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A Scoping Review of Artificial Intelligence in Halal Service

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Abstract

The global Islamic economy continues to be driven by key halal service industries including Islamic finance, Muslim-friendly travel, and Islamic media and recreation. In these service contexts, part of the economic growth is due to the increased use of artificial intelligence (AI) for the provision of service to customers. Despite the importance of AI in halal service, the literature in this field remains fragmented resulting in a lack of understanding of the research terrain and what has been done in research. The purpose of this scoping review is to provide a broad overview of the state of research of AI in halal service. Findings from the 28 articles reveal that a vibrant research stream has sprung up in recent years looking at the impact of AI on both consumers and organizations in multiple halal service sectors. This study contributes to the literature on the application of AI in services in the context of halal industries by providing a holistic map of the research terrain and provides suggestions for future development in this research area.

Keywords: artificial intelligence, AI service, halal, scoping review

Introduction

The halal lifestyle market continues to grow significantly. Reports estimate that this economy has grown by 41.4% from US$1.62 trillion in 2012 to US$2.29 trillion in 2022 (DinarStandard, 2023). Key halal industries driving the global Islamic economy that can be classified as service industries include Islamic finance, Muslim-friendly travel, and Islamic media and recreation (Noor, 2022). Indeed, these halal service industries are among the largest halal sectors and are forecasted to grow between 5 to 9% from 2022 to 2027. Similar to the disruptions in the global service industry (Bagozzi et al., 2022; Wirtz et al., 2018), a key driver impacting the halal service economy is artificial intelligence (AI) (DinarStandard, 2023).

In service, autonomous human-like powered by AI are changing the way services are being provided to customers (Noor, 2024a). AI applications can now be used to perform mechanical, analytical, and empathetic tasks (Huang & Rust, 2018; Huang & Rust, 2020) while delivering productivity and service excellence (Wirtz et al., 2023). These result in the multiple uses of AI in key service sectors such as the hospitality industry (Noor et al., 2024; Sharma et al., 2022). Some of the more novel applications combining the mechanical, analytical, and empathetic intelligence afforded by AI include AI concierge services that can manage the entire customer journey (Liu et al., 2024). Similarly, the use of AI in service-dominated halal economies has also begun, with AI being used in Fintech in Islamic finance to travel booking in Muslim-friendly travel (DinarStandard, 2023).

In tandem with these developments, research on AI in service is more mature than AI in halal service and has resulted in several rigorous reviews of the literature in the field. On AI in service, such reviews include systematic literature reviews (SLRs) of the general hospitality industry (Sharma et al., 2022) to specific applications such as service chatbots (Suhaili et al., 2021) and how consumers engage in such AI technologies (Hollebeek et al., 2024). These SLRs are designed to provide a state-of-the-art understanding of the literature (Paul et al., 2021). However, in the emerging field of AI in halal service, to the best of our knowledge, few thorough literature reviews have been clearly done. While recent research by Battour et al. (2024) gives useful insights into the literature related to ChatGPT and halal tourism, the methodology of their in-depth review was not clear. Also, while there has been SLR research conducted by Noor (2024b) on the technology acceptance model (TAM), this research tangentially refers to technology adoption in the context of consumer behavior and does not refer to the use of AI technologies in halal services. In addition, the review conducted by the authors in a recent publication titled “Islamic Finance and Fintech: A Scoping Review” only focuses on the Islamic finance sector and the nature of their review is unclear as to whether a scoping or systematic review was conducted (Minz et al., 2024). One seminal SLR was by Alrumiah and Al-Shargabi (2023) that reviewed Quran recitation applications using AI. Thus, overall the literature on AI in halal service remains fragmented and lacks a clear broad understanding of what has been done in this research field.

To address this gap in the literature, this paper conducts a scoping review of AI in halal service. Compared to SLRs which are aimed at synthesizing research findings of a body of research in greater detail (Levac et al., 2010), a scoping review was chosen as the research methodology for the following reasons. First, as the key research objective of this study is broad and pertains to describing the extent to which research has been done on AI in halal service, a scoping review is more appropriate compared to an SLR (Arksey & O'Malley, 2005). Second, as the literature on AI in halal service is emerging, the volume, quality, and discussion areas in the literature remain unclear to warrant an immediate SLR (Levac et al., 2010).

Accordingly, the research question of this study is as follows: What are the relevant studies and characteristics of research on AI in halal service? The results of this scoping review will inform future research if it is feasible to conduct an SLR on specific research areas within AI in halal service (Arksey & O'Malley, 2005). Results can also provide directions for other exploratory and empirical research to investigate specific phenomena on AI in halal service. Overall, this paper will contribute to the emerging literature on AI in halal service. As for practitioners, insights from this scoping review can inform managers of current key areas concerning the implementation of AI in halal service and provide them with strategic directions to improve their service to halal markets using AI.

The remaining sections of this paper are as follows. First, this paper will give further background on the literature of the use of AI in general services as well as specific halal contexts. Subsequently, the paper will explain the methodology used to create this scoping review. The findings of the scoping review will be discussed before concluding on the main insights and implications of this paper.

Background of AI in Services including Halal

The impact of AI in service can be understood in terms of the capabilities AI brings to the service industry, the fundamental service tasks that AI can perform, and how this translates to the entire service experience.

In terms of intelligence, AI applications now include capabilities associated with mechanical, analytical, and empathetic intelligence (Huang & Rust, 2020). In the context of the halal market, examples include offering Islamic greetings to the customer (mechanical), recommending service personalization such as room and entertainment preferences (analytical), and managing customer emotions (empathetic tasks). On emotional intelligence, the emergence of Generative AI including ChatGPT has given AI the ability to manage customer care resulting in an emotional connection with the customer (Huang & Rust, 2024).

The above capabilities result in AI impacting the components of almost any service (Noor & Sim, 2024). AI helps to further increase the efficiency of facilitating service components such as billing through automation while further enhancing service components associated with consultation and hospitality (Noor & Sim, 2024). These service components are integral in the formation of an effective customer journey. Accordingly, the ability of ChatGPT to perform mechanical (e.g., managing routine queries), analytical (e.g., providing recommendations), and empathetic (e.g., consulting with customers) tasks allows the application to enhance all stages of the customer’s journey in halal services (Battour et al., 2024).

Overall, these developments will change how customers experience the entire service and how organizations need to manage their relationships with customers throughout the customer journey. In the context of Muslim-friendly travel, a suite of AI-enabled applications including chatbots, autonomous vehicles, and social media analytics will usher in a new travel experience for the halal market (Battour et al., 2023). However, the new capabilities that AI offers to both customers and the organization may also require careful planning and implementation to manage adverse outcomes such as increased service discrimination (Libai et al., 2020).

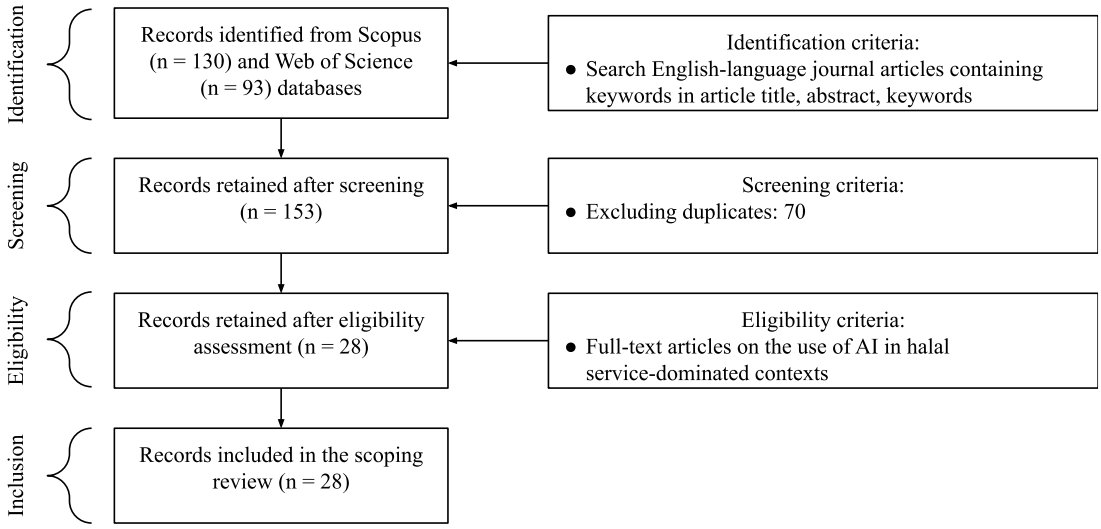
Given these rapid developments and the increased research interest in the use of AI to improve halal services both in the frontend and backend of the organization, it is important to have a

holistic view of the studies that have been conducted in this space. Accordingly, the next section proceeds to describe the methodology used in this scoping review.

Research Methodology

Scoping review frameworks that have been introduced to the literature generally include the key phases of identifying the research question, identifying relevant studies, selecting studies, charting the data, and preparing and reporting the results (Arksey & O'Malley, 2005; Levac et al., 2010). Based on the recommendations by McGowan et al. (2020), this paper proceeds to use the scoping review extension of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-ScR) developed by Tricco et al. (2018). Figure 1 summarizes the key scoping review research phases.

Figure 1: Flow Diagram of PRISMA-ScR Protocol Adapted from Moher et al. (2010)



In the identification phase, journal articles were searched in the Scopus and Web of Science (WoS) databases. Both Scopus and WoS are quality databases suitable for thorough literature reviews (Paul et al., 2021) and have been used in past systematic reviews involving halal markets (Noor, 2024b). These database sources have also been used in past scoping reviews involving services (Sadeghi-Demneh et al., 2018). Keywords were selected based on the scope of the review and included the following terms: “halal”, “Muslim*”, “Islam*” AND “artificial intelligence”. The keyword search was done on the title, abstract, and keywords of publications. This resulted in the identification of 130 records from Scopus and 93 records from WoS.

In the screening phase, 70 duplicates were found, leaving the remaining 153 records. Subsequently, in the eligibility phase, only full-text articles that could be accessed and that discussed the use of artificial intelligence in halal service-dominated contexts such as in the industries of Islamic finance, Muslim-friendly travel, and Islamic media and recreation were selected for the scoping study. Hence, while articles such as Sukkar et al. (2024) discuss the impact of AI on Islamic architecture, the link to the service industry was tangential (i.e. AI affecting the physical service environment) and not central to this paper's discussion. Similarly, Taufik (2020) discussed the repercussions of emerging technologies on Islamic education but

did not mainly focus on AI. Other papers including Rabbani et al. (2023) and Khan et al. (2023) provided insights on the impact of AI in general service industries without specific findings on the halal service industry. Also, there were several interesting studies encountered during the eligibility-screening phase related to the use of AI and Islamic worldviews (Alkhiri, 2022), religious texts (Saloot et al., 2016), ethical issues (Nawi et al., 2023) and content moderation (Wang & Kim, 2023) but these too did not focus on halal service contexts. Therefore, such papers were excluded from the review.

The eligibility screening was done manually by the paper author. After the eligibility assessment, the total number of articles was 28. The following section describes the characteristics of the articles in review.

Results and Discussion

Table 1 lists the top 10 articles on AI in halal services based on the citation count on Google Scholar as of 7 July 2024. Subsequently, Table 2 summarizes the general characteristics of the articles in review based on an adaptation of several information characteristics reported in Arksey and O'Malley (2005).

Table 1: Top 10 Articles on AI in Halal Services by Citation

# Cited	Author (Year)	Journal	Article Title	Industry
199	Haider et al. (2020)	International Journal of Economics and Business Administration	An artificial intelligence and NLP based Islamic FinTech model combining Zakat and Qardh-Al-Hasan for countering the adverse impact of COVID 19 on SMEs and individuals	Islamic finance
70	Khan and Rabbani (2021)	International Journal of Information Retrieval Research	Artificial intelligence and NLP-based chatbot for Islamic banking and finance	Islamic finance
54	Suhartanto et al. (2022)	Journal of Islamic Marketing	Millennial loyalty towards artificial intelligence-enabled mobile banking: evidence from Indonesian Islamic banks	Islamic finance
43	Yaseen et al. (2013)	Safety Science	Real-time crowd density mapping using a novel sensory fusion model of infrared and visual systems	Muslim-friendly travel
34	Battour et al. (2023)	Journal of Islamic Marketing	AI-enabled technologies to assist Muslim tourists in Halal-friendly tourism	Muslim-friendly travel
25	Ordukaya and Karlik (2016)	IEEJ Transactions on Electrical and Electronic Engineering	Fruit juice–alcohol mixture analysis using machine learning and electronic nose	Halal food

22	Kishada et al. (2016)	Journal of Theoretical and Applied Information Technology	Customer loyalty assessment in Malaysian Islamic banking using artificial intelligence	Islamic finance
22	Elhalwany et al. (2015)	International Arab Journal of Information Technology	Using textual case-based reasoning in intelligent Fatawa QA system	Islamic media and recreation
14	Sumarliah and Al-Hakeem (2023)	Kybernetes	The effects of digital innovations and sustainable supply chain management on business competitive performance post-COVID-19	Halal food
12	Klemens et al. (2022)	Borsa Istanbul Review	Robo-Sukuk pricing for Chinese equities	Islamic finance

Table 2: General Characteristics of Articles in Scoping Review (n=28)

Characteristic		# Articles	% Articles
Publication year	2010-2014	1	3.57
	2015-2019	5	17.86
	2020-2024	22	78.57
Journal	Journal of Islamic Marketing	3	10.71
	Arabian Journal for Science and Engineering	2	7.14
	Journal of Theoretical and Applied Information Technology	2	7.14
	Borsa Istanbul Review	1	3.57
	Computers, Materials and Continua	1	3.57
	Decision Science Letters	1	3.57
	Heliyon	1	3.57
	IEEJ Transactions on Electrical and Electronic Engineering	1	3.57
	International Arab Journal of Information Technology	1	3.57
	International Journal of Data and Network Science	1	3.57
	International Journal of Economics and Business Administration	1	3.57
	International Journal of Economics and Financial Issues	1	3.57
	International Journal of Information Retrieval Research	1	3.57
	International Journal of Integrated Engineering	1	3.57
	International Journal of Religion	1	3.57
	ISRA International Journal of Islamic Finance	1	3.57
	Journal for the Study of Religions and Ideologies	1	3.57
	Kybernetes	1	3.57
	Legality: Jurnal Ilmiah Hukum	1	3.57

	Pertanika Journal of Science and	1	3.57
	Technology	1	3.57
	Public Organization Review		
	Safety Science	1	3.57
	Sustainability	1	3.57
	WSEAS Transactions on Business and	1	3.57
	Economics	1	3.57
Halal service industry	Islamic finance	10	35.71
	Muslim-friendly travel	9	32.14
	Halal media and recreation	5	17.86
	Halal food	3	10.71
	Halal pharma	1	3.57
Study location	Indonesia	5	17.86
	Saudi Arabia	5	17.86
	Malaysia	4	14.29
	Bahrain	1	3.57
	China	1	3.57
	Egypt	1	3.57
	Jordan	1	3.57
	Pakistan	1	3.57
	Yemen	1	3.57
	Unspecified	8	28.57
Methodology	Quantitative database analysis	9	32.14
	Conceptual	7	25.00
	Quantitative survey	6	21.43
	Case studies	1	3.57
	Experimental design	1	3.57
	Qualitative interviews	1	3.57
	Systematic reviews	1	3.57
	Others	2	7.14
Theory	Unified Theory of Acceptance and Use of Technology (UTAUT)	2	7.14
	Analysis, Design, Development, Implementation and Evaluation (ADDIE)	1	3.57
	Customer experience		
	Customer journey	1	3.57
	Expectation-confirmation theory	1	3.57
	Social Cognitive Theory	1	3.57
	Unspecified	1	3.57
		21	75.00
AI user context	Consumer	19	67.86
	Organization	9	32.14
AI study context	Service improvement	21	75.00
	AI attitudes	5	17.86
	AI used for study analysis	2	7.14
Outcome	governance	5	17.86
	well-being	5	17.86
	business performance	3	10.71
	customer loyalty	3	10.71
	customer engagement	2	7.14
	customer experience	2	7.14
	learning	2	7.14
	technology adoption	2	7.14
	customer satisfaction	1	3.57

	productivity	1	3.57
	reporting quality	1	3.57
	resource management	1	3.57

Citation Influence

As seen in Table 1, the most cited article on the use of AI in halal service contexts was published in 2020 by Haider et al. (2020) in which they conceptualize how AI could be used to better assess the applicability of Zakat recipients and borrowers. The second and third most cited articles by Khan and Rabbani (2021) and Suhartanto et al. (2022) respectively also featured industries related to Islamic finance.

The top 10 articles are representative of all key halal industries except for halal pharma, modest fashion, and halal cosmetics. Of the top 10 most influential articles, 50% discuss the use of AI in the Islamic finance industry. This is reflective of the relative progress of technology-related research in the Islamic finance sector (Noor, 2024b) and emphasizes the need for more AI research in other halal sectors.

Publication Year

The earliest study on the use of AI in halal service contexts was published in 2013 by Yaseen et al. (2013) in which they studied how AI sensory technology could be used to estimate the densities of crowds during the Hajj pilgrimage. The key outcome of this study, being to improve the well-being of pilgrims, sits well with the early calls during the period for service research to focus on the well-being of customers (Anderson & Ostrom, 2015; Anderson et al., 2013; Rosenbaum et al., 2011).

As seen in Table 2, the number of publications grew about five-fold from 2015 to 2019 compared to the previous period between 2010 to 2014. However, the clear spike in publications on AI in halal service contexts began in the last half-decade with 78.57% of articles published during this period. This positive trend shows how the Islamic marketing literature and halal industries are contributing to research on AI in service and encourages continued research in this space.

Journal

In terms of journals, the Journal of Islamic Marketing is the most popular journal outlet with 10.71% of publications as shown in Table 2. Of the 24 journal outlets in which studies on AI in halal service have been published, eight journals are focused on Islamic industries or studies involving faith, namely the Journal of Islamic Marketing, Arabian Journal for Science and Engineering, Borsa Istanbul Review, International Arab Journal of Information Technology, International Journal of Religion, ISRA International Journal of Islamic Finance, Journal for the Study of Religions and Ideologies and Legality: Jurnul Ilmiah Hukum.

The range of disciplines as represented by the journal publication outlets reflects one key challenge of conducting scoping reviews in which careful analysis is required to ascertain the relevance of the breadth of studies explored in the review (Arksey & O'Malley, 2005). However, this diversity in research disciplines also reflects the importance of continued multidisciplinary research in this space.

Halal Service Industry

The nature of the halal service industry in the studies reviewed was labeled using the categorizations used in the State of the Global Islamic Economic Report which identifies seven main economies: Islamic finance, halal food, modest fashion, Islamic media and recreation, Muslim-friendly travel, halal pharma, and halal cosmetics (DinarStandard, 2023). While Islamic finance, Muslim-friendly travel and Islamic media and recreation are more readily service-dominated halal industries, papers that focused on more product-dominated halal industries such as halal food were relevant for this review if the studies focused on service interactions, particularly between firms in the supply chain (Sumarliah & Al-Hakeem, 2023).

In terms of the studies in this review, the majority of the research, or 35.71% focused on Islamic finance followed by Muslim-friendly travel with 32.14%. Overall, the breadth of industries covered by current AI studies in halal services as seen in Table 2 attest to AI as one of the key disruptive drivers in the fourth and fifth industrial revolutions (Noble et al., 2022). This also shows that the global halal service economy is part of the industrial revolution and is a rallying call for the exploration of the use of AI in business service transactions in halal cosmetics as well as modest fashion.

Study Location

Table 2 shows that the majority of studies were focused on locations in Islamic countries and those that belong to the Organisation of Islamic Cooperation (OIC) (DinarStandard, 2023). The majority of the studies on AI in halal services looked at the phenomenon in Indonesia and Saudi Arabia (17.86% each) followed by Malaysia (14.29%).

The study by Klemens et al. (2022) is a notable exception that looked at how the use of AI could improve Sukuk pricing for Chinese equities. Indeed, more studies on the use of AI in halal service economies need to be conducted in non-Islamic countries with considerable halal markets.

Methodology

Table 2 highlights the dominant use of quantitative database analysis as a key research methodology for the use of AI in halal service industries. 32.14% of the studies in this review used quantitative database analysis while 21.43% used surveys as their research approach. 25% of the studies were in the form of conceptual papers which contributed to the theorizing of AI in halal service.

As this emerging space is also fertile for theory development, more qualitative research methods including conceptual papers and qualitative interviews are encouraged in this research area. Case studies such as Syahrizal et al. (2024) also encourage fresh perspectives and learning points that would enrich this research field.

Theory

Table 2 shows a variety of theories used in studies of AI in halal services. The Unified Theory of Acceptance and Use of Technology (UTAUT), featured in studies by Mbaidin et al. (2024) and Abdullah et al. (2024), was the most widely used theory. What was surprising was that the widely-used TAM (Noor, 2024b) was not featured in any of the studies in this review.

Accordingly, the finding of this scoping review in which TAM has not been investigated in the context of AI and halal services concurs with Noor (2024b).

A clear weakness of the studies in this review is that 75% of the articles did not discuss any clear underpinning theory in their studies. Future studies may wish to investigate the applicability of existing theories in their halal service contexts to advance theory development.

AI user context

Table 2 emphasizes how most studies on AI in halal services focus on the application of AI to consumers. These include Hajj pilgrims (Albahar et al., 2023), bank customers (Khan & Rabbani, 2021), and the general public making religious inquiries (Elhalwany et al., 2015). Only 32.14% of the studies focused on how the organization used AI in halal services.

This highlights the continued importance of better understanding how AI affects the consumer in various service situations. The skewed focus on the business-to-consumer (B2C) context of the use of AI also reiterates the call for more research to investigate how AI can benefit the internal stakeholders of halal services in business-to-business (B2B) contexts.

AI study context

As seen in Table 2, 75% of studies focus on the significant role of AI in improving services. This includes improvements associated with business performance (Naser et al., 2024) to customer experience (Battour et al., 2023). 17.86% of the studies in the review focused on the effects of AI attitudes, such as how attitudes toward AI can affect mobile banking loyalty (Suhartanto et al., 2022).

These findings are related to the earlier analysis in which most of the studies have focused on the B2C context and have therefore mainly looked at consumer-centric issues. While this remains important, as AI applications become more pervasive and accessible to both internal and external stakeholders, more attitudinal studies and key frameworks relevant to both external consumers and the key internal operations of the service business are needed to advance the field.

Outcome

Table 2 shows that the list of outcomes investigated in the papers on AI in halal service spans a range of issues ranging from the management of resources (Munshi et al., 2022) to bottom-line considerations including customer loyalty (Sulaiman et al., 2020).

The top two outcomes investigated in the papers in the review are governance and well-being with 17.86% each. These are reflective of the importance of these two issues amid the rapid expansion of the AI industry. Further, the number of AI studies focusing on the well-being of their halal service markets is encouraging as this contributes to the research agenda of developing more transformative services that contribute to sustainable service ecosystems (Field et al., 2021).

Conclusion

The purpose of this scoping review was to map the current research landscape on AI in halal service to identify the relevant studies and characteristics of research in this area. The scoping review reveals that the research landscape on the use of AI in halal services is vibrant and dynamic. An industrial revolution is clearly being experienced by halal service economies with the use of AI being explored in multiple use cases. Accordingly, recent studies of multiple disciplines have sprung in the literature to better understand the role of AI in halal service.

While research on AI in halal service has been mostly concentrated in the field of Islamic finance, more multidisciplinary research across other halal sectors is required and expected to emerge in the coming years. The use of more varied quantitative and qualitative research approaches will enable a richer and better triangulation of insights looking at the complex interplay between AI, services, and the Islamic tradition. This research area will also benefit from more studies testing the relevance of various theoretical frameworks in the context of AI and halal services. A better understanding of the consequences of AI in service on both the internal and external stakeholders that go beyond the bottom line also contributes to a more transformative agenda for AI in halal services. Overall, the above results of this scoping review have important implications for both researchers and practitioners.

In terms of research, this scoping review fills a critical gap in the halal services literature by summarizing what has been done in this otherwise fragmented research field. Research in this space supports the themes commonly discussed in the AI-services marketing literature as well as offers unique perspectives for halal markets. With a clearer view of this research area due to this scoping review, researchers can further investigate specific areas within the literature on AI in halal service. This includes SLRs that explore the antecedents, decisions, and outcomes associated with AI in particular halal industries such as Islamic finance, or systematic reviews using more specific search queries including “service quality” and “customer experience”. Further qualitative and quantitative research can also be done based on the areas highlighted from the insights of this study.

As for practical implications, halal service managers now have a greater awareness of the issues that have been of focus when it comes to using AI in halal service. Results from the scoping review can be used as a point of comparison with existing business initiatives to utilize AI to serve their halal markets. Practitioners can also use the insights from this scoping review as guidance in formulating their strategic directions to achieve their business objectives. This can include a cross-pollination of ideas based on AI use cases from different halal service industries.

Despite these research contributions, this study has several limitations. First, the inclusion of grey literature which is supported in scoping reviews (Levac et al., 2010) as well as non-English publications and other databases would have increased the number of articles available for review. In addition, this scoping review focused on the use of AI in halal service markets and not on the impact of AI on Muslim consumers in traditional non-halal markets. Hence, future reviews can also assess if traditional finance sectors are also dominantly featured in studies involving Muslim consumers and AI. Finally, this scoping review lacks an in-depth synthesis of the different articles identified, though scoping reviews are meant to focus on the descriptives of the articles analyzed (Arksey & O'Malley, 2005). Accordingly, this paper has provided a useful snapshot of the current state of AI research in the halal service context for further studies to advance research in this field.

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