| **https://doi.org/10.24035/ijit.29.2026.365** | | | |
|---|---|---|---|
| Received: | 18 December 2025 | Accepted: | 23 April 2026 |
| Revised: | 23 January 2026 | Published: | 15 June 2026 |
| Volume: | 29 (June) | Pages: | 242-254 |

**To cite:**
Pick-Soon Ling, Fatin Iman Yusof, Hanini Ilyana Che Hashim & Kelvin Yong Ming Lee. 2026. Intention to adopt mobile halal verification applications on the authenticity of the halal certification**.** *International Journal of Islamic Thought*. Vol. 29 (June): 242-254.


# Intention to Adopt Mobile Halal Verification Applications on the Authenticity of the Halal Certification

PICK-SOON LING*[1], FATIN IMAN YUSOF[2], HANINI ILYANA CHE HASHIM[3] & KELVIN YONG MING LEE[4]

**ABSTRACT**

*The authenticity of the Halal certification labelled on the products has become one of the hot issues due to the unauthorised or uncertified Halal certification. Muslim consumers are required to verify the Halal certification to certify the authenticity of the certification. Severe mobile Halal verification applications (apps) have been introduced to facilitate the verification process, and this signifies the importance of these verification apps. Although numerous mobile technologies have been extensively investigated. However, the study on the adoption of the mobile Halal verification apps is still limited. Therefore, this study intends to bridge this research gap by identifying the factors that affect the adoption of mobile Halal verification apps. This study proposed an extended mobile technology acceptance model (MTAM) by including Halal awareness, Halal knowledge and attitudes. This study collected responses from 198 Muslim consumers through purposive sampling and further validated the proposed framework through the partial least squares-structural equation modelling (PLS-SEM). The results found that only attitudes and mobile usefulness have a significant effect on the adoption intention, with attitudes having the most influential effect. Besides, the four proposed predictors also displayed a significant indirect role on adoption intention through attitudes, with the mobile usefulness having the strongest indirect effect.*

***Keywords:***
*Halal awareness, halal knowledge, intention to use; mobile halal verification applications, mobile technology acceptance model.*

[1]**PICK-SOON LING***, Ph. D., (*Corresponding Author*), Lecturer at School of Business and Management, University of Technology Sarawak, 96000 Sibu, Sarawak, MALAYSIA. Email: ling.pick.soon@uts.edu.my [ORCID iD: 0000-0001-7036-2400].
[2]**FATIN IMAN YUSOF,** MBA., School of Business and Management, University of Technology Sarawak, 96000 Sibu, Sarawak, MALAYSIA. Email: pbm25090002@student.uts.edu.my [ORCID iD: 0009-0001-8677-9654].
[3]**HANINI ILYANA CHE HASHIM**, Ph. D., Lecturer at Faculty of Management, Universiti Teknologi Malaysia, 81310 Johor Bharu, Johor, MALAYSIA. Email: haniniilyana@uts.my [ORCID iD: 0000-0002-7732-8114].
[4]**KELVIN YONG MING LEE**, Ph. D., Lecturer at School of Accounting and Finance, Taylor's University, 47500 Subang Jaya, Selangor Darul Ehsan, MALAYSIA. Email: kelvinyongming.lee@taylors.edu.my [ORCID iD: 0000-0001-6884-1787].

## Introduction

The halal industry has experienced notable growth over the past few decades, and this has reflected the greater demand for Shariah-compliant products and services. The global halal food market will be around $1,978 billion in 2021 (Business Wire, 2022), and it is expected to propel the market to a staggering $3,907.7 billion by 2027. Besides, the global halal market holds immense importance for Muslims worldwide as the population grows steadily. The demographic shift underscores the global halal market's enduring significance and potential expansion. The global halal market, therefore, acts as a bridge between commerce and culture, reflecting the values and preferences of the global Muslim population. Its growth is not just a response to market trends but is intricately tied to Muslim communities' worldwide social, cultural, and religious preferences. As Muslims increasingly seek Shariah-compliant products, the global halal market becomes an essential conduit for fulfilling these objectives and contributing to the overall well-being and obligations of the Muslim population. These figures underscore the importance of the halal industry and its potential to continue thriving in the future.

In Malaysia, the authority that is responsible for halal certification is the Department of Islamic Development Malaysia (JAKIM), which consists of executing the halal certification system and owning the Malaysian halal logo. According to the Trade Description Act 2011, it is considered a violation to designate products with halal certification without certified by JAKIM, and the accredited regulatory entities have the authority to cancel or suspend trading permits for those who misuse or fabricate halal certification (Salaam Gateway, 2022). JAKIM has been Malaysia's exclusive halal certification organisation since the Trade Description Act was amended in 2011, and it is also the regulating body that monitors and enforces halal standards in Malaysia. In addition, Malaysia has established the first government body to regulate halal certification. Thus, local halal food products earn global trust and widespread acceptance (Malaysian Investment Development Authority, 2023). In this ever-changing setting, the development of halal certification verification apps signifies noteworthy technological progress that aims to simplify and enable well-informed and convenient decision-making for Muslim consumers in Malaysia.

However, the issue of misusing halal logos has become a hot topic in Malaysia, raising concerns about the authenticity of halal products. Recently, there have been a few cases of misuse, or the relevant authorities have caught false halal logos. The issue of misuse of halal certification marks has spread and become a hot topic throughout Malaysia. It raised the public and consumers' awareness and concern on the legality of labelling the halal logo on the products. This growing issue highlights the importance of Muslim consumers verifying the integrity of their halal products thoroughly before they purchase them. With the growth of mobile technologies, halal logo verification can now be done through mobile apps. These apps are specifically developed to check the halal status of products and provide them with a handy and accessible tool to quickly and efficiently validate the legitimacy of the halal certification using their mobile devices. With that, the Ministry of Religious Affairs (MoRA) also advises the Muslim community to carefully check food labels before buying. Thus, consumers can obtain information regarding the halal status of various products using their mobile devices, making the verification process more efficient and easily accessible. Unfortunately, these apps are not fully utilised, and there is a lack of awareness among Muslim consumers in Malaysia.

Additionally, numerous studies have explored the determinants factors that influence consumers or users to adopt several mobile technologies and apps, such as wearable payments (Loh *et al.*, 2019), mobile tourism (Wan *et al.*, 2022), mobile payment (Yan *et al.*, 2021; Ling *et al.*, 2025), mobile investment (Ling *et al.*, 2024a), mobile wallets (Lew *at al.*, 2021), mobile taxi booking (Lau *et al.*, 2021), mobile shopping (Ng *et al.*, 2022), and the like. Unfortunately, very limited research has particularly investigated the consumers' adoption intention of the mobile Halal certification verification apps, and further study is required to discover this area. Therefore, the study intends to identify the factors that affect Muslim attitudes (ATT) and behavioural intention (BI) to adopt mobile halal verification apps. The Mobile Technology Acceptance Model (MTAM) has been commonly adopted in previous research and has proven its suitability in

predicting mobile technology or application adoption. However, the two technology factors in MTAM (mobile ease of use (MEOU) and mobile usefulness (MU)) may limit the comprehensiveness of its predictability. With that, in line with most previous studies, this study further extends the MTAM with ATT, halal awareness (HA), and halal knowledge (HK) to represent the halal-related factors to capture better the unique feature of the study context, the mobile halal certification verification apps.

This study is expected to offer some significant contributions toward knowledge and industry. The findings are projected to discover the research gaps above and add evidence to the literature regarding mobile technology adoption. Besides, in practice, the findings are valuable for related stakeholders involved in the halal industry ecosystem. For regulators, a comprehensive study on the misuse of halal certification is crucial to identify and rectify regulatory gaps, ensuring the robustness of oversight mechanisms. Halal product manufacturers are vested in this research as it directly affects their brand credibility and market competitiveness. By understanding and addressing issues related to false halal certifications, manufacturers can enhance consumer trust, maintain the integrity of their products, and protect their investments in complying with halal standards. Retailers, as intermediaries in the supply chain, are impacted by the reliability of halal certifications. A thorough investigation into misuse ensures that retailers can confidently stock and promote genuinely halal products, reinforcing their commitment to meeting consumer expectations and ethical business practices. Consumers, particularly the Muslim community, stand to gain from this research as it directly influences their ability to make purchase decisions that are compliant with their religious beliefs. A transparent and trustworthy halal certification process ensures that consumers can rely on product labels, promote faith-based dietary practices and reinforce their confidence in the market. Therefore, this study is worthwhile as it addresses the concerns of regulators, governments, halal product manufacturers, retailers, and consumers alike.

## Literature Review and Hypotheses Development

### Mobile Technology Acceptance Model (MTAM)

MTAM has been commonly adopted in the context of mobile technologies and apps since its introduction by Ooi and Tan in 2016. Compared with other traditional technology acceptance models, MTAM is proposed to overcome the limitations that appeared in the prevailing prominent models, such as the mandatory use of technology in the organisational or working context (Ooi & Tan, 2016). Therefore, these traditional models may not be suitable for explaining the intention of mobile technology adoption on a personal voluntary basis. However, MTAM only consists of two predictors, MEOU and MU, which may restrict the model's predictability power, as these merely focus on technology-related factors. Therefore, the MTAM model has been extended to include two halal-related factors (HA and HK) and personal factors (ATT) to study the subject matter better. This is because the adoption of mobile halal certification verification apps is not only solely influenced by the two technology-related factors, but it is also expected that personal factors and halal-related factors also play crucial roles.

### MEOU on ATT and BI to Adopt

MEOU is defined as the perception of an individual toward the level of easiness of using mobile technology (Ooi & Tan, 2016). As remarked by Yan *et al.* (2021), the mobile technology use intention tends to be higher when it is easy to use. With that, a positive ATT toward the technology is expected if individuals believe that technology is user-friendly and effortless. Chong et al. (2021) and Ling *et al.* (2025) have proved this association whereas they concluded that MEOU positively correlates with users' ATT on mobile technologies. Moreover, the usage of the technology tends to be higher when it is user-friendly (Ng *et al.*, 2022), and this is agreed with the studies of Lew *et al.* (2021), Loh *et al.* (2022), and Wan *et al.* (2022), who documented the substantial role of MEOU on the adoption of mobile technology. Therefore, the hypotheses below were formulated.

H1: MEOU has positively influenced consumers' ATT.

H2: MEOU has positively influenced the consumers' BI to adopt mobile Halal certification verification apps.

MU on ATT and BI to Adopt

MU is the perception of an individual regarding the performance improvement that one might enjoy when using mobile technology (Ooi & Tan, 2016). The development in technology has improved the usefulness of mobile devices, and it might substantially affect the personal feeling of an individual toward the apps if they find that these apps would increase the performance of a particular behaviour. This is proved by Chawla and Joshi (2020) and Ling *et al.* (2025), who found that MU significantly influences ATT. In addition, when individuals perceive that the usage of mobile technology could improve their usefulness, the tendency to use such technology will increase. For instance, Wan *et al.* (2022) showed that MU substantially affect mobile tourism shopping intention. The role of the MU on the adoption intention of mobile technologies has also been remarked on in recent studies by Ling *et al.* (2025) on mobile payment and Ling *et al.* (2024a) on mobile investment. Thus, the following hypotheses were proposed.
H3: MU has positively influenced consumers' ATT.
H4: MU has positively influenced the consumers' BI to adopt mobile Halal certification verification apps.

HA on ATT and BI to Adopt

HA refers to having personal knowledge or being thoroughly knowledgeable about the current state of food, beverages, and other halal products (Nurhayati & Hendar, 2019). In this study, for an individual to have a favourable ATT and develop an intention to use mobile halal certification verification apps, they must likely possess an in-depth awareness of the concept of halal. Therefore, it is expected that consumers with high HA tend to have favourable ATT on verification apps. For instance, Handriana et al. (2021) and Irfany et al. (2024) found that HA significantly affects consumers' ATT. Besides, the substantial role of HA in BI has been acknowledged from different perspectives. For example, Bashir (2019) stated that the intention is positively affected by HA. Meanwhile, Azam (2016) also concluded that HA significantly affected Muslims' intention to buy halal packaged food. Accordingly, the study proposed the hypotheses below.
H5: HA has positively influenced consumers' attitudes.
H6: HA has positively influenced the consumers' BI to adopt mobile Halal certification verification apps.

HK on ATT and BI to Adopt

HK is defined as the level to which a person understands the halal concept (Nurcahyo & Hudrasyah, 2017). Therefore, it is referred to as awareness regarding acknowledgement and know-how about halal products. According to Loussaief *et al.* (2023), consumers who know halal products can become more aware of the legal matters related to halal standards. For an individual to want to utilise mobile halal certification verification apps in this study, an individual needs to understand the meaning of halal. Empirically, the substantial role of HK on ATT and BI was evidenced. For instance, Kasri et al. (2023) and Widyanto and Sitohang (2022) revealed that HK significantly influenced consumers' ATT. Besides, Berakon *et al.* (2021) further noted that HK is positively related to the intention to use halal tourism apps. The substantial role of HK in the purchase intention was also concluded by Widyanto and Sitohang (2022). Hence, the hypotheses below are formulated.

H7: HK has positively influenced consumers' attitudes.
H8: HK has positively influenced the consumers' BI to adopt mobile Halal certification verification apps.

ATT on BI to Adopt

ATT is the positive or negative feelings of an individual evaluation of their behaviour (Ajzen, 1991). With that, ATT is described as the intuition of individuals against mobile halal verification apps. An individual tends to have greater usage intention if they possess a good ATT towards that technology, or otherwise. ATT has been recognized as one of the key factors for BI. For instance, the substantial effect of ATT on the use intention on mobile investment has been revealed by Ling et al. (2024a). Likewise, the impact of ATT on mobile payment adoption was also reported by Flavian et al. (2020), while Bailey et al. (2020) also concluded the important role of ATT in mobile payment technology. Subsequently, the study suggests that:
H9: ATT has positively influenced the consumers' BI to adopt mobile Halal certification verification apps.

Indirect Effect of Predictors on BI to Adopt through ATT

Besides the direct influence, the study also further proposed that the four predictors (MEOU, MU, HA, and HK) may indirectly influence the intention to adopt mobile halal certification verification apps through ATT. As Khan et al. (2022) remarked, the predictors may posit an indirect effect on BI, even though these predictors have no direct impact on BI. Therefore, ATT is proposed as the mediator that may mediate the indirect relationship between these four predictors and intention to use. Besides, some empirical studies also revealed the mediation role of ATT. For example, Ling et al. (2024b) found a significant mediating influence of ATT in their study on socially responsible investment. Similarly, Rizkitysha and Hananto (2022) also documented that ATT can mediate the effect of perceived usefulness on the intention to purchase halal-labeled detergent. The indirect effect of the proposed predictors is also found in the literature in different contexts, such as Widyanto and Sitohang (2022), which documented that ATT mediated the effect of HK on purchase intention. Irfany et al. (2024) consistently concluded that ATT mediated the influence of halal green awareness and environmental knowledge on purchase intention. With that, the four predictors (MEOU, MU, HA, and HK) may not only directly influence the intention to adopt but also indirectly affect the intention to adopt through ATT, and the following hypotheses were proposed.

H10: The effect of MEOU on the BI to adopt is significantly mediated by ATT.
H11: The effect of MU on the BI to adopt is significantly mediated by ATT.
H12: The effect of HA on the BI to adopt is significantly mediated by ATT.
H13: The effect of HK on the BI to adopt is significantly mediated by ATT.

## Research Methodology

The quantitative data were gathered through an online questionnaire using the Google Forms platform. The targeted respondents are approached through purposive sampling, as only Malaysian Muslim consumers are invited to participate in the study. Two main criteria for the respondents' selections are (1) that they must be located in Malaysia and (2) that they must be Muslims. Through the data collection process from December 2024 until March 2024, the study has collected 198 usable responses, and this number met the required sample size of 166 based on the power analysis for the study's model.

In the study, a total of six constructs and 28 validated measurement items were adapted from past studies (Lew et al., 2021; Rostiani et al., 2024; Verma et al., 2020; Widyanto & Sitohang, 2022; Yan et al., 2021). The study has prepared a dual language questionnaire (English and Malay) and utilized the seven-point Likert scale to assess the agreement level.

In determining the appropriate analytic technique, the Mardia normality test is utilized to assess the multivariate normality of the responses, and the kurtosis coefficient (75.8502) is found to exceed 20 (Kline, 2011). This indicated the non-normally distributed responses and thus

confirmed the appropriateness of partial least squares-structural equation modelling (PLS-SEM) in validating the hypotheses (Hair et al., 2019).

## Analysis and Results

Table 1 provided the background information of the participating respondents and showed that around three-fourths were females (74.24%), while the remaining were male (25.76%). The majority of the respondents are between 21 and 30 years old (56.57%), followed by 31 to 40 years old (19.70%), and 51 years old and above (13.64%). Besides, around 54.04% of the respondents were married, and 44.44% were still single. Regarding professionals, 62.63% of respondents are public and private sector employees. The respondents' education level showed that most received tertiary education, and only 12.12% received secondary education.

**Table 1: Background Information of Respondents**

| Characteristic | Group | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 51 | 25.76 |
| | Female | 147 | 74.24 |
| Age Range | 20 YO & below | 3 | 1.52 |
| | 21 – 30 YO | 112 | 56.57 |
| | 31 – 40 YO | 39 | 19.70 |
| | 41 – 50 YO | 17 | 8.59 |
| | 51 YO & above | 27 | 13.64 |
| Marital Status | Single | 88 | 44.44 |
| | Married | 107 | 54.04 |
| | Others | 3 | 1.52 |
| Professional | Employee | 124 | 62.63 |
| | Self-Employed | 21 | 10.61 |
| | Students | 27 | 13.64 |
| | Housewife / House Husband | 17 | 8.59 |
| | Retirees | 9 | 4.55 |
| Education Level | Primary / Secondary Education | 24 | 12.12 |
| | Certificate / Diploma / Bachelor Degree | 150 | 75.76 |
| | Master / PhD Degree | 24 | 12.12 |

Table 2 presents that, except for four items (MU1, HA5, HK1 and HK5), all measurement items have loading values greater than 0.708 (Hair et al., 2017), confirming the item level's convergent validity. Similarly, the convergent validity was also verified as all the AVE values (ranging from 0.6270 to 0.8496) exceeded 0.5000 (Bagozzi & Yi, 1988). Besides, as all the composite reliability (CR) values (ranging from 0.8342 to 0.9576) are more than 0.7000 (Gefen et al., 2000), this further confirmed the internal consistency of the study. The study also uses the heterotrait-monotrait (HTMT) ratio of correlation for discriminant validity. The HTMT results in Table 3 proved that discriminant validity was also confirmed as HTMT values were lower than 0.8500 (Kline, 2011).

Additionally, the common method bias (CMB) issue has been assessed through the Harman single-factor test and full collinearity test. The results consistently showed that this has no CMB issue, as all the items also predicted 47.67% of the variations in the first factor (Podsakoff et al., 2003). Besides, the variance inflation factors (VIF) value from full collinearity (in Table 2) also revealed a similar conclusion, as the VIF values were not more than 5 (Hair et al., 2017).

**Table 2: Results of Reliability and Convergent Validity**

| Constructs | Items | Loading | AVE | CR | VIF |
|---|---|---|---|---|---|
| Mobile Ease of Use | MEOU1 | 0.8736 | 0.7797 | 0.9340 | 2.1320 |
| | MEOU2 | 0.8750 | | | |
| | MEOU3 | 0.8887 | | | |
| | MEOU4 | 0.8944 | | | |
| | MU2 | 0.8528 | 0.7699 | 0.9304 | 2.9610 |

| | | | | | |
|---|---|---|---|---|---|
| Mobile | MU3 | 0.8618 | | | |
| Usefulness | MU4 | 0.9033 | | | |
| | MU5 | 0.8909 | | | |
| Halal Awareness | HA1 | 0.8704 | 0.7268 | 0.9141 | 1.9850 |
| | HA2 | 0.8542 | | | |
| | HA3 | 0.8289 | | | |
| | HA4 | 0.8561 | | | |
| Halal | HK2 | 0.7751 | 0.6270 | 0.8342 | 1.8670 |
| Knowledge | HK3 | 0.7593 | | | |
| | HK4 | 0.8388 | | | |
| Attitudes | ATT1 | 0.9235 | 0.8496 | 0.9576 | 3.3960 |
| | ATT2 | 0.9394 | | | |
| | ATT3 | 0.9239 | | | |
| | ATT4 | 0.8997 | | | |
| Behavioural | BI1 | 0.8555 | 0.7797 | 0.9462 | 1.8580 |
| Intention | BI2 | 0.9264 | | | |
| | BI3 | 0.9208 | | | |
| | BI4 | 0.9376 | | | |
| | BI5 | 0.7627 | | | |

Table 3: Result of Discriminant Validity using HTMT

| | MEOU | MU | HA | HK | ATT | BI |
|---|---|---|---|---|---|---|
| **MEOU** | | | | | | |
| **MU** | 0.7825 | | | | | |
| **HA** | 0.4382 | 0.6194 | | | | |
| **HK** | 0.5399 | 0.6583 | 0.7504 | | | |
| **ATT** | 0.6604 | 0.7978 | 0.7268 | 0.7773 | | |
| **BI** | 0.5480 | 0.6321 | 0.5099 | 0.6030 | 0.6907 | |

The determination coefficient's ($R^2$) result shows that all predictors have a moderate effect in explaining ATT and BI to adopt. Specifically, MEOU, MU, HA, and HK could explain around 67.78% of the variance in ATT, while approximately 46.18% of the variance in BI to adopt was predicted by MEOU, MU, HA, HK, and ATT. In addition, the predictive validity of these predictors is also confirmed as the predictive relevancy ($Q^2$) values for both ATT (0.5660) and BI to adopt (0.3449) exceeded zero (Hair et al., 2017). Moreover, the effect size is also presented in Table 4. By using the guidelines of Cohen (1988), MEOU, HA, and HK have a small effect on ATT ($0.02 > f^2 < 0.15$), while MU has a medium effect on ATT ($0.15 > f^2 < 0.35$). However, only ATT possesses a small effect on BI to adopt ($0.02 > f^2 < 0.15$), and the remaining predictors have no effect on BI to adopt ($f^2 < 0.02$).

The hypotheses testing's results are presented in Tables 4 and 5, together with Figure 2. Firstly, the result in Table 4 revealed that six hypotheses were accepted, except for H2, H6, and H8. Precisely, MEOU (β = 0.1526), MU (β = 0.3467), HA (β = 0.2720), and HK (β = 0.2159) are significantly related with ATT, and accepting H1, H3, H5, and H7. However, for BI to adopt, the result showed that only MU (β = 0.1490) and ATT (β = 0.3963) are positively significant with BI to adopt (supporting H4 and H9), while no significant result is found for MEOU, HA, and HK. These findings showed that MU was the most crucial predictor of ATT, and ATT was the most crucial factor determining BI to adopt.

**Table 4: Results of Direct Hypotheses Testing**

| Hypo. | Path | Coef. | T-value | P-value | BCI-LL | BCI-UL | $f^2$ | Results |
|---|---|---|---|---|---|---|---|---|
| H1 | MEOU -> ATT | 0.1526 | 2.4567 | 0.0070 | 0.0481 | 0.2517 | 0.0354 | Accepted |
| H2 | MEOU -> BI | 0.1086 | 1.3700 | 0.0854 | -0.0183 | 0.2363 | 0.0104 | Rejected |
| H3 | MU -> ATT | 0.3647 | 4.6740 | 0.0000 | 0.2370 | 0.4992 | 0.1647 | Accepted |
| H4 | MU -> BI | 0.1490 | 1.8184 | 0.0345 | 0.0139 | 0.2794 | 0.0141 | Accepted |
| H5 | HA -> ATT | 0.2720 | 4.5851 | 0.0000 | 0.1805 | 0.3768 | 0.1308 | Accepted |
| H6 | HA -> BI | 0.0125 | 0.1250 | 0.4502 | -0.1424 | 0.1867 | 0.0001 | Rejected |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| H7 | HK -> ATT | 0.2159 | 3.3159 | 0.0005 | 0.1082 | 0.3190 | 0.0851 | Accepted |
| H8 | HK -> BI | 0.1120 | 1.2301 | 0.1094 | -0.0456 | 0.2546 | 0.0126 | Rejected |
| H9 | ATT -> BI | 0.3963 | 4.6427 | 0.0000 | 0.2558 | 0.5331 | 0.0940 | Accepted |

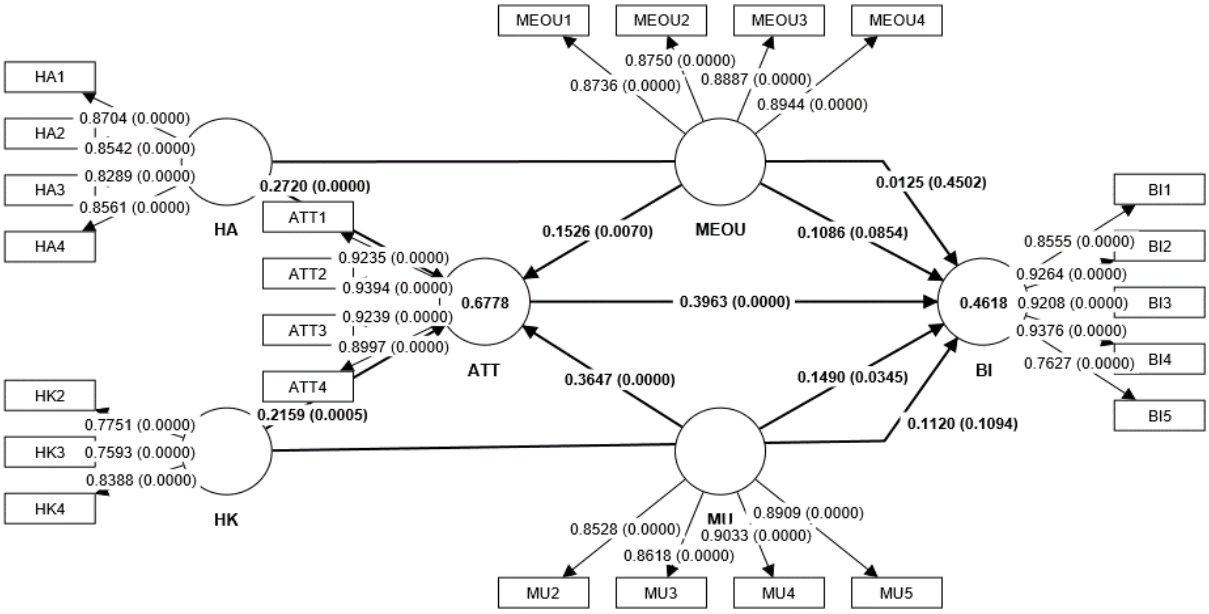


**Figure 2: Results of Hypotheses Testing using SmartPLS**

The result of the indirect relationship through ATT is further provided in Table 5 and reveals the significant mediation role of ATT on all four proposed predictors of BI to adopt. Specifically, MEOU, MU, HA, and HK are found to indirectly influence BI to adopt through ATT, thus accepting H10, H11, H12, and H13. This finding is surprising as MEOU, HA, and HK have no significant direct relationships with BI to adopt.

**Table 5: Result of Indirect Hypotheses Testing**

| Hypo. | Path | Coef. | T-value | P-value | BCI-LL | BCI-UL | $f^2$ | Results |
|---|---|---|---|---|---|---|---|---|
| H10 | MEOU -> ATT -> BI | 0.0605 | 2.2610 | 0.0119 | 0.0224 | 0.1114 | 0.0037 | Accepted |
| H11 | MU -> ATT - > BI | 0.1445 | 3.0090 | 0.0013 | 0.0791 | 0.2427 | 0.0209 | Accepted |
| H12 | HA -> ATT -> BI | 0.1078 | 3.3541 | 0.0004 | 0.0639 | 0.1736 | 0.0116 | Accepted |
| H13 | HK -> ATT-> BI | 0.0855 | 2.7416 | 0.0031 | 0.0416 | 0.1472 | 0.0073 | Accepted |

## Discussions and Implications

This study has successfully filled the existing gaps by exploring the factors that affect the Malaysian Muslim consumers to adopt the mobile Halal verification apps, via an extended MTAM framework. The results first found that the ATT is affected by MEOU, MU, HA and HK, while only MU and ATT have a significant effect on the consumers' BI to adopt. These findings offer substantial theoretical implications as they identified the factors that influence consumers to adopt mobile Halal verification apps and provided new insights about mobile technology usage, especially in mobile Halal verification apps that are lacking in the literature. Besides, the study also proved that the MTAM is adequate in explaining the consumers' BI on mobile Halal verification apps adoption, but it has to be extended with other additional factors to capture multifaceted behaviour in the specific research contexts of the study, such as HA, HK and ATT. Additionally, the significant indirect role of the four predictors (MEOU, MU, HA, and HK) further contributed to the body of knowledge as it confirmed that these predictors not only influence the outcome variables directly but also indirectly, through the mediator of attitudes. This supports Khan et al. (2022), who mentioned that certain predictors might have no direct effect on BI adoption, but they might affect BI adoption indirectly through certain mediators, such as ATT in

this study. However, it is required to have a further investigation on the various findings on the direct and indirect influences of these predictors on BI, to offer a more comprehensive understanding.

Firstly, MEOU has significantly influenced ATT but has no significant effect on BI. The result of MEOU on ATT is supported by Chong et al. (2021) and Ling *et al.* (2025). However, the non-significant influence of MEOU on BI is opposed by Ng *et al.* (2022), Loh *et al.* (2022), and Wan *et al.* (2022). This signified that the difficulty in adopting mobile verification apps could directly affect consumers' ATT, and consumers tend to have favorable ATT if it requires less effort. However, this perception doesn't directly influence consumers' BI to adopt, as an insignificant relationship was found. Nevertheless, although direct relationships are absent, the indirect effect of MEOU on BI to adopt through ATT was reported. Therefore, the developers of the mobile Halal verification apps should simplify the steps and procedures for adopting the apps. For instance, the apps should be user-friendly and easy to use, as this could further reduce the complexity of the apps. Besides, the developers should also make these apps freely available for users to download and use, without any complicated registration. As found in the study, MEOU played a significant role in establishing consumers' favorable ATT and BI to adopt mobile halal verification apps directly and indirectly through ATT. With that, it would be expected that consumers who have positive ATT on these apps, eventually encourage them to use them.

Next, MU possess a significant effect on ATT and BI to adopt. The significant effect of MU on ATT is paralleled with Chawla and Joshi (2020) and Ling *et al.* (2025), while the substantial role of MU on BI is also in agreed with Wan *et al.* (2022), Ling *et al.* (2025), and Ling *et al.* (2024a). Consumers tend to have positive ATT and greater BI to adopt when using mobile halal verification apps if they believe these apps would enhance their efficiency and effectiveness in verifying the authenticity of the halal certificates. Besides the direct relationship, the indirect role of MU on the BI to adopt via ATT was also found in the study. With that, it posits that MU is essential in influencing consumers' ATT and BI to adopt, as both direct and indirect effects were found. The stakeholders, like application developers, should broaden the function of these verification apps by not only providing information regarding the authenticity of the halal certificates but probably including details information pertinent to the products, such as the country of origin, ingredients information, or even is the carbon emissions information of consuming the products. The regulatory agencies, such as JAKIM as well as the Ministry of Religious Affairs (MoRA) and Ministry of Domestic Trade and Costs of Living may have to consider to develop a central database to store the details of the products, including the Halal certifications, and further allow the mobile Halal verification apps to access this database in verifying the status of the Halal certificates. Moreover, relevant agencies may consider requesting all manufacturers or merchandisers in Malaysia to register their products with this central database. This will ensure that consumers can verify any products that they find in the markets.

The findings also concluded the diverse effects of HA on ATT and BI to adopt, whereas the positively significant effect of HA is found on ATT but not on BI to adopt. In line with Handriana et al. (2021) and Irfany et al. (2024), consumers are inclined to have good and positive ATT toward mobile halal verification apps if they are highly aware of the halal issues. However, this awareness doesn't directly affect consumers' BI to adopt when using these apps. HA's insignificant role in BI is opposed by Bashir (2019) and Azam (2016), who found the significant effect of HA on BI. Like MEOU, the HA does not directly impact consumers' BI to adopt. However, the indirect hypotheses testing further concluded that mobile halal verification apps could indirectly significantly affect HA through ATT. This result showed that HA also reacted as a vital factor as it would substantially affect consumers' ATT and indirectly affect consumers' BI when using ATT. Therefore, JAKIM and the Ministry of Communications are responsible for conveying any information or updates related to Halal issues and development, and ensuring that this information and updates are widely and publicly disseminated to the public. So that the public, especially the Muslim community, knows the latest Halal issues and developments. It would help form the consumers' favourable ATT and ultimately establish their intention to use.

Again, the different influences of HK on ATT and BI to adopt are also revealed for HK. Similar to the findings in the literature (Kasri et al., 2023; Widyanto & Sitohang, 2022),

consumers' knowledge of the Halal concept would significantly help in forming positive and favourable ATT on mobile halal verification apps. Consumers tend to have positive ATT when they possess a greater understanding of the halal concept. Yet, this knowledge doesn't translate into their BI to adopt, as an insignificant relationship between HK and BI to adopt was found. This finding conflicts with Berakon *et al.* (2021) and Widyanto & Sitohang (2022), which revealed the substantial impact of HK on BI in other contexts. Although the direct impact of HK on BI to adopt is absent, the indirect relationship of HK on BI to adopt is significant with the appearance of ATT. Therefore, this indicated that the consumers' BI to adopt isn't directly affected by their knowledge level, but HK will indirectly influence it through ATT. Government agencies like the Ministry of Education and JAKIM may play their role in improving the consumers' knowledge of halal products. For instance, the education program related to Halal has to be incorporated into the syllabus or curriculum, and this could ensure that everybody has certain knowledge of Halal. Besides, the concept of Halal, as well as the processes of getting the Halal certification, have to be promoted publicly so that people will have a greater understanding of the Halal certification. All of these are necessary to create a positive ATT toward mobile halal verification apps and their intention to use them through ATT.

Furthermore, consistent with most of the past research (Bailey *et al.*, 2020; Ling *et al.*, 2024a), the substantial role of ATT on BI to adopt mobile halal verification apps is also revealed in the study. Consumers are likely to adopt mobile halal verification apps if they have favourable ATT for these apps. With that, favourable ATT is essential to cultivate the consumers' intention to use mobile halal verification apps. For promoting positive and favourable ATT, the four predictors (MEOU, MU, HA, and HK) should be concentrated, as the finding was that positive ATT would be formed by improving these four factors. Hence, all stakeholders, including government agencies, businesses, as well as the consumer associations, have to work together in offering accurate and clear information pertinent to the Halal certification, as consumers will have better ATT if they understand the concept and reason behind verifying the Halal certified products.

## Conclusions and Recommendations

that affect the adoption of the mobile Halal verification apps. The evidence has supplemented the existing literature by offering new evidence regarding the mobile technology adoption based on the mobile Halal verification apps. Besides that, the result confirmed the substantial role of the Halal-related factors, such as HA and HK, together with the ATT. This implied that some specific factors that captured the unique feature of the research context have to be integrated into the initial MTAM to understand the consumers' adoption intention more thoroughly. Additionally, the usefulness of the mobile Halal verification apps, as well as the consumers' personal feelings toward the apps, have to be prioritised, as they could directly enhance the usage of these mobile apps. The findings showed that the Muslim consumers have a greater tendency to adopt these verification apps if they believe that these apps are useful for verifications. However, reducing the difficulty of the apps as well as improving the level of understanding and knowledge of the consumers on the Halal-related issues and problems cannot be underestimated, as the study proved that this is crucial in promoting the favourable personal feelings toward the verification apps. These findings are beneficial for the numerous stakeholders for their further actions in improving the usage of the Halal verification apps, as well as to against the unauthorised or uncertified usage of the Halal certification.

Although the study offers some important significances. However, several limitations are still present in the study, and this might lower the usefulness of the study. Firstly, only the Muslim community in Malaysia was focused on in the study, which may limit the findings' generalizability. Upcoming studies may enlarge the study's scope by expanding to more Muslim communities in other countries, such as Indonesia, Brunei, Thailand and others, to provide more robust results. Moreover, a comparison study between countries may also be considered in future studies, as the different countries' settings and cultures may produce some interesting findings. Moreover, the study only included two halal-related factors and ATT in the proposed research model. Yet, numerous factors may affect the consumers' ATT and BI to adopt. With that, future studies are

required to add other factors that may significantly impact consumers' ATT and BI, such as trust, the provider's reputation, government regulations, etc., as this might further offer comprehensive findings from different perspectives. Furthermore, the composition of the respondents has to be more balanced to produce more vigorous findings, as females and the younger generation dominate the current study's respondents. In addition, the heterogeneity of these respondents is not considered in the study, and all respondents are assumed to be homogeneous. With that, future studies may recognise this heterogeneity by investigating the differences among the consumers based on their profiles, such as gender, age groups, educational background, and the like. Additionally, the diverse findings on the direct and indirect effects of MEOU, HA and HK have to be explored in future studies as this might further provide a clear understanding regarding to their influence on the subject domain. The most comprehensive findings would be generated if the above limitations were addressed in

## Acknowledgement

The authors wish to thank the University of Technology Sarawak for the financial support under the UTS Research Grant (UTS/RESEARCH/1/2024/17), that awarded to the first author.

## Conflict of Interest Statement

All authors declare that they have no conflicts of interest, except that the first author has received financial support from the University of Technology Sarawak under the UTS Research Grant (UTS/RESEARCH/1/2024/17).

## Author's Contribution Statement

1. **P-S. Ling** contributed to conceptualization, methodology, investigation, data curation, formal analysis, and writing – review and editing.

2. **F. I. Yusof** contributed to conceptualization, investigation, and writing – original draft preparation.

3. **K. Y. M. Lee** contributed to methodology, data curation, and writing – review and editing.

4. **H. I.** Che Hashim contributed to formal analysis and writing – original draft preparation.

## Ethics Statement

The authors confirmed that this research complies with the ethical standards, as the respondents who participated in the study were entirely voluntary. The participants have been instructed to review the ethical statement mentioned in the description of the Google Form, which further clarified the rights of the respondents. The respondents only have to continue the survey if they agree with the ethical statement and rights mentioned in the description. Besides, the study also guaranteed confidentiality of the responses as the identities of the respondents will remain anonymous. Based on the research ethical clearance guideline of the host university of the first author, formal ethical approval is not required for this study, as the survey does not involve any dangerous action that may harm the respondents.

## References

Ajzen, I. 1991. The theory of Planned Behavior. *Organisational Behavior and Human Decision Processes 50*: 179-211.

Azam, A. 2016. An empirical study on non-Muslim's packaged halal food manufacturers. *Journal of Islamic Marketing 7*(4): 441–460.

Bagozzi, R. P., & Yi, Y. 1988. On the evaluation of structural equation models. *Journal of the Academy of Marketing Science 16*(1): 74-94.

Bailey, A. A., Pentina, I., Mishra, A. S., & Mimoun, M. S. B. 2020. Exploring factors influencing US millennial consumers' use of tap-and-go payment technology. *The International Review of Retail, Distribution and Consumer Research 30*(2): 143-163.

Bashir, A. M. 2019. Effect of halal awareness, halal logo and attitude on foreign consumers' purchase intention. *British Food Journal 121*(9): 1998–2015.

Berakon, I., Wibowo, M. G., Nurdany, A., & Aji, H. M. 2021. An expansion of the technology acceptance model applied to the halal tourism sector. *Journal of Islamic Marketing 14*(1): 289–316.

Business Wire. 2021. Global Halal Food Market Report 2022: Industry Trends, Share, Size, Growth, Opportunity and Forecast 2016-2021 & 2022-2027. *Business Wire*. https://www.businesswire.com/news/home/20220429005337/en/Global-Halal-Food-Market-Report-2022-Industry-Trends-Share-Size-Growth-Opportunity-and-Forecast-2016-2021-2022-2027---ResearchAndMarkets.com [Retrieved: 20 May 2024].

Chawla, D., & Joshi, H. 2020. The moderating role of gender and age in the adoption of mobile wallet. *Foresight 22*(4): 483-504.

Chong, L-L., Ong, H-B., & Tan, S-H. 2021. Acceptability of mobile stock trading application: A study of young investors in Malaysia. *Technology in Society 64*: 101497.

Cohen, E. 1988. Authenticity and commoditization in tourism. *Annals of Tourism Research 15*(3): 371-386.

Flavian, C., Guinaliu, M., & Lu, Y. 2020. Mobile payments adoption – introducing mindfulness to better understand consumer behavior. *International Journal of Bank Marketing 38*(7): 1575-1599.

Gefen, D., Straub, D., & Boudreau, M.-C. 2000. Structural equation modeling and regression: guidelines for research practice. *Communications of the Association for Information Systems 4*: 1-70.

Hair, J. F., Jr, Hult, G. T. M., Ringle, C. M., & Sarstedt, M. 2017. A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM). Sage Publications, London.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. 2019. When to use and how to report the results of PLS-SEM. *European Business Review 31*(1): 2-24.

Handriana, T., Yulianti, P., Kurniawati, M., Arina, N. A., Aisyah, R. A., Aryani, M. G. A., & Wandira, R. K. 2021. Purchase behavior of millennial female generation on Halal cosmetic products. *Journal of Islamic Marketing 12*(7): 1295-1315.

Irfany, M. I., Khairunnisa, Y., & Tieman, M. 2024. Factors influencing Muslim Generation Z consumers' purchase intention of environmentally friendly halal cosmetic products. *Journal of Islamic Marketing 15*(1): 221-243.

Kasri, R. A., Ahsan, A., Widiatmoko, D., Hati, S. R. H. 2023. Intention to consume halal pharmaceutical products: evidence from Indonesia. *Journal of Islamic Marketing 14*(3): 735-756.

Khan, A., Arafat, M. Y., & Azam, M. K. 2022. Role of halal literacy and religiosity in buying intention of halal branded food products in India. *Journal of Islamic Marketing 13*(2): 287-308.

Kline, R. B. 2011. Principles and Practice of Structural Equation Modeling, Guilford Press, New York, NY.

Lau. A. J., Tan, G. W-H., Loh, X-M., Leong, L-Y., Lee, V-H., & Ooi, K-B. 2021. On the way: Hailing a taxi with a smartphone? A hybrid SEM-neural network approach. *Machine Learning with Applications 4*: 100034.

Lew, S., Tan, G. W-H., Loh, X-M., Hew, J-J., & Ooi, K-B. 2021. The disruptive mobile wallet in the hospitality industry: An extended mobile technology acceptance model. *Technology in Society 63*: 101430.

Ling, P-S., Lee, K. Y. M., Ling, L-S., & Mohd Suihaimi, M. K. A. 2024a. Investors' intention to use mobile investment: an extended mobile technology acceptance model with personal factors and perceived reputation. *Cogent Business & Management 11*(1): 2295603.

Ling, P-S., Lim, X-J., Wong, L-J., & Lee, K. Y. M. 2024a. Thank you, government! Your support facilitated my intention to use mobile payment in the new normal era. *Spanish Journal of Marketing – ESIC 29*(1): 3-21.

Ling, P-S., Ling, L. S., & Wasali, S. D. 2024b. Investing in socially responsible investment (SRI): the role of responsibility, consciousness and literacy. *Journal of Sustainability Science and Management 19*(2): 95-108.

Loh, X., Lee, V., Tan, G. W., Hew, J., & Ooi, K. 2019. Towards a cashless society: The imminent role of wearable technology. *Journal of Computer Information Systems 62*(1): 39–49.

Loussaief, A., Lin, J., Dang, H. P., Bouslama, N., & Cheng, J. M. S. 2023. Eating halal: a serial mediation model for the effect of religiosity on the intention to purchase halal-certified food. *Asia Pacific Journal of Marketing and Logistics 36*(1): 167-184.

Malaysian Investment Development Authority. (2023). *Malaysia's Halal Food Opportunities - MIDA | Malaysian Investment Development Authority*. MIDA | Malaysian Investment Development Authority. https://www.mida.gov.my/malaysias-halal-food-opportunitiescarving-out-the-lions-share-in-a-usd3-trillion-global-market/ [Retrieved: 18 May 2024].

Ng, F., Z-X., Yap, H-Y., Tan, G., W-H., Lo, P-S., & Ooi, K-B. 2022. Fashion shopping on the go: A Dual-stage predictive-analytics SEM-ANN analysis on usage behaviour, experience response and cross-category usage. *Journal of Retailing and Consumer Services 65*: 102851.

Nurcahyo, A., & Hudrasyah, H. 2017. The influence of halal awareness, halal certification, and personal societal perception toward purchase intention: a study of instant noodle consumption of college student in Bandung. *Journal of Business and Management 6*(1): 21-31.

Nurhayati, T., & Hendar, H. 2019. Personal intrinsic religiosity and product knowledge on halal product purchase intention. *Journal of Islamic Marketing 11*(3): 603–620.

Ooi, K-B., & Tan, G. W-H. 2016. Mobile technology acceptance model: An investigation using mobile users to explore smartphone credit card. *Expert Systems with Applications 59*: 33-46.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology 88*(5): 879-903.

Rizkitysha, T. L., & Hananto, A. 2022. Do knowledge, perceived usefulness of halal label and religiosity affect attitude and intention to buy halal-labeled detergent? Journal *of Islamic Marketing 13*(3): 649-670.

Rostiani, R., Firdausi, A. S. M., Arini, H. M., Mulyani, Y. P., & Sunarharum, T. M. 2024. The effect of Islamic attributes, destination image, scepticism, perceived value and halal awareness on the intention to engage in Muslim-friendly travel. *Journal of Islamic Marketing 15*(2): 613-632.

Salaam Gateway. (2022). *Halal food industry challenged with fraudulent products and certification disputes*. Salaam Gateway - Global Islamic Economy Gateway. https://salaamgateway.com/story/halal-food-industry-challenged-with-fraudulent-products-and-certification-disputes [Retrieved: 20 May 2024].

Verma, S., Chaurasia, S. S. and Bhattacharyya, S. S. 2020. The effect of government regulations on continuance intention of in-store proximity mobile payment services. *International Journal of Bank Marketing 38*(1): 34-62.

Wan, S-M., Cham, L-N., Tan, G. W-H., Lo, P-S., Ooi, K-B., & Chatterjee, R-S. 2022. What's Stopping You from Migrating to Mobile Tourism Shopping? *Journal of Computer Information Systems 62*: 1223-1238.

Widyanto, H. A., & Sitohang, I. A. T. 2022. Muslim millennial's purchase intention of halal-certified cosmetics and pharmaceutical products: the mediating effect of attitude. *Journal of Islamic Marketing 13*(6): 1373-1394.

Yan, L., Tan, G. W., Loh, X., Hew, J., & Ooi, K. 2021. QR code and mobile payment: The disruptive forces in retail. *Journal of Retailing and Consumer Services 58*: 102300.