poor communication between agents, deterioration in transportation networks, lack of knowledge about the magnitude of the encountered disasters, among many others that conform a set of extremely difficult constraints, conditioning the range of maneuvers available to decision makers (Garrido, 2020: 2369). To address these issues, Local Governments (suppliers) own or lease warehouses to store their products for subsequent distribution. These facilities must be strategically located to serve specific geographical areas. Additionally, at least one facility should be positioned in each potentially affected area. Thus, it is needed a useful facility to assist authorities in the optimal location/allocation of resources such as supplies, human resources or transportation capacity. The optimal location/allocation of resources includes the minimization of response time, thus mitigating the damaging effects of the disaster (Akkihal, 2006; Garrido, 2020: 2374).

Therefore, in this paper TAM is used to study the acceptance of the Regional Disaster Management Resources Hub Center (RDMRHC). The research presented here is motivated and guided by two main questions. First, local government officers and experts would like to accept model of RDMRHC or vice versa? Second, what are the factors that are significant in explaining the intention towards RDMRHC?, that is, do the attitudinal beliefs such as perceived ease of use and perceived usefulness have a relationship towards the RDMRHC operation?

This study aims to identify the needs of local officials and experts for the technology acceptance of a Regional Disaster Management Resources Hub Center. This will serve as the foundation for policy design in operating emergency logistics centered around the Regional Disaster Management Resources Hub Center.

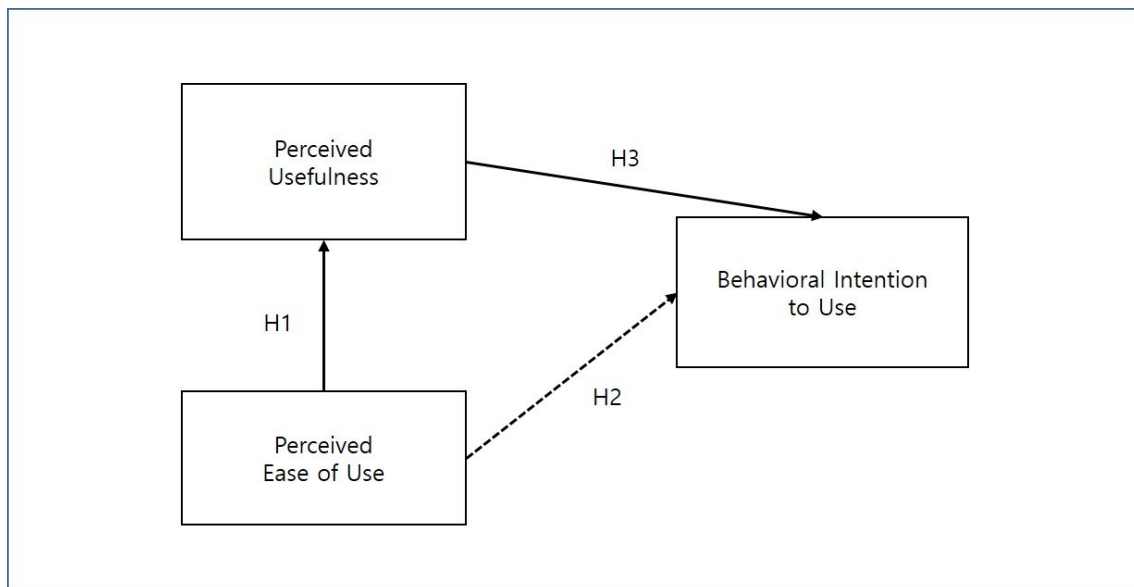
II. Theoretical Framework

1. Technology Acceptance Models

The technology acceptance model (TAM), introduced by Fred Davis more than a quarter century ago, became a dominant model in investigating factors affecting users' acceptance of the technology. The TAM presumes a mediating role of two variables called perceived ease of use and perceived usefulness in a complex relationship between system characteristics (external variables) and potential system usage (Marangunić & Granić, 2015: 81). That is, TAM proposes that perceived ease of use and perceived usefulness of technology are predictors of user attitude towards using the technology, subsequent behavioral intentions and actual usage (Masrom, 2007: 3). In TAM, perceived usefulness refers to the degree to which the user believes that using the technology will improve his or her work performance, while perceived ease of use refers to how effortless he or she perceives using the technology will be. Both are considered distinct factors influencing the user's attitude towards using the technology, though perceived ease of use is also

hypothesized to influence perceived usefulness and attitude towards using the technology. Finally, such attitude towards using the technology determines the behavioral intention to use that technology (Masrom, 2007: 3). But the research model in the study is a reduced TAM model, excluding actual system use and attitude toward using. Because of The technology acceptance model (TAM) was first created by Davis (1989), based on the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975; Masrom, 2007: 2) in psychology research. The TRA posits that individual behavior is driven by behavioral intention where behavioral intention is a function of an individual's attitude toward the behavior and subjective norms surrounding the performance of the behavior. In other words, it states that ones behavior and the intent to behave is a function of one's attitude toward the behavior and their perceptions about the behavior. Therefore, behavior is the function of both attitudes and beliefs (Masrom, 2007: 3). Since there is no intention to examine antecedents to perceived usefulness and perceived ease of use, the external variables constructs are also not included in the research model. Figure 1 depicts the research model employed in the study.

Figure 1. The Research Model (A technology usage model for RDMRHHC)



Therefore, the research hypotheses are:

- H1. Perchived ease of use has a significant effect on the perceived usefulness
- H2. Perchived ease of use has a significant effect on the behavioral intention to use
- H3. Perceived usefulness has a significant effect on the behavioral intention to use

III. Research Methodology

1. Sample

This survey was conducted over the course of one month in May 2022, targeting local government

officials responsible for disaster management resources and disaster management scholars in Korea. The survey examined perceptions regarding the introduction of RDMRHC for the efficient operation of disaster management resources. The survey respondents included 60 local government officials and 91 disaster management experts (N=151). Each participant was asked to fill out a single-page questionnaire indicating agreement or disagreement with each statement on a 5-point Likert-type scale with the end points being “strongly disagree” and “strongly agree”.

2. Measures

The reliability analysis was conducted in order to ensure the internal validity and consistency of the items used for each variables. Table 1 shows the reliability of the measurement scales. Cronbach’s alpha reliability scores were all over 0.8, which is considered very good (Nunnally, 1978). Thus, the results demonstrate that the questionnaire is a reliable measurement instrument.

Table 1. Reliability

Scale	Cronbach's alpha
perceived ease of use (4)	0.904
perceived usefulness (4)	0.895
behavioral intention to use (6)	0.931

To examine construct validity of measures adopted in this study, a factor analysis was performed. Three factors were requested, based on the fact that the items were designed to index three constructs: perceived ease of use, perceived usefulness, and behavioral intention to use. All factor loadings were 0.6 or above, showing good convergent validity (Chesney, 2006). Table 2 displays the items and factor loadings for the rotated factors.

Table 2. Results of Factors Analysis

Scale Item	1	2	3
perceived ease of use 1	0.184	0.391	0.798
perceived ease of use 2	0.217	0.404	0.826
perceived ease of use 3	0.200	0.387	0.810
perceived ease of use 4	0.306	0.052	0.694
perceived usefulness 1	0.251	0.740	0.347
perceived usefulness 2	0.221	0.797	0.355
perceived usefulness 3	0.406	0.727	0.169

perceived usefulness 4	0.326	0.791	0.300
behavioral intention to use 1	0.768	0.361	0.122
behavioral intention to use 2	0.613	0.418	0.233
behavioral intention to use 3	0.779	0.245	0.228
behavioral intention to use 4	0.805	0.235	0.251
behavioral intention to use 5	0.883	0.186	0.207
behavioral intention to use 6	0.880	0.178	0.221
% of variance explained	31.25	23.52	22.13
Cumulative percentages	31.25	54.77	76.91

Principal axis factoring was used with varimax rotation and Kaiser normalization, N = 151

Rotation converged in six iterations.

Factor 1=Perceived usefulness; Factor 2=Perceived ease of use; Factor 3=Behavioral Intention to use

IV. Results and Analysis

The research model shown in Figure 1 was tested using SPSS 25.0 software. Demographic variables were dropped from further analysis in this study.

Separate linear regression analyses were conducted based on 151 completed surveys collected from the study. In testing Hypothesis 1 (H1), a regression analysis was performed, with perceived ease of use as an independent variable and perceived as the dependent variable. Hypothesis 1 (H1) was supported.

Table 3. Regression results for H1

Factor	β	Standard Error of β	t	p	Adjusted-R ²
perceived ease of use	0.704	0.687	11.552	0.000	0.469

a. dependent variable: perceived usefulness

Hypothesis 2 (H2) and Hypothesis 3 (H3) were tested by regressing both perceived ease of use and perceived usefulness on behavioral intention to use the RDMRHC. Table 4 provided results from the regression analysis for both H2 and H3. As shown in Table 4, H2 and H3 are both supported.

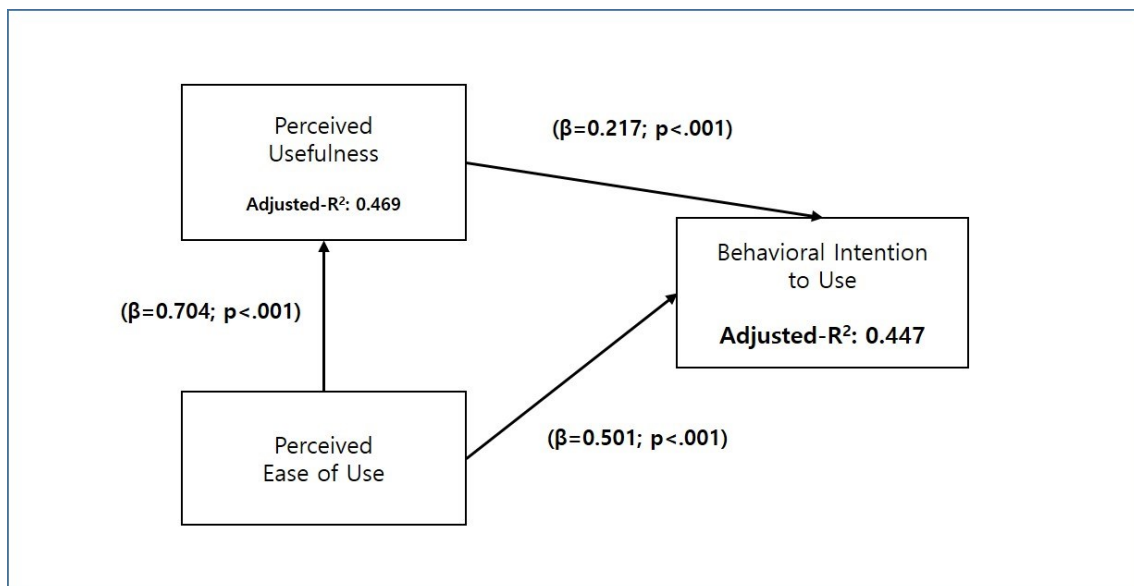
Table 4. Regression results for H2 and H3

Factor	β	Standard Error of β	t	p	Adjusted-R ²
perceived ease of use	0.501	0.502	6.002	0.000	0.447
perceived usefulness	0.217	0.223	2.664	0.009	

a. dependent variable: behavioral intention to use

This study examined TAM regarding the acceptance of RDMRHC by local government officials and experts. The analysis results showed that perceived ease of use had a significant effect on perceived usefulness, supporting the existing explanation of TAM. Additionally, both perceived ease of use and perceived usefulness were found to influence the determination of usage intention. Contrary to TAM's hypothesis, perceived ease of use was found to be more important than perceived usefulness in determining usage intention. This is predicted to reflect the limitations of TAM's applicability concerning user groups, policy designers, or both. Simultaneously, considering the importance of perceived ease of use, it indicates that policy designers should consider emphasizing the ease of use of technology rather than its usefulness in their policy explanations.

Figure 2. Summary of hypotheses testing



V. Conclusions and Recommendations

This study was conducted with the aim of enhancing the applicability of the Regional Disaster Management Resource Hub Centers (RDMRHC) operated by local governments in Korea, which were planned under the initiative of the central government. The primary purpose of this study is to apply the Technology Acceptance Model (TAM) to increase local governments' acceptance of RDMRHC and to derive implications for the central government's policy implementation for efficient resource management. The analysis results showed that perceived ease of use had a greater impact on the intention to use than perceived usefulness. Several implications can be drawn from these findings. First, it should be clarified that local governments need to find it easy to operate the disaster management resource hub centers, rather than focusing solely on their advantages or efficiency. Second, this study did not verify a complete TAM.

It is necessary to investigate the external antecedent variables and explore the factors influencing perceived ease of use to reflect them in the policy. Future research should investigate by adding external variables based on the TAM model variables.

References

- A. R. Akkihal. 2006. *Inventory Pre-positioning for Humanitarian Operations*, Master's Thesis. Massachusetts Institute of Technology.
- Adiguzel, Selminaz. 2019. Logistics Management in Disaster. *Journal of Management, Marketing and Logistics*, 6(4): 212-224.
- Barbarosoglu, G., Ozdamar, L. and Cevik, A. 2002. An Interactive Approach for Hierarchical Analysis of Helicopter Logistics in Disaster Relief Operations. *European Journal of Operational Research*, 140(1): 118-33.
- Börühan, G., Ersoy, P. and Tek, Ö. B. 2012. *Preliminary Importance of Logistics Planning and Checklist Method in Disaster Management*. National Logistics and Supply Chain Congress, Konya University. National Logistics and Supply Chain Congress.
- Chesney, T. 2006. An Acceptance Model for Useful and Fun Information Systems. *Human Technology*, 2(2): 225-235.
- Davis, F. D. 1989. Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology. *MIS Quarterly*, 13(3): 319-339.
- Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. 1989. User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8): 982-1003.
- Fishbein, M. and Ajzen, I. 1975. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.
- Marangunić, Nikola and Andrina Granić. 2014. Technology Acceptance Model: A Literature Review from 1986 to 2013. *Universal Access in the Information Society*, 14: 81-95.
- Nunnally, J.C. 1978. *Psychometric Theory*, (2nd ed.). New York: McGraw-Hill.
- Rodrigo A. Garrido. 2020. Emergency Logistics for Disaster Management under Spatio-temporal Demand Correlation: The Earthquakes Case. *Journal of Industrial and Management Optimization*, 16(5): 2369-2387.
- Thomas, Anisya S. and Laura R. Kopczak. 2005. *From Logistics to Supply Chain Management: The Path Forward in the Humanitarian Sector*. Fritz Institute. <http://www.fritzinstitute.org/PDFs/WhitePaper/FromLogisticsto.pdf>, 26/03/2017.