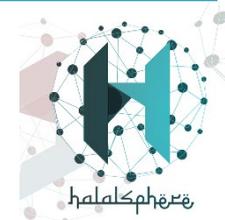


# HALALSPHERE

International Islamic University Malaysia - INHART



## Adoption of halal verification mobile applications: A conceptual framework integrating perceived trust and technology adoption

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### Abstract

The digitalisation of halal certification has led to the emergence of halal verification mobile applications to support informed consumption decisions. Despite their increasing availability, adoption remains uneven, particularly in settings where halal options are reinforced by strong institutional certification systems, religious obligation, and heightened risk sensitivity. Existing studies on halal digitalisation frequently adopt operational or organisational perspectives and examine adoption determinants in a fragmented manner, limiting theoretical coherence. This study proposes a trust-centred conceptual framework for the adoption of a halal verification mobile application, grounded in the Technology Acceptance Model (TAM). Perceived usefulness and perceived ease of use are retained as core cognitive beliefs, while perceived trust is positioned as a central mediating mechanism linking these beliefs to adoption intention. The framework further distinguishes halal verification app awareness from general halal awareness. It incorporates social influence, together with external antecedents, as external antecedents shaping internal belief formation rather than exerting direct effects on adoption. By integrating halal-specific considerations into TAM, the framework offers a theoretically coherent foundation for future empirical research on halal digital trust and governance.

### 1. Introduction

The rapid digitalisation of consumer markets has transformed how individuals access, evaluate, and verify product information, particularly in contexts where consumption decisions carry ethical, religious, and moral implications (Hamdan *et al.*, 2025; Wan Ismail *et al.*, 2024). Within the halal industry, the increasing complexity of global supply chains, ingredient sourcing, processing methods, and certification regimes has intensified consumer uncertainty regarding halal integrity (Alzeer *et al.*, 2025; Che Hassan & Osman, 2024; Hassam *et al.*, 2025). In response, halal verification mobile applications have emerged as digital tools to support Muslim consumers in making informed, confident halal decisions at points of purchase and consumption. These applications typically provide access to halal certification databases, product ingredient information, brand verification, and institutional endorsements, thereby functioning as intermediaries between consumers, halal authorities, and market actors (BERNAMA, 2021; Rahmat & Samsudin, 2022; Serunai, 2025).

Despite increasing availability and acceptance, halal verification applications remain uneven in Muslim-majority markets, including Malaysia (Wan Ismail *et al.*, 2024). Although Malaysia is internationally recognized as a leading halal hub due to its robust halal governance infrastructure and institutional leadership in halal certification, the presence of formal certification alone does not dispel consumer doubts (Che Hassan & Osman, 2024). Contemporary halal

consumption increasingly occurs in fast-paced retail situations where choices must be made quickly, often under limited information and time constraints (Hamdan *et al.*, 2025; Wan Ismail *et al.*, 2024). In such a context, consumers rely not only on institutional assurance but also on their subjective perceptions of digital tools that claim to mediate halal authenticity. This has transformed halal verification applications from a convenient tool of choice to a potentially critical tool for religious assurance and risk reduction (Zulkifli & Yusuf, 2023).

While research on halal digitalisation has expanded substantially, much of the existing literature adopts operational, logistical, or organisational perspectives, focusing on firms, regulators, and supply chain actors rather than end users (Azwar & Usman, 2025; Zulkifli & Yusuf, 2023). Consumer-facing halal certification software, such as mobile applications (VerifyHalal and SmartHalal), built for everyday use, remains poorly understood in terms of uptake and acceptance (Ismail *et al.*, 2024). Where consumer acceptance has been investigated, research often relies on fragmented theoretical frameworks or introduces multiple concepts without a consistent explanatory framework, thereby limiting cumulative theoretical progress (Hamdan *et al.*, 2025; Hamdan & Jamaian, 2024; Ismail *et al.*, 2024). Within the broader technology adoption literature, the Technology Acceptance Model (TAM) remains one of the most parsimonious and empirically robust frameworks for explaining individual-level technology adoption (Adnan *et al.*, 2025; Al-Hattami, 2023; Al-Nuaimi & Al-Emran, 2021; Na *et*

*al.*, 2022). TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) shape behavioural intention by guiding users' cognitive evaluations of a system (Bhatta *et al.*, 2025; Cao *et al.*, 2025; Liesa-Orús *et al.*, 2023). Nevertheless, decisions related to halal verification differ from conventional technology use due to their grounding in religious obligation, ethical accountability, and heightened sensitivity to perceived risk, necessitating careful contextualisation of established acceptance models (Ibrahim & Hasim, 2023; Miftahudin *et al.*, 2018; Yusof *et al.*, 2024).

Perceived trust, in particular, occupies a central position in halal-related decision-making (Abu Bakar *et al.*, 2017; Julpa & Napitu, 2023; Koc *et al.*, 2024; Rahayu *et al.*, 2025). Halal verification applications must be perceived as credible, reliable, and institutionally legitimate, as inaccurate or misleading information may lead not only to inconvenience but also to religious non-compliance and moral concern. (Berakon *et al.*, 2023; Evriyenni *et al.*, 2025; Khan *et al.*, 2025; Yusof *et al.*, 2024). Though existing adoption studies frequently treat trust as either a direct predictor or a peripheral factor, without adequately theorising its mediating role within established acceptance frameworks (Ibrahim & Anuar, 2024; Tams *et al.*, 2018).

In addition to perceived trust, awareness, and social influence, these factors play critical roles in shaping halal verification app adoption (Hamdan *et al.*, 2025; Wan Ismail *et al.*, 2024). According to Wan Ismail *et al.* (2024) awareness determines whether users recognize the existence, purpose, and function of such applications, especially in a market filled with alternative sources of halal information. Meanwhile, social influence reflects the socially embedded nature of halal consumption, where recommendations from peers, family members, religious authorities, and institutions significantly shape perceptions of authenticity and credibility. In societies where Islam is the dominant religion, the process of making halal decisions seldom occurs in isolation; rather, it is shaped through interactions with peers, family members, religious authorities, and institutions (Alam *et al.*, 2025; Wan Ismail *et al.*, 2024). Nonetheless, existing models do not sufficiently explain how awareness and social influence shape users' internal cognitive perceptions, particularly perceived trust (Hamdan & Jamaian, 2024; Syaefulloh *et al.*, 2025).

The lack of a coherent, trust-focused conceptual framework marks a significant gap in the halal certification literature (Dawam & Iswandi, 2023). While many empirical studies have recognised PU, PEOU, trust, awareness, and social influence as important factors, these variables are often analysed either in isolation or in combination, lacking a clear theoretical hierarchy (Ridlwani *et al.*, 2025). As a result, the discipline lacks a comprehensive framework that explains how external influences are transformed into the development of internal trust and, ultimately, into adoption intentions in the context of halal certification. This fragmentation hinders theoretical progress and restricts the practical applicability of research findings for policymakers, halal authorities, and application developers.

This study addresses the existing gap by developing and presenting a conceptual framework for the adoption of halal verification mobile applications. It does so by enhancing the Technology Acceptance Model (TAM) with halal-specific factors and incorporating a trust-centred mediation structure. The framework clearly identifies PU and PEOU as fundamental cognitive beliefs, while framing perceived trust as a crucial

mediating mechanism that shapes how these perceptions affect behavioural intention. Moreover, awareness of halal applications and social influence are incorporated as external factors that inform users' internal assessments, rather than directly affecting them. In this manner, the framework provides a theoretically informed understanding of adoption behaviour that aligns with the religious, social, and cognitive aspects of halal decision-making.

This study is conceptual and does not aim to validate the proposed relationships empirically. Instead, it integrates perspectives from technology acceptance, halal consumption, and the literature on perceived trust to develop a coherent framework that can inform future empirical research. The originality of this study lies in its clear identification of perceived trust as a key mediating factor in a TAM-based framework, as well as its contextual exploration of the dynamics of acceptance in the halal certification sector. The proposed framework enhances understanding of the adoption of halal verification applications by outlining the relationships among app awareness, social influence, cognitive beliefs (PU and PEOU), perceived trust, and adoption intention, thereby providing a foundation for future quantitative and qualitative research.

## 2. Literature review

### 2.1 Conceptualisation of key constructs

#### 2.1.1 Perceived trust

Perceived trust refers to an individual's belief that a technology is reliable and credible, and that it operates in the user's best interest by safeguarding data and providing accurate information (Alrawad *et al.*, 2023). In this study, perceived trust denotes consumers' confidence in a halal verification application's ability to function as claimed, deliver authentic and verifiable halal certification information, and be supported by legitimate authorities. Accordingly, perceived trust is posited as a mediating construct linking users' evaluations (PEOU and PU) and external antecedents (halal verification app awareness and social influence) to the intention to adopt halal verification applications. While institutional credibility may underpin trust formation, perceived trust in this study is conceptualised at the application level, reflecting users' confidence in the app's performance, accuracy, and reliability as a halal verification tool.

#### 2.1.2 Halal verification app awareness

App awareness refers to the degree to which potential users possess knowledge about a technology's existence, functionality, and benefits, which influences their likelihood of adoption (Flavián *et al.*, 2022; Patil, 2013). In the context of this study, app awareness refers to consumers' understanding and familiarity with halal verification applications, including their availability, core features, benefits, and perceived reliability, which collectively shape their readiness to use such technologies.

#### 2.1.3 Social influence

Social influence refers to the degree to which individuals perceive that people important to them (e.g., family members, friends, or peers) expect or encourage them to use a particular system (Venkatesh *et al.*, 2003). In this study, social influence reflects how opinions, recommendations, and normative expectations from close social circles and the broader

community shape consumers' perceptions of halal verification applications, particularly their perceived usefulness, perceived ease of use, and perceived trust, and ultimately influence adoption intention in Malaysia.

## 2.2 Technology acceptance model as the core analytical lens

The Technology Acceptance Model (TAM) has been widely used to explain how individuals adopt information systems in a variety of technological and cultural settings. TAM was developed to understand the cognitive processes underlying technology use. It proposes that PU and PEOU are the primary cognitive beliefs that influence users' intention to adopt a system. According to Davis (1989), PU indicates the extent to which an individual believes that using a particular system will improve task performance. In contrast, PEOU indicates the extent to which the system is perceived to require minimal effort. The streamlined TAM framework has played a key role in its enduring importance, allowing it to be modified and expanded for new digital contexts without unnecessary theoretical complexity.

TAM has proven particularly effective in explaining adoption behaviour in mobile and digital service environments, where users form rapid evaluations under conditions of limited time and cognitive resources (Marikyan & Papagiannidis, 2025). PU and PEOU function as heuristic cognitive beliefs that guide immediate usage decisions, especially at the point of purchase, where information overload and time pressure constrain deliberation (Pratiwi *et al.*, 2024). These characteristics render TAM an appropriate foundational framework for examining the adoption of halal verification mobile applications, which are typically evaluated and used in similarly time-sensitive consumption settings.

Nevertheless, applying TAM to halal verification contexts requires careful contextualisation. Decisions concerning halal compliance are embedded within religious obligation, moral accountability, and heightened sensitivity to perceived risk, distinguishing them from conventional technology adoption scenarios (Berakon *et al.*, 2023; Ibrahim and Hasim, 2023; Miftahudin *et al.*, 2018; Yusof *et al.*, 2024). In halal-related decision-making, adoption is influenced not only by functional efficiency and usability but also by concerns about legitimacy, religious assurance, and confidence in the credibility of verification mechanisms. As such, while TAM offers a robust cognitive foundation, it does not fully capture the evaluative processes that dominate halal verification behaviour.

Alternative acceptance frameworks, such as the Unified Theory of Acceptance and Use of Technology (UTAUT) and its extensions, include additional constructs such as facilitating circumstances, performance expectations, effort expectations, and social influence, which are often moderated by demographic variables (Venkatesh *et al.*, 2003). While these models provide a broader explanation, their complex nature may not be appropriate for user situations where decisions are made quickly and haphazardly, rather than through formal organizational processes (Forster, 2024). Furthermore, TAM's conceptual clarity enables focused theoretical expansion, making it particularly amenable to integration with context-specific constructs relevant to halal verification. Accordingly, this study adopts TAM as the core analytical lens while extending it to reflect the distinctive epistemic and religious dimensions of halal verification. PU and PEOU are retained as foundational cognitive beliefs. However, their influence is

understood within a broader evaluative process, shaped by trust-related concerns central to halal decision-making. This positioning preserves TAM's theoretical strengths while enabling a more context-sensitive explanation of adoption behaviour.

## 2.3 Perceived trust as a central mediator

Perceived trust is recognized as a crucial factor influencing the adoption of digital systems, particularly in contexts characterized by uncertainty, risk, or information asymmetry. In contexts of halal verification, the significance of PT becomes increasingly important due to the religious implications of consumption choices. Trust signifies users' assurance that the application delivers precise, reliable, and authentic halal information sourced from credible, esteemed authorities. In contrast to financial digital services, which tend to foster trust over time through consistent use, halal verification applications are typically assessed immediately (Bux *et al.*, 2022; Karyani *et al.*, 2024). Users quickly develop opinions based on their perceptions of credibility and alignment with established institutions.

In the context of extended TAM frameworks, trust has been analysed as a direct predictor of behavioural intention and as an antecedent of PU (Dhagarra *et al.*, 2020; Siagian *et al.*, 2022). Nonetheless, treating perceived trust as a separate entity may lead to a significant underestimation of its role in PT formation. In adopting halal verification, trust functions as an essential mediator that transforms PU and PEOU into intention (Berakon *et al.*, 2023). Even when an application is seen as functionally advantageous and user-friendly, its adoption can fail if users lack trust in the accuracy or religious legitimacy of the information it offers (Chouykaew *et al.*, 2024).

Conceptualising PT as a mediator is consistent with the principles of TAM, which suggests that external factors affect intention/adoption mainly through internal cognitive beliefs (Al-Haraizah *et al.*, 2025). In this context, PT embodies a complex evaluative belief that synthesizes functional assessments alongside moral and institutional factors. By positioning PT at the forefront, the proposed framework recognizes the distinct epistemic requirements of halal verification and promotes a more theoretically sound understanding of adoption behaviour.

## 2.4 External antecedents: Halal verification app's awareness and social influence

In the field of technology adoption research, it is widely acknowledged that awareness is a crucial prerequisite for adoption, as individuals cannot assess or embrace unfamiliar technologies. In the field of halal verification, it is crucial to differentiate between general awareness of halal and the specific awareness surrounding halal verification mobile applications. Although numerous consumers might have a strong understanding of halal concepts and principles, this does not automatically imply that they are familiar with the digital tools available for halal verification, leading to low trust (Abu Bakar *et al.*, 2017; Berakon *et al.*, 2023; Mohd Radzi *et al.*, 2016; Mustapha *et al.*, 2024; Rahmawati *et al.*, 2023; Sumardi *et al.*, 2025; Ying & Zaaba, 2022). Thus, the current framework defines awareness of halal verification apps as a distinct concept that pertains to consumers' understanding of their existence, purpose, and functionality. Awareness of halal verification applications involves consumers recognizing their existence, understanding the

types of information they provide, and knowing how to use them to support halal-related decision-making (Ahmadun & Rifin, 2024; Ijabah *et al.*, 2025; Umami *et al.*, 2023). Limited app awareness can lead consumers to rely on traditional verification indicators, such as halal logos, brand recognition, or point-of-sale confirmations, even when digital verification could offer greater confidence. On the other hand, when consumers recognize the existence of halal verification applications and understand their functionalities, they tend to view these tools as relevant and possibly advantageous in their consumption choices.

From the TAM perspective, a mobile application's awareness serves as an external stimulus that influences internal cognitive beliefs rather than directly influencing behavioural intention. Awareness plays a crucial role in shaping consumers' perceptions of an application's utility in meeting their verification requirements, as well as their confidence in its efficient use in daily consumption situations (Ibrahim & Hasim, 2023; Ismail *et al.*, 2024; Nazri *et al.*, 2025; Nugraha *et al.*, 2025; Tang *et al.*, 2021; Ting & Ariffin, 2024). In the absence of adequate app awareness, it becomes challenging to develop meaningful PU and PEOU, as users lack the necessary information to evaluate the app properly. In this context, app awareness is framed as an antecedent of fundamental TAM cognitive beliefs rather than a direct predictor of adoption.

In halal verification contexts, app awareness significantly influences judgments about PT. Understanding the data sources of an application, its institutional affiliations, and the verification methods may reduce uncertainty and improve perceptions of its legitimacy. When consumers learn that an application is associated with reputable halal authorities or trustworthy certification bodies, their confidence in the technology is more likely to grow (Ramlan *et al.*, 2025). On the other hand, a lack of depth in understanding may foster doubt about the application's trustworthiness or spiritual legitimacy, even if the technology is operationally effective.

In addition to being informed, social influence is another essential external factor that influences the adoption of halal verification apps. Social influence refers to how individuals interpret endorsements or support from significant referent groups, such as family members, peers, religious figures, or established halal institutions, regarding the use of halal verification applications. In contexts of halal consumption, decision-making is deeply rooted in social dynamics, as community standards frequently shape evaluations of halal compliance (Hidayati *et al.*, 2024), religious teachings (Koc *et al.*, 2024; Rafiki *et al.*, 2024), and institutional oversight (Deti, 2025; Ramlan *et al.*, 2025; Tangkham, 2025). Social endorsement operates not just as a form of normative pressure, but also as an indicator of legitimacy and religious suitability (Bebasari *et al.*, 2025; Koc *et al.*, 2024; Salim & Wafa, 2025).

In a TAM-based framework, social influence primarily affects adoption indirectly by shaping users' internal PT systems (Gerli *et al.*, 2022; Na *et al.*, 2023; Vahdat *et al.*, 2021). Support from reputable social or religious figures can increase the PU of the application by indicating that it provides significant value for halal decision-making (Rafiki *et al.*, 2024). At the same time, it can enhance PEOU by assuring consumers that the technology is accessible, user-friendly, and socially acceptable. Furthermore, social influence is crucial in the development of PT. When applications for halal verification receive recommendations or validation from credible authorities or trusted social networks, consumers are more inclined to view

the technology as reliable, legitimate, and aligned with their religious obligations, thus enhancing their trust (Rahim *et al.*, 2021; Supriani *et al.*, 2025; Vidiyanna *et al.*, 2023; Yanti, 2024).

However, it is important to recognize that social influences on the adoption of halal authentication may not always be viewed entirely positively. In highly contextualized usage environments, the presence of conflicting opinions, scepticism, or negative narratives within the community can act as barriers to adoption. (Sari & Rahayu, 2024; Satifa & Haidar, 2023). Conflicting perspectives on the reliability of digital authentication tools, concerns about data accuracy, and scepticism toward privately developed applications can permeate social discourse and erode PT, even among tech-savvy individuals. In these situations, social influences can increase uncertainty rather than provide comfort, reinforcing reliance on traditional authentication cues and constraining adoption of digital alternatives.

The complex relationship of social influence highlights its complex nature in the context of halal authentication (Satifa & Haidar, 2023). Rather than simply being a driver of acceptance, social influence can shape internal PT in different ways, influenced by the social narratives prevalent in the consumer's reference group (Gabriella & Sudiani, 2025). In situations where sceptical or critical views dominate, perceived value and credibility can be diminished, even in the presence of institutional support or technical robustness. Understanding this uncertainty is essential to conceptualizing social influence effectively within a TAM-based framework, as it emphasizes that acceptance outcomes depend not only on the presence of social cues but also on their acceptability and credibility in a given social context.

The awareness of applications and the influence of social factors together play a significant role in shaping evaluations related to PT. Understanding an application's data sources, verification processes, and institutional connections can reduce uncertainty and enhance perceptions of its credibility. Additionally, social endorsement strengthens these views by integrating the technology into established social and religious contexts. Conversely, a lack of deep understanding, paired with minimal or nonexistent social support, can lead to doubts about the reliability or religious validity of the application, even when the technology is functionally sound. The proposed framework identifies halal verification app awareness as a unique antecedent, suggesting that barriers to adoption may stem not from reluctance to embrace technology but from a lack of information about the existence and functionality of verification applications. This distinction is significant in markets where halal certification has become established, as consumers may believe current systems are adequate and may not recognize the additional digital tools available. Incorporating app awareness into the framework may significantly enhance its explanatory capacity and accurately reflect the practical realities of halal verification behaviour.

In terms of scope, the proposed framework is primarily intended for application within contexts where halal consumption norms and institutional halal certification systems are firmly embedded. In particular, the model is most relevant in environments where halal verification apps are positioned as complementary tools to formal certification bodies. The framework applies to both authority-linked apps

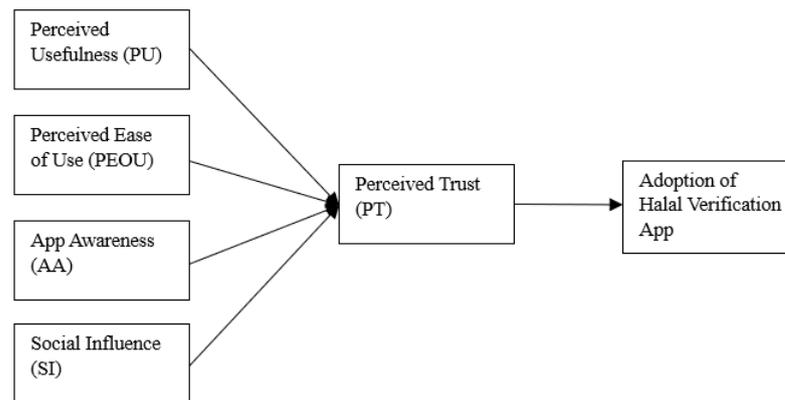


Figure 1: Extended technology acceptance model.

(e.g., those perceived to be affiliated with halal authorities such as JAKIM) and private verification apps; however, it is expected that perceived legitimacy and PT formation may differ between these categories. In addition, the framework is intended to capture adoption among users with varying levels of digital literacy and technological familiarity. Differences across age groups and technology confidence are recognised as relevant contextual factors that may influence perceptions and PT and should be considered in future empirical testing of the proposed model.

Figure 1 presents the proposed conceptual framework for halal verification mobile application adoption, grounded in TAM and extended through Perceived Trust (PT) as a core mediating mechanism. In this model, external antecedents (i.e., Halal Verification App Awareness and Social Influence) are theorised to influence adoption intention indirectly by shaping key cognitive app evaluations. Specifically, app awareness (AA) and social influence (SI) are expected to enhance PEOU, PU, and PT toward the adoption of a verification app. PT is positioned as a central explanatory bridge, translating consumers' perceptions of the app's credibility, reliability, and institutional legitimacy into behavioural intention to adopt. This fully mediated structure is intended to reflect the conceptual premise that PT acts as a necessary evaluative condition before users convert positive perceptions into adoption intention in risk-sensitive halal consumption contexts. In this conceptual framework, direct paths from PU, PEOU, AA, and SI to behavioural intention are not specified, as the study adopts a fully mediated model in which behavioural intention is theorised to occur primarily through PT. This modelling choice aligns with the nature of halal-related decision-making, in which consumers often treat halal assurance as a credence-based, risk-sensitive attribute. Even when users perceive an app as helpful or easy to use, adoption may remain unlikely unless the app is also perceived as credible, reliable, and legitimate in its verification function. Therefore, PU, PEOU, AA, and SI are theorised to shape behavioural intention indirectly by influencing PT, which acts as a critical evaluative mechanism before intention is formed. However, in the context of halal authentication, this cognitive belief is not sufficient to directly translate into consumption intentions without the presence of PT, in which consumption decisions are embedded in religious obligations, moral accountability, and heightened sensitivity to perceived risks. Accordingly, the framework positions PT as a central mediating mechanism that transforms users' assessments of usefulness and ease of use into behavioural intention to adopt halal verification applications.

PT reflects users' confidence in the accuracy, credibility, and religious legitimacy of the information provided, synthesising functional evaluations with institutional and moral considerations. This mediating role acknowledges that even technologically efficient and user-friendly applications may fail to gain acceptance if users lack confidence in their religious reliability.

Furthermore, this framework incorporates awareness of halal verification applications and social influence as external antecedents that shape the formation of internal beliefs rather than directly impacting usage intentions. Awareness of halal verification applications refers specifically to users' recognition of the existence, purpose, and functionality of mobile applications designed for halal verification, as distinct from general halal knowledge or awareness of halal principles. Sufficient application awareness allows users to form informed judgements about the usefulness, ease of use, and trustworthiness of the application, while limited awareness constrains meaningful cognitive evaluations. Moreover, social influence, arising from peers, family members, religious authorities, and institutional endorsements, informs users' evaluations by signalling legitimacy, acceptability, and religious appropriateness. Thus, awareness of halal verification apps and social influence structure the informational and social environment in which cognitive beliefs and PT are developed, thereby indirectly shaping adoption intention.

The proposed approach integrates the TAM with a trust-centred mediation structure. Clearly, it differentiates between awareness of halal verification applications and general halal awareness, providing a theoretically coherent explanation of adoption behaviour. It explains the hierarchical process by which external contextual influences affect cognitive beliefs, which PT then mediates to ascertain adoption intention. The paradigm incorporates the unique religious, social, and cognitive attributes of halal decision-making, offering a systematic basis for subsequent empirical research.

### 3. Research design and methodology for future research

To fulfil the research objectives of this conceptual study, a thorough review of the relevant literature was conducted. Articles from academic journals on technology adoption, halal verification, trust, and digital halal governance were analysed using reputable scholarly databases and publisher platforms

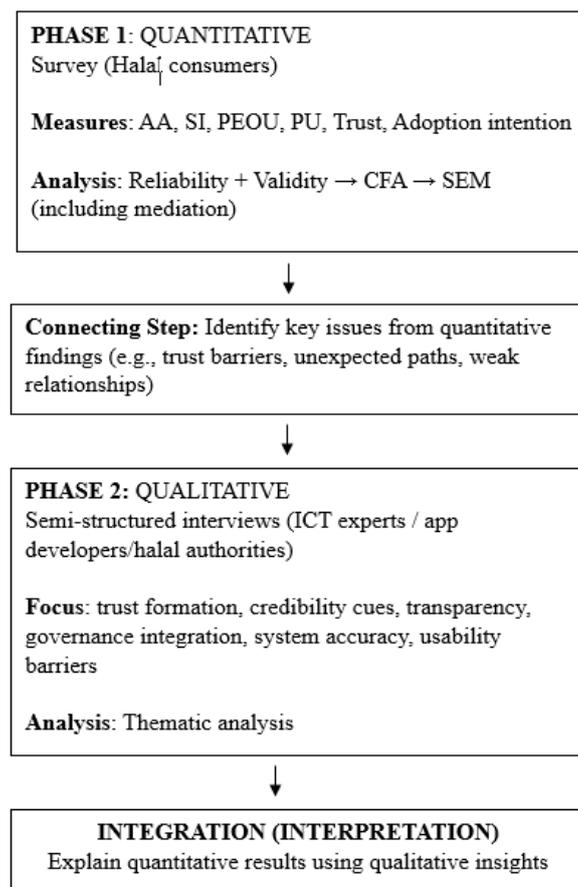


Figure 2: Proposed mixed-methods roadmap for empirical validation of the conceptual framework.

(e.g., Scopus, Web of Science, Emerald Insight, and ScienceDirect) and subsequently used to develop the proposed framework. The development of the proposed conceptual framework was guided by these sources, ensuring that the model is firmly rooted in established theoretical and contextual insights.

In line with the proposed framework, further empirical studies can be conducted to validate and expand the model. Given the complex aspects of adopting halal verification applications, future research could benefit from a mixed-methods approach to gain deeper insights into this phenomenon, particularly into how consumers form PT and decide whether to use halal verification apps. Quantitative methods will enable empirical testing of the proposed framework constructs. At the same time, qualitative research can provide a deeper understanding of the contextual and technological factors that shape PT and the system's credibility. To enhance clarity, Figure 2 presents the sequential mixed-methods roadmap proposed for empirical validation of the conceptual framework, in which quantitative testing is followed by qualitative inquiry to deepen the interpretation of PT formation mechanisms.

Figure 2 above presents a mixed-methods design for validating the proposed conceptual framework. The quantitative phase empirically tests the hypothesised relationships using SEM, while the qualitative phase provides contextual explanations of

PT formation and governance-related factors that shape adoption intention. For the quantitative aspect, future research could utilize a survey-based approach with structured questionnaires crafted from recognised literature on technology adoption and halal consumption. Measurement items can be crafted to assess AA, SI, PU, PEOU, PT, and the adoption of halal verification applications. Data can be gathered from halal consumers, as they are the primary users and decision-makers in halal verification contexts. Responses can be quantified using Likert-type scales, enabling practical statistical analysis. In terms of sampling, future quantitative studies could employ either probability or non-probability sampling methods, contingent upon accessibility and the research context. Data collection can occur in physical retail spaces and food service environments, or via online platforms where decisions about halal consumption are typically made. A sample size within the commonly suggested range for multivariate analysis would be sufficient to ensure thorough model evaluation.

In addition, in the field of data analysis, future studies may use structural equation modelling (SEM) to assess measurement validity and the structural relationships among constructs. SEM is particularly effective for investigating mediation effects, which is important for evaluating the function of PT proposed in the framework. This analytical method allows researchers to examine both direct and indirect relationships between halal verification, AA, SI, cognitive beliefs (PU and PEOU), PT, and the adoption. Moreover, to improve the quantitative findings, further studies could integrate qualitative aspects by conducting semi-structured

interviews with halal authorities, app developers, or ICT experts involved in the design, development, or governance of halal verification systems. These interviews could explore topics related to data accuracy, system architecture, manageability, transparency, and integration with halal certification bodies. Qualitative insights would enhance understanding by situating consumer PT in a broader context and clarifying how technological and governance factors shape the system's credibility.

In all future empirical studies, it is important to consider the ethical implications carefully. Such considerations include informed consent, confidentiality, voluntary participation, and awareness of religious values related to halal decision-making. Upholding ethical research practices is important, especially given the moral and religious dimensions involved in halal certification behaviour. The proposed conceptual framework provides a structured basis for comprehensive empirical investigation. This study outlines methodological paths for future research, encouraging comprehensive model validation and refinement, while maintaining a clear separation between conceptual advancement and empirical examination.

#### **4. Discussion: Theoretical and practical implications**

As a conceptual contribution, the framework offers theoretically inferred implications for halal authorities, app developers, and industry stakeholders. The model suggests that strategies such as transparent information display, perceived institutional legitimacy, and user-friendly verification functions may strengthen PT, thereby supporting adoption intention. However, these implications remain propositional and should be validated through empirical testing. Future studies may examine whether institutional affiliation, promotional exposure, and communication strategies meaningfully contribute to PT formation and subsequent adoption behaviour across different consumer segments.

##### **4.1 Theoretical implications**

The proposed framework contributes to the literature on technology adoption, halal governance, and digital trust in several ways. First, the proposed framework builds on the TAM by placing it in a religiously sensitive decision-making context. In this context, acceptance is influenced not only by how well it works but also by moral responsibility and religious PT. Although TAM has been widely used in digital services, its application in halal verification has been uneven or insufficiently well thought out. This study adds further contextual knowledge about acceptance behaviour by examining PT as a key mediating concept and awareness of halal verification applications and their social impact as external precursors.

Second, this theory adds to halal research by suggesting that PT is an integral part of religion rather than a secondary indicator. Existing studies often view trust as a direct cause of behavioural intentions. Instead, this study conceptualises PT as a complex belief shaped by PU and PEOU, which, in turn, influences adoption intention. This approach is consistent with the core principle of TAM and fulfils the specific knowledge requirement for halal evidence, where consumers seek trust-based confidence alongside practical value (Berakon *et al.*, 2023; Karyani *et al.*, 2024; Miftahuddin *et al.*, 2022; Noor, 2024). In this way, this theory facilitates understanding of how

cognitive and moral considerations work together to influence adoption choices.

Third, this study contributes to the growing body of research on digital halal governance by demonstrating differences between people who are generally aware of halal and those who are aware of mobile applications that certify halal. This difference in ideas fills a gap that has been overlooked in research, especially in places where Muslims are the majority and halal certification is well-established. This framework suggests that adoption problems may stem from information gaps rather than resistance to the technology itself. This perspective enhances understanding of adoption dynamics in a context where digital tools complement rather than replace existing certification systems.

Finally, the framework deepens theoretical understanding by providing a flexible, innovative model that can be applied across a range of contexts, technologies, and stakeholder groups. The proposed framework offers a comprehensive foundation that goes beyond a single application or market, facilitating future empirical testing, comparative analysis, and model refinement in a structured manner. This enhances a broader understanding of research in the use of halal technologies.

##### **4.2 Practical implications**

The proposed framework not only contributes theoretically but also presents various practical implications for stakeholders involved in the development, governance, and promotion of halal verification mobile applications. The framework highlights the need for halal authorities and policymakers to prioritize the visibility, support, and integration of digital verification tools. Increasing institutional collaboration through verification applications can increase consumer trust by demonstrating religious authenticity. Policymakers can leverage this framework to shape digital halal strategies that enhance current certification systems, particularly by increasing public understanding of verification applications and clarifying their function in facilitating halal compliance. For app developers and technology providers, this framework emphasizes PT as a fundamental design principle. In addition to technical functionality, developers should emphasize transparency about data sources, certification updates, and the mechanisms used for verification. Creating functional and user-friendly apps can increase PT by minimising uncertainty and perceived risk. Additionally, incorporating elements that demonstrate institutional affiliation or recognition from a certification authority can significantly increase consumer trust. Furthermore, for industry stakeholders, including retailers and food service operators, this framework demonstrates that halal verification apps can serve as a valuable resource that enhances consumer trust at the point of purchase. Raising awareness of verification tools in the retail environment and supporting their use can reduce consumer scepticism and foster informed decision-making about halal products, especially in complex product categories.

Finally, for researchers, this framework provides a well-structured basis for empirical research using quantitative, qualitative, or mixed-methods strategies. This allows researchers to analyse how PT is formed, the mechanisms

underlying PT, and patterns of adoption, while considering the religious and social aspects associated with halal consumption.

## 5. Conclusion

This study presents a conceptual framework that aims to explore the adoption of halal verification mobile applications. It does so by combining the TAM with halal-specific contextual elements and a trust-oriented mediation structure. Understanding that halal verification decisions are rooted in religious accountability and social norms, this framework identifies PU and PEOU as underlying cognitive beliefs, while explicitly defining trust as a key mediating factor linking these beliefs to adoption intentions. Furthermore, awareness of halal verification applications and the effects of social influence are integrated as external factors that inform internal evaluations, rather than having direct effects.

By situating technology adoption within a context-sensitive framework of religious use, this framework broadens our understanding of digital halal verification behaviour in a more sophisticated way. It emphasizes that adoption is not only influenced by functional efficiency but also by perceived legitimacy, religious certainty, and PT in the verification process. The inconsistency between general awareness of halal and awareness of halal verification applications highlights that barriers to adoption may stem from information gaps rather than reluctance to adopt the technology itself. This study makes a conceptual contribution and does not claim empirical validation. Instead, it presents a theoretically informed, context-sensitive framework that effectively integrates insights from previous studies into a unified explanatory model. This study also serves as a basic reference for future empirical investigations and contributes significantly to the ongoing theoretical development in the fields of halal authentication and digital trust.

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