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Acceptance of Health Information Systems in Sri Lanka using Fuzzy Set Qualitative Comparative Analysis

Introduction

The global doctor-patient ratio is 17 per 1000 population, however, it is 1.23 per 1000 population in Sri Lanka [1]. As it is far behind the expected numbers, the Sri Lankan public health sector is facing challenges in providing efficient services to citizens free of charge, including surgeries and cancer treatments. Looking at Nordic countries adoption of HIS has reached 95%-100% and the health sector has been digitalized using powerful Health Information Systems (HIS) in the form of Electronic Health Records (EHR), Personal Health Records (PHR), and Electronic Medical Records (EMR). The Government of Sri Lanka (GoSL) has launched various initiatives to digitalize the public health sector and trailed Hospital Health Management Information Systems (HHMIS). However, it is noted that the acceptance of HIS is low among healthcare stakeholders. The empirical findings suggest the main reasons for low acceptance could be issues relating to usability. Therefore, this study is focused on identifying the factors impacting the acceptance of HIS by doctors and nurses in the public health sector.

Background

Information Systems theories were developed to assess the technology acceptance among the users namely the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and UTAUT2 are widely adopted to assess the acceptance of technology. The TAM has been a base model for UTAUT to evolve and UTAUT2 was expanded further by the researchers including more dynamic variables to assess the acceptance of technology [2]. These models were not developed specifically for the health sector and research highlights that these models do

not have adequate factors to evaluate the acceptance of HIS among the healthcare stakeholders [3]. A closer analysis of existing studies shows that these three models have emphasized three main variables and TAM has been a suitable fit for the Sri Lankan context with the highest predictive power [4]. The usefulness that highlights the system should benefit the user by reducing the workload and increasing efficiency. Ease of use refers to that the users expect the systems to be designed for easy access and learning quickly and the attitude of the users on perceiving the technology can impact the actual use of the Information Systems.

Methodology

The study was conducted among the doctors and nurses affiliated with the Western Province teaching hospitals, which use HIS. Purposive and snowball sampling was chosen to collect data as the hospitals were not fully utilizing HIS. The researchers set a criterion as a "minimum of 1 year of experience of using HIS" is required to participate in the study and direction HIS occupied units were gathered from the participants. A total of 101 doctors, including House Officers to Consultants, and 69 nurses, including Nursing Officers to Matrons participated, resulting in the sample size reaching 170. The questionnaire was developed based on standard models [2] to measure the independent variables Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Attitude (ATT), and the dependent variable actual use of HIS as in Figure 1. The fuzzy set Qualitative Comparative Analysis (fsQCA) was chosen for the data for several reasons. First, this method allows a small data set to be analyzed. Second, it identifies necessary conditions and figures out various combinations. Third, it is easy to use and understand the results for the researchers to explain and conclude [5].

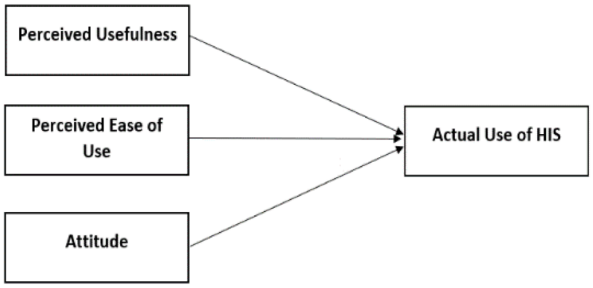

Figure 1: Research Model

Data Analysis and Discussion

The data analysis consisting various steps and processes. First, the researchers assessed the data reliability, and the values for Cronbach's alpha, composite reliability, are above the threshold of 0.7 and the Average Variance Extracted (AVE) is 0.5 [5]. Second, the data calibration is the core part as it is necessary to convert the data into fuzzy values. The researchers identified three qualitative breakpoints to calibrate the data which are minimum, average, and maximum values for the Likert scale of 7 and the data has been calibrated into the three thresholds 1, 5, and 7. Third, truth table analysis was applied to perform the standard analysis [5]. Table 1 shows the findings of intermediate solutions.

Table 1 Intermediate Solution of the fsQCA Method
Complex, parsimonious, and intermediate solutions were generated. The researcher considered parsimonious and intermediate solutions to analyze as complex solutions including configurations with several terms. The analysis reveals that the results of both configurations PU and PEOU*ATT indicate promising aspects. The configuration's raw coverage and consistency have high values, exceeding 0.7 and 0.8 respectively. These values are reliable indicators of the actual usage of the HIS. It is important to emphasize that the coverage values are below the threshold for both configurations however, both configurations lack distinctiveness in their explanatory capacity.

Since both configurations show higher raw coverage and consistency, perceived usefulness emphasizes that the doctors and nurses expect the systems to provide more benefits and reduce the workload. Perceived ease of use highlights that the systems should be designed to be used easily in a stressful and unpredictable work environment. Furthermore, the attitude of the healthcare professionals will impact the actual use of HIS. Therefore, hospital directors and policymakers should create awareness of HIS and provide continuous training to keep a positive attitude.

Table 2 displays the outcomes of the Necessary Condition Analysis (NCA) for the research model. The PU, PEOU, and ATT coverage scores are all greater than 0.7 in the high degree of actual use

Table 1: Intermediate Solution of the fsQCA Method

Path	PU	PEOU	ATT	Raw Coverage	Unique Coverage	Consistency
PU	●			0.712	0.075	0.847
PEOU*ATT		●	●	0.764	0.127	0.826
Overall solution coverage = 0.839				Overall solution consistency = 0.794		
● large circle indicates the presence of the core condition and ● small circle indicates the presence of the peripheral condition; PU: Perceived Usefulness; PEOU: Perceived Ease of Use; ATT: Attitude.						

of HIS. It is important to highlight that the consistency scores for ATT and PEOU are above 0.8, while the consistency score for PU is above 0.7. These findings confirm that the PU, PEOU, and ATT are highly predictive of the adoption of HIS in the Sri Lankan healthcare setup. Looking at the low degree, PU stands out as its consistency is above 0.9 and coverage score is 0.7. This highlights the significance of offering training and fostering a greater understanding of HIS to effectively alter attitudes positively. Insufficient resources, support, and facilities can have a detrimental effect on one's attitude. More importantly, the systems should reduce the workload of the healthcare staff to increase adoption.

Table 2: Necessary Condition Analysis

	Higher Degree of Actual Use		Low Degree of Actual Use	
	Consistency	Coverage	Consistency	Coverage
PU	0.712	0.847	0.387	0.704
~PU	0.751	0.445	0.916	0.830
PEOU	0.826	0.761	0.507	0.714
~PEOU	0.690	0.478	0.830	0.879
ATT	0.876	0.711	0.429	0.655
~ATT	0.648	0.500	0.767	0.904
~ denotes negation; PU: Perceived Usefulness; PEOU: Perceived Ease of Use; ATT: Attitude				

Conclusion

The healthcare sector across the world is replacing the traditional pen and paper with powerful HIS. As the doctor-patient ratio is decreasing in Sri Lanka, it is important to digitalize the health sector to manage patients effectively. The study reveals that PU is the core condition for the acceptance of the HIS, while PEOU and ATT are peripheral conditions. The result of the study emphasizes that the users are expecting the systems to have useful functionalities, that can reduce their workload and the system to be designed in a user-friendly manner. Furthermore, research highlights that policymakers and hospital directors should focus on training and awareness campaigns to create positive attitudes among healthcare practitioners as it impacts the actual use of HIS.

References:

[1] P. Rajmohan and G. M. Johar, "Adoption of the Internet of Things in the Healthcare Services of Sri Lanka," International Journal of Recent Technology and Engineering, vol. 9, no. 1, pp. 1095-1104, 2020.

[2] V. Venkatesh, J. Y. L. Thong and X. Xu, "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology," MIS Quarterly, vol. 36, no. 1, pp. 157-178, 2012.

[3] S. Aljarboa and S. J. Miah, "Acceptance of Clinical Decision Support Systems in Saudi Healthcare Organisations," Sage Journals, vol. 39, no. 1, pp. 81-106, 2023.

[4] T. Senthilrajah and S. Ahangama, "An Analysis of the Use of Health Information Systems in Public Healthcare in Sri Lanka Using the Technology Acceptance Model," in 4th International Conference on Advanced Research in Computing (ICARC), Belihuloya, 2024.

[5] I. O. Pappas and A. G. Woodside, "Fuzzy-set Qualitative Comparative Analysis (fsQCA): Guidelines for Research Practice in Information Systems and Marketing," International Journal of Information Management, vol. 58, 2021.

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