

RANKING FACTORS INFLUENCING THE SELECTION OF PAYMENT METHOD USING FUZZY ANALYTIC HIERARCHY PROCESS (FAHP)

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Abstract

The shift in digital technologies has changed how people conduct financial transactions. However, the wide range of payment options can be overwhelming. This study identifies the most important factors influencing payment method preferences and prioritises the available options. Data were gathered from vendor representatives, lecturers, and student leaders through questionnaires. The evaluation focused on acceptance, accessibility, convenience, cost benefits, speed, and security. Using the Fuzzy Analytic Hierarchy Process, results showed that digital payment was the most preferred option with a weight of 0.4782, followed by card at 0.3139 and cash at 0.2040. Security was the most important factor overall with a weight of 0.2518, followed by convenience at 0.2255 and speed at 0.2041. These findings offer useful insights for supporting a cashless environment.

Keywords: *Fuzzy AHP, payment methods, cashless campus, digital payment, decision-making*

1. Introduction

The development of payment systems in Malaysia has been underway for the last thirty years. Card-based payment systems such as credit and debit cards emerged in the mid-1970s, marking Malaysia's first attempt towards a cashless society (Loke, 2007). However, a considerable number of Malaysian consumers still favored cash transactions over digital payment options long after they became available (Loh et al., 2021). In recent years, the widespread use of smartphones has contributed to the growing popularity of mobile payments. This case study focuses on the UiTM Perlis community and their common transactions, such as purchasing supplies and settling academic fees. Due to the variety of payment options available, users often face difficulty in selecting the most appropriate method. Therefore, this study aims to rank the factors that influence the selection of payment methods and to prioritise the available options. Six criteria and three alternatives were assessed based on input from six expert respondents comprising two vendors, two lecturers, and two student representatives.

2. Methodology

This study applies the Fuzzy Analytic Hierarchy Process (FAHP) to assess factors influencing payment method selection within the UiTM Perlis community. The methodology focuses on systematically capturing expert evaluations based on subjective judgments, which are difficult to quantify using traditional techniques. Data were gathered from six experts consisting of two vendors, two academic lecturers and two student representatives through a structured questionnaire. The questionnaire was divided into three sections where Section A contained background information, Section B focused on pairwise comparisons between criteria, and Section C compared alternatives under each criterion. The pairwise comparison matrices were constructed using Saaty's 1 to 9 scale and were transformed into fuzzy triangular numbers to reflect human uncertainty (Saaty, 1980). These fuzzy matrices were then tested for consistency using the Consistency Ratio (CR) to ensure logical coherence in expert evaluations. Only matrices with consistency values below the threshold of 0.1 were accepted for further analysis. All valid matrices were aggregated into a single group matrix. Next, the fuzzy geometric mean method was applied to calculate synthetic extent values and

determine fuzzy weights for each criterion. These weights were then normalised and defuzzified to obtain crisp values. The final ranking of criteria and alternatives was based on these values, providing a structured and flexible framework for evaluating payment method preferences at UiTM Perlis.

3. Results / Findings

The analysis identified security as the most influential criterion overall with a weight of 0.2518. This was consistently prioritised by vendors and students, highlighting concerns over data protection and fraud. Convenience followed with a weight of 0.2255, showing that users across all groups value ease of use and frictionless experiences. Speed ranked third with a weight of 0.2041, particularly important for vendors and students who require efficient service in time-sensitive environments. Cost benefits and accessibility were moderately valued, while acceptance was the least important factor with a weight of 0.0321. In terms of alternatives, digital payment emerged as the most preferred method with a weight of 0.4782. This option was consistently ranked first by all three respondent groups due to its integration with mobile platforms, ease of use, and security features. Card payment ranked second with a weight of 0.3139, remaining relevant for formal and higher-value transactions. Cash was ranked lowest with a weight of 0.2040, indicating a shift away from physical currency, especially among students. These results support UiTM's move towards cashless initiatives and reflect broader trends in digital adoption.

4. Novelty of Research

This study applies the Fuzzy Analytic Hierarchy Process (FAHP) to assess how the UiTM Perlis community selects payment methods, focusing on vendors, academic lecturers, and students. Unlike previous studies that only use general surveys or fixed-ranking tools, the use of FAHP is to handle the uncertainty and subjectivity involved in decision-making (Alyamani & Long, 2020). The novelty lies in how it combines expert judgment with a structured evaluation process that reflects real-world preferences under unclear conditions. By focusing on a specific academic setting, the findings offer a more practical insight into how digital payment methods are received in line with the university's cashless strategy. The study also contributes to how FAHP can be applied in small community-based environments to produce more accurate and relevant results for policy or service improvements.

5. Conclusion

This study successfully identified and ranked payment method criteria using FAHP, with digital payment emerging as the top choice across all respondent groups. Future research is encouraged to expand the respondent profile and apply alternative methods like Fuzzy TOPSIS to explore additional factors influencing digital payment adoption and user decision-making behaviour.

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