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Strategic Approaches to AI Adoption in Fast Food Restaurants in Malaysia: A Qualitative Inquiry

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ABSTRACT

This study explores the adoption of Artificial Intelligence (AI) in Malaysia's fast-food industry using the Technology Organization Environment (TOE) framework. Although global fast-food chains have embraced AI to enhance efficiency and customer experience, adoption in the Malaysian context remains limited, especially among small and medium-sized enterprises (SMEs). Through a qualitative approach involving semi-structured interviews with ten key stakeholders, including managers, franchise owners, and AI consultants, the study uncovers key enablers and barriers to AI implementation. Findings indicate that technological challenges such as system incompatibility and complexity, organizational limitations including leadership support and financial readiness, and environmental gaps in policy awareness and vendor support significantly influence AI uptake. The study concludes that targeted digital toolkits, inclusive policy execution, and localized vendor ecosystems are essential to accelerate AI integration in this sector. This research contributes to a better understanding of how internal and external factors interact in shaping technology adoption in service-based SMEs.

1. Introduction

The fast-food industry is undergoing a profound transformation thanks to Artificial Intelligence (AI), with innovations like voice-enabled drive-thrus, smart kiosks, predictive inventory systems, and intelligent kitchen automation reshaping operations worldwide. Globally, major chains such as Taco Bell, KFC, McDonald's, Chick-fil-A, Wendy's, and Domino's are deploying AI to accelerate service, improve order accuracy, and personalize customer experiences [2,9]. In Malaysia, early adoption of AI-driven technologies is gaining momentum, particularly through self-ordering kiosks. In 2019, KFC Malaysia introduced self-service kiosks across Klang Valley outlets that support multiple digital wallets, including Alipay, WeChat Pay, Maybank QR Pay, Boost, and Touch 'n Go Wallet, significantly improving ordering speed and reducing errors [1,10,12]. Local kiosk providers like Xyreon and Vendfun are further advancing this shift by offering customizable, AI-enhanced kiosks with

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multilingual interfaces, backend inventory integration, and digital signage tailored for Malaysian eateries [14,15].

These developments suggest that Malaysian fast-food outlets are progressively adapting global AI innovations to local needs, leveraging digital payments, multilingual support, and backend connectivity to enhance speed, consistency, and customer experience [10,15]. However, AI adoption within the fast-food industry, a crucial segment of Malaysia's consumer economy, remains limited and poorly understood. While self-service technologies (SSTs) such as kiosks have been studied [5], broader adoption of AI tools across operations is still in its nascent stages, with a lack of comprehensive qualitative insights into organizational, technological, and environmental barriers [5,11].

Fast-food outlets thrive on speed, consistency, and customer satisfaction. Internationally, AI applications such as self-ordering kiosks, chatbots, and predictive inventory systems have significantly increased operational efficiency and personalized customer experiences. Conversely, many Malaysian fast-food restaurants, especially small and medium-sized enterprises (SMEs), struggle to adopt these technologies due to financial constraints, insufficient digital readiness, and a lack of sector-specific support structures.

Although the Malaysia Digital Economy Blueprint (MyDIGITAL) sets out ambitious goals for nationwide digitalisation, its sector-specific uptake, particularly in food services, has been limited. Most existing studies on AI adoption in Malaysia centre on public administration, manufacturing SMEs, and financial services [3], offering little insight into the fast-food sector.

The lack of qualitative research on AI adoption in Malaysia's fast-food industry highlights a significant gap in understanding the challenges and opportunities within this sector. To address this, the current study is guided by the Technology Organization Environment (TOE) framework, which serves as the foundational structure for investigating the strategies, enablers, and barriers influencing AI adoption. Originally developed by Tornatzky and Fleischer [13], the TOE framework provides a systematic approach to exploring technology adoption by examining three critical dimensions: technological factors (e.g., system compatibility, perceived usefulness), organizational factors (e.g., leadership support, resource readiness), and environmental factors (e.g., regulatory support, market dynamics). As this study focuses on fast-food outlets, particularly small and medium-sized enterprises (SMEs) in Malaysia, the TOE framework is highly relevant as it enables a holistic analysis of both internal and external conditions affecting AI integration. By using the TOE framework as a foundation, this research ensures a structured and theory-driven exploration of AI adoption, generating practical insights for digital transformation strategies in the Malaysian fast-food context.

2. Methodology

A qualitative research design was employed to explore the adoption of Artificial Intelligence (AI) in Malaysian fast-food outlets. Semi-structured interviews were conducted to elicit in-depth perspectives from key stakeholders, including managers, franchise owners, and technology service providers. A total of 10 participants were selected using purposive sampling to ensure diverse representation in terms of outlet size, geographical location, and digital readiness.

Interviews were carried out through a combination of video conferencing and face-to-face sessions, each lasting between 30 to 60 minutes. All interviews were audio-recorded with consent, transcribed verbatim, and subjected to thematic analysis. The analysis was guided by the TOE framework, which provided a structured lens for identifying key enablers and barriers across technological, organizational, and environmental domains.

Table 1

Respondent profile

Respondent ID	Role	Organization Type	Years of Experience
R1	Manager	Fast Food Chain	8
R2	Operations Supervisor	Fast Food Chain	6
R3	Franchise Owner	SME Restaurant Franchise	10
R4	Technology Consultant	AI Solutions Firm	7
R5	Technical Lead	AI Vendor	9
R6	Research Fellow	University	11
R7	Lecturer	Public University	13
R8	Branch Manager	Fast Food Chain	5
R9	Manager	Fast Food Chain	5
R10	Technology Consultant	AI Solutions Firm	5

3. Results

This section presents the findings from 10 semi-structured interviews with fast-food operators, franchise managers, and AI service providers across Malaysia. Thematic analysis revealed distinct enablers and barriers for AI adoption, categorized under the TOE framework.

3.1 Technological Factors

Participants generally acknowledged the potential of AI tools in improving operational efficiency. Popular AI solutions cited included customer analytics dashboards, self-ordering kiosks, automated inventory tracking, and dynamic pricing algorithms.

“We love how the kiosk systems speed up service during peak hours. Customers don’t have to queue to place orders anymore,” (R8).

Despite these benefits, technological complexity and system compatibility were major challenges. Many fast-food outlets used outdated POS systems that could not support real-time AI integration. Some participants noted that existing hardware would require complete overhauls, which was both costly and time-consuming.

“The AI module they proposed? It’s great, but our system can’t even talk to it. We’d have to replace everything—from the cash register to our kitchen screens,” (R3).

This is consistent with Lim and Seng [8], who found that technological complexity and poor system interoperability are key barriers deterring AI adoption, especially among SMEs with legacy infrastructure.

3.2 Organizational Factors

Leadership attitude and prior digital exposure emerged as decisive internal factors. Managers who had previously implemented digital tools (e.g., QR payments, online delivery systems) were more inclined to view AI as a necessary evolution rather than a luxury.

“I’ve used basic analytics on GrabFood and Shopee before. Once you see the data, it changes how you make decisions. That’s why I’m open to AI,” (R3).

Financial capability also played a critical role. While larger franchises had structured budgets for technology upgrades, independent operators voiced concerns over ROI and affordability.

“The demo was impressive. But let’s be real—I can’t fork out RM30,000 for a fancy kiosk. That’s my entire renovation budget for the year,” (R3).

These findings echo Lada *et al.*, [6], who emphasized that managerial support and resource availability strongly influence innovation outcomes in Malaysian SMEs.

3.3 Environmental Factors

The study also revealed limited awareness and accessibility of government-led digital initiatives. Most participants were unfamiliar with MyDIGITAL, MDEC grants, or AI innovation funds. Those aware felt the schemes were skewed toward larger tech industries or lacked clarity.

“They always say SMEs can apply, but where’s the guidance? I’ve never met anyone who’s successfully gotten it for F&B,” (R1).

Another interviewee pointed out that the support ecosystem (consultants, training modules, government liaisons) for fast-food services was underdeveloped compared to other sectors.

“There’s no playbook for our industry—it’s like we’re overlooked,” (R2).

These sentiments are supported by Firdaus *et al.*, [3], who observed that policy implementation in Malaysia tends to neglect service-oriented sectors like food and hospitality. Furthermore, Geetha *et al.*, [4] noted that while national frameworks such as MyDIGITAL are comprehensive, execution at the SME level often falls short due to fragmented support structures and communication gaps.

4. Discussion and Conclusions

This study affirms the relevance of the TOE framework as a foundational lens for examining AI adoption within Malaysia’s fast-food industry. The findings highlight that AI adoption remains in its early stages, with implementation shaped by interrelated technological, organizational, and environmental factors.

From a technological standpoint, system incompatibility and perceived complexity remain significant barriers, particularly among SMEs still reliant on outdated point-of-sale (POS) systems. Although the benefits of AI applications such as self-ordering kiosks, customer analytics, and inventory optimization are well recognized, the lack of integration-ready infrastructure impedes effective deployment. These challenges echo the concerns raised by Lim and Seng [8], who emphasized that technical limitations often delay innovation among small service providers.

Organizationally, leadership commitment, digital awareness, and financial capacity play crucial roles. Managers with prior exposure to digital tools, such as online ordering and delivery platforms, demonstrate greater openness to adopting AI innovations. However, high implementation costs and uncertain returns make many smaller operators hesitant to invest. This observation supports Lai *et al.*, [7], who highlighted the importance of internal managerial support and resource readiness in facilitating innovation among SMEs.

On the environmental front, the study reveals a clear disconnect between national digital initiatives and sector-specific implementation. Many respondents were unaware of policies like MyDIGITAL or found them inaccessible and overly focused on tech-intensive industries such as manufacturing and fintech. Moreover, the underdevelopment of local AI vendor ecosystems tailored to the fast-food sector further limits adoption opportunities. These issues align with findings by Firdaus *et al.*, [3] and Geetha *et al.*, [4], who noted that while policy frameworks are ambitious on paper, their translation into actionable support for service-based SMEs is often inconsistent and insufficient.

In conclusion, the TOE framework effectively captures the multifaceted barriers and enablers of AI adoption in the fast-food context. The interdependence of technological readiness, organizational support, and environmental enablers must be addressed holistically. To facilitate smoother AI integration, this study recommends the development of AI-readiness toolkits specifically designed for food service SMEs, the expansion of local vendor ecosystems, and the inclusion of the fast-food sector in national digitalization roadmaps. Additionally, more inclusive government outreach, simplified access to incentives, and stronger cross-sector partnerships are necessary to align policy intentions with on-the-ground realities. This research contributes to a deeper understanding of the complexities of AI adoption in fast-food operations and offers practical insights for policymakers, technology providers, and business leaders committed to driving digital transformation in Malaysia's service industry.

4. Limitations and Future Directions

This study has several limitations. First, the qualitative design limits generalizability across all fast-food businesses in Malaysia. Second, the sample size was relatively small and may not represent all stakeholder views. Third, the rapidly evolving nature of AI technologies means that findings may become outdated as new innovations emerge.

Future research should consider a mixed-methods approach involving a larger and more diverse sample across multiple states and business scales. In addition, longitudinal studies would help track the evolution of AI adoption over time. Collaboration between academia, government, and industry is also recommended to co-create practical AI implementation guidelines tailored to Malaysia's food service sector.

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