RANKING FOR TECHNOLOGY INFLUENCING FACTORS TOWARDS LOCATION BASED SERVICES ADOPTION IN E-GOVERNMENT

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Abstract

E-government is known to have adopted the use of location-based applications. This study identifies the technological factors that influence the adoption of location-based services (LBS) in e-government application from the perspective of public sector in Malaysia. The technological factors were identified through previous work and expert studies to determine important elements for the adoption of LBS in e-government applications. In this research, the fuzzy Delphi method was used to obtain the result. Therefore, 12 experts from e-government and LBS participated in the process. The result of this study was a consensus on 10 important elements of the technological influencing factors of e-government: integrated services; near real-time information; emergency alert; sustainability; compatibility; rapid provision of information; provision of useful information; reliability; ease of use (usability); and privacy. These factors were then ranked using the fuzzy Delphi method as the consensus of the expert study.

Keywords: *Location based services, e-government, technological influence, technology adoption, Fuzzy Delphi Method*

1. Introduction

LBS can be recognized by the technology that provides mobile users with real-time location information, which is essential for many e-government services. Because it is a critical function for e-government applications, the strategy for implementing LBS includes four elements: People, Processes, Technology, and Data, which are not interdependent (Obi & Iwasaki, 2015). In this study, ten technological influencing factors were identified and ranked using the fuzzy Delphi method (FDM). The result will help the government to improve, innovate and achieve its strategic goals. Knowing how useful each influencing factor is could help in decision making for e-government.

2. Overview

2.1 E-Government and Location Based Services

E-government is known for using location-based services for almost all of its applications. During the Covid 19 pandemic, the public sector in Malaysia relied on LBS technology accessible through mobile phones and the capabilities of GPS and the Internet to locate critical infected areas and warn people to quarantine them to control the spread of infection.

2.2 Ranking the consensus using FDM

FDM is widely used in many fields such as management, healthcare, physical science and engineering including information systems (Saffie, Shukor, et al., 2016). FDM and the Delphi method (DM) differ by using probability theory instead of mathematical concepts to account for the fuzziness of natural language in decision making (Saffie, Shukor, et al., 2016). DM uses absolute numbers to account for expert judgment. FDM was initiated by Murray et al. to resolve ambiguity in DM (Murray, Pipino, & Gigch, 1985). Ishikawa et al. developed the FDM algorithm using the Max-Min fuzzy Delphi method and improved the new DM by fuzzy integration (Ishikawa et al., 1993). In the improved version, the weighted intuitionistic FDM is proposed to achieve better conclusions (Garai et al., 2013).

2.3 Study Setup

Data collection involved experts study setup by 12 experts (Jones and Twiss, 1978) in e-government and LBS domain were participated in the process. Three category of experts; public sectors developer; vendors; and project management teams were provide in the study protocol. Furthermore, they had at least 10 years of experience related to development in LBS, e-government and competent.

Experts then determine the importance weight of technology influencing factors of 7 variables importance weightage range from “Strongly Least Important”, “Highly Least Important”, “Least Important”, “Fairly Important”, “Important”, “Highly Important” and “Strongly Important”. Scale of fuzzy were determine as Table 1.

Table 1: Variable and importance weight of criteria

Variable	Scale Fuzzy		
Strongly Least Important	0	0	1
Highly Least Important	0	0.1	0.3
Least Important	0.1	0.3	0.5
Fairly Important	0.3	0.5	0.7
Important	0.5	0.7	0.9
Highly Important	0.7	0.9	1
Strongly Important	0.9	1	1

Average rating with value determined according to formula specified:

= SQRT [1/3*((m1^2)+(m2^2)+(m3^2))

3. Findings

Findings of ten technology influencing factors towards LBS in e-government during experts study were listed in Table 2. 12 Experts had evaluate and weighted the factors.

Table 2: Features Description of Technological Factors

Item / Element
Integrated services
Information almost Real-time
Emergency alert
Sustainability
Compatibility
Provide fast information
Provide useful information
Reliability
Simple to use (ease of use)
Information privacy

Triangular Fuzzy Number Rules were used to gain the Threshold and Expert group agreement. The Average rating of the items were specified using the Threshold value, d. Value d that <0.2 shown that all experts have reached a consensus agreement and shown that Expert Group agreement percentage as in Table 3. All 10 items received more than 75% consensus agreement. Agreement percentage is reached by counting the percentage of experts reaching the threshold value in the consensus agreement process.

Table 3: Features Description and Threshold Value, d and Agreement Percentage.

Item / Element	***Triangular Fuzzy Numbers RULES***	
	***Threshold Value*, d**	**Expert Group Agreement Percentage, %**
Integrated services	0.068	100.00%
Information almost Real-time	0.126	91.67%
Emergency alert	0.119	91.67%

Sustainability	0.119	91.67%
Compatibility	0.119	91.67%
Provide fast information	0.111	91.67%
Provide useful information	0.111	91.67%
Reliability	0.111	91.67%
Simple to use (ease of use)	0.094	91.67%
Information privacy	0.180	83.33%

Defuzzification process and evaluation are used to provide the most reliable methods of ranking for this implementation. This process involves complex numbering and alternative method by using mathematical formulas to rank. Fuzzy Score (A) formula is Amax = 1/3* (m1+m2+m3). Table 4 shown the findings of the Fuzzy Score (A).

Table 4**:** Defuzzification Process Rules

Item / Element	***Defuzzification Process RULES***			
	m1	**m2**	**m3**	***Fuzzy Score (A)***
Integrated services	0.767	0.933	1.000	0.900
Information almost Real-time	0.767	0.917	0.975	0.886
Emergency alert	0.750	0.908	0.975	0.878
Sustainability	0.750	0.908	0.975	0.878
Compatibility	0.750	0.908	0.975	0.878
Provide fast information	0.733	0.900	0.975	0.869
Provide useful information	0.733	0.900	0.975	0.869
Reliability	0.733	0.900	0.975	0.869
Simple to use (ease of use)	0.700	0.883	0.975	0.853
Information privacy	0.717	0.875	0.950	0.847

4. Results

The technology influencing factors were accepted by all experts and the weightage were listed according to ranking in Table 5. The three top ranking of most influence items were integrated services, information that almost real-time and emergency alert. These were followed by sustainability; compatibility; fast information; useful information; reliability; simple to use; and information privacy.

Table 5: Expert Consensus, weight accepted and ranking

Item / Element	Expert Consensus	Element ACCEPTED	Ranking
Integrated services	Accepted	0.900	1
Information almost Real-time	Accepted	0.886	2
Emergency alert	Accepted	0.878	3
Sustainability	Accepted	0.878	4
Compatibility	Accepted	0.878	4
Provide fast information	Accepted	0.869	6
Provide useful information	Accepted	0.869	7
Reliability	Accepted	0.869	7
Simple to use (ease of use)	Accepted	0.853	9
Information privacy	Accepted	0.847	10

5. Conclusion

The findings and results show that the expert study proved that integrated services, near real time information, emergency alert, sustainability, compatibility, fast information, useful information, reliability, ease of use and privacy are the most important technological influencing factors in LBS. This study aims to prove that the fuzzy Delphi method is useful and reliable in reaching a consensus on weighting and ranking the most important items in the study other than just these items in this study only.

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