INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

14, Issue 12, (2024) E-ISSN: 2222-6990

The Perception of Virtual Clinics Adoption among Dietitians in Klang Valley, Malaysia

[1]Abdullah Abdualziz Bawazir, [2]Hui Ping Lee, [3]Sharifah Mariam Syed Zainal Abidin, [4]Wei Ni Tang, [5]Koghilavani Manayokhen

[1,2] Faculty of Business, UNITAR International University, Petaling Jaya 47301, Malaysia, [3]Temerloh Health Clinic, Temerloh 28000, Malaysia, [4]SCHOTT Glass, Perai 13600, Malaysia, [5]Great Eastern Life Assurance, Malaysia.

To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v14-i12/23177 DOI:10.6007/IJARBSS/v14-i12/23177

Published Date: 31 December 2024

Abstract

Recently, the healthcare industry has witnessed a transformative shift, with telemedicine and virtual clinics emerging at the forefront of innovation. These digital healthcare solutions have gained significant attention for their potential in offering unprecedented access, convenience, and efficiency in patient care. This study investigates the factors influencing the adoption of virtual clinics among dietitians in the Klang Valley, Malaysia. using the Technology-Organization-Environment (TOE) framework. A cross-sectional survey was conducted among 155 registered dietitians practicing in the region, using a structured questionnaire based on previous studies. The study focuses on the three main factors influencing this perception of adoption: technological compatibility, organizational readiness, and government policies. Technological compatibility emerged as the most crucial factor, indicating that virtual clinic technologies must seamlessly integrate with existing workflows to be effectively utilized. Organizational readiness, including the availability of resources, training, and support, is also vital, underscoring the need for healthcare institutions to foster a conducive environment for technology adoption. Government policies play a significant role by providing the necessary regulatory support and guidelines for the deployment of virtual clinics. The study highlights that while there are potential benefits, adoption remains limited due to various barriers. Recommendations include ensuring technological alignment with current practices, enhancing organizational preparedness through targeted training and resource allocation, and leveraging supportive government policies to promote widespread adoption. The findings contribute valuable insights for policymakers, healthcare providers, and researchers to enhance the implementation of virtual health technologies in dietetic practice, aiming to improve healthcare delivery and patient outcomes in the Klang Valley and beyond.

Keywords: Virtual Clinic, Technological Compatibility, Organizational Readiness, Government Policies

Introduction

Virtual clinics are transforming healthcare by addressing challenges like geographical barriers, workforce shortages, and resource constraints, particularly in regions such as the Klang Valley, Malaysia (Snoswell et al., 2020). These clinics enable dietitians to provide remote consultations, improving access to care, especially in underserved areas (Ramos et al., 2021). Despite their potential, the adoption of virtual clinics among dietitians remains limited due to factors such as technological compatibility, organizational readiness, and government policies (Ahmad et al., 2020; Nambiar et al., 2019).

The Technology-Organization-Environment (TOE) framework, established by Tornatzky and Fleischer (1990), is instrumental in examining the adoption of technological innovations in organizational settings. The TOE framework addresses three key contexts: technological, organizational, and environmental. Technological compatibility refers to how well new technologies integrate with existing systems, influencing their adoption (Davis, 1989). Organizational readiness, encompassing the availability of resources, training, and supportive culture, is crucial for the successful implementation of virtual clinics (Vasista & Yap, 2018). Additionally, government policies play a significant role in shaping the external environment by providing regulatory frameworks and incentives for adopting virtual clinics (Kruse et al., 2018).

This study leverages the TOE framework to investigate the factors influencing the adoption of virtual clinics among dietitians in the Klang Valley. The research aims to provide insights into the barriers and facilitators of virtual clinic adoption, contributing to the broader understanding of digital health implementation in dietetic practice. Given the increasing demand for dietetic services in Malaysia, driven by rising rates of non-communicable diseases such as obesity and diabetes (Institute for Public Health, 2020), understanding these determinants is crucial. This study seeks to inform policy development, guide organizational strategies, and enhance the implementation of virtual clinics, ultimately improving healthcare delivery and patient outcomes in the Klang Valley and beyond.

Technological compatibility, as emphasized by Rogers (2003), is crucial for the seamless integration of virtual clinics into existing healthcare systems. The perceived ease of use and usefulness, as proposed by the Technology Acceptance Model (Davis, 1989), also play a significant role in adoption decisions. Organizational readiness, including resources and training, has been identified as a critical factor in the successful adoption of new technologies in healthcare settings (Vasista & Yap, 2018). Environmental factors, such as government policies and regulations, are equally important, as they create the framework within which virtual clinics operate (Nambiar et al., 2019).

Despite the potential benefits, the underutilization of virtual clinics by dietitians represents a missed opportunity to address critical healthcare challenges in the region. By examining these variables within the TOE framework, this study aims to provide a comprehensive understanding of the factors influencing virtual clinic adoption, offering practical recommendations to improve the efficiency and accessibility of dietetic services in the Klang Valley.

Research highlights that effective patient-doctor communication is critical in virtual clinic guidelines, emphasizing the importance of medico-legal considerations (Sabrina & Defi, 2021). Additionally, the acceptance of virtual clinics in Malaysia is influenced by healthcare professionals' awareness of privacy, security, and reimbursement issues, as well as their access to adequate training (Ismail & Razak, 2023). The COVID-19 pandemic has played a pivotal role in accelerating the acceptance of virtual clinics, with studies demonstrating a shift in perceptions among clinicians and a significant increase in adoption during this period (Thong et al., 2021; Ramírez-Correa et al., 2020).

Despite these advances, significant barriers remain, particularly in areas such as mental health care and abortion services, where legal ambiguities and outdated laws present challenges to the applicability of virtual clinics (Deris, 2023; Mohamad & Singam, 2023). Overcoming these challenges is crucial for realizing the full potential of virtual clinics in Malaysia's healthcare system, particularly in dietetic practice.

The Malaysian healthcare system faces resource limitations, including shortages of healthcare professionals (Aziz et al., 2019). Virtual clinics could help optimize the use of available resources, allowing dietitians to serve more patients efficiently. Bokolo (2021) in his study to explore the adoption of telemedicine and virtual software for care of outpatients has highlighted the importance of remote healthcare delivery. However, the adoption among dietitians in the Klang Valley remains limited. Thus, it is important to understand the barriers to virtual clinic adoption in building a more resilient healthcare system.

Moreover, it is important for adapting to changing patient expectations. Modern patients increasingly expect convenient, technology- enabled healthcare services (Yin et al., 2022). The slow adoption of virtual clinics may result in a misalignment between service provision and patient preferences. In Malaysian context, the compatibility of virtual clinic technologies with existing systems could significantly influence adoption rates.

Furthermore, the concept of “e-readiness” in healthcare organization, which encompasses technological infrastructure, human resources, and organizational factors, has been shown to be a significant predictor of successful e-health implementation. A comprehensive understanding of the factors influencing virtual clinic adoption is crucial for developing targeted strategies and enhance the uptake of virtual clinics, ultimately improving the efficiency and accessibility of dietetic services in the region.

The main objective of this article is to examine the relationship between technological compatibility, organizational readiness and government policies with the perception of adoption of virtual clinics among dietitians in the Klang Valley. This study is a cross-sectional study adopting a survey method. For this research, correlational techniques were chosen to understand the factors influencing the perception of adoption of virtual clinics among dietitians in Klang Valley.

This study aims to shed light on the factors influencing the adoption of virtual clinics among dietitians in the Klang Valley, Malaysia. By focusing on dietitians, this study targets an essential segment of the healthcare workforce that can greatly benefit from digital health tools. Findings of this study will greatly contribute towards the understanding of how

technological compatibility, organizational readiness, and government policies impact the adoption of virtual clinics, particularly in the context of dietetic practice. The significance of this study will provide insights into barriers in adopting virtual healthcare, ensuring the virtual clinics can be effectively integrated into existing healthcare systems. By addressing the gaps in the adoption process, this will help improve the efficiency and accessibility of dietetic services and enhance patient care in underserved regions.

Literature Review and Conceptual Framework

The Technology-Organization-Environment (TOE) framework, introduced by Tornatzky and Fleischer (1990), is extensively used to examine the adoption of technological innovations in organizational contexts, including healthcare (Ahmad et al., 2020). The framework identifies three key contexts: technological (innovation characteristics like compatibility and ease of use), organizational (resources, capabilities, and readiness for change), and environmental (external factors such as policies and regulations) (Oliveira et al., 2019; Mohd Salleh et al., 2020).

For virtual clinics, technological compatibility is crucial, ensuring seamless integration with existing practices (Davis, 1989). Organizational readiness, involving resources, training, and supportive culture, significantly influences adoption (Ross et al., 1996). Moreover, government policies play a pivotal role in providing the necessary regulatory frameworks and incentives for adoption (Kruse et al., 2018).

The TOE framework has been applied in various studies to analyze technology adoption, particularly in healthcare (Alshamaila et al., 2019; Mauco et al., 2020). In telehealth, which includes virtual clinics, the framework highlights the importance of technological infrastructure, organizational readiness, and external pressures like government policy (Ayoobzadeh, 2021; Cichosz et al., 2020).

Given its comprehensiveness, the TOE framework is an appropriate theoretical lens for investigating virtual clinic adoption among dietitians in the Klang Valley, offering a holistic understanding of the factors influencing adoption in dietetic practice. Figure 1 shows the conceptual framework.

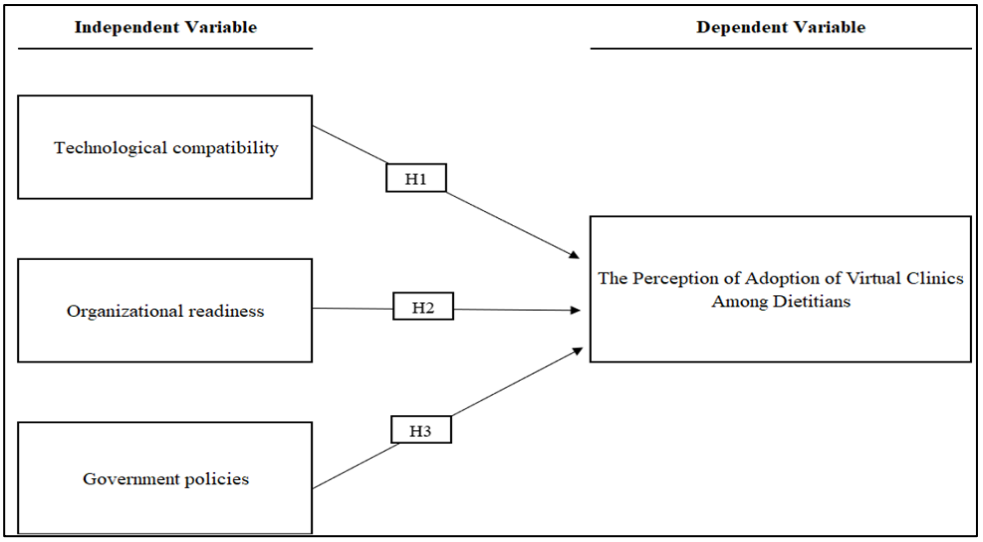

Figure 1: Conceptual Framework

Technological Compatibility

The technological context plays a vital role in adopting virtual clinics, especially in Malaysia's virtual dietetic clinics. Zhu et al. (2006) emphasized the significance of understanding technology assimilation stages, highlighting how innovations like virtual clinics spread and are adopted in organizations. Baral et al. (2023) and Ali et al. (2020) further highlight the importance of considering technology, organization, and environment in adoption processes, showing that integrating multiple frameworks offers a holistic understanding of technology adoption.

Studies such as those by Stamenova et al. (2022) have highlighted challenges in adopting virtual care, stressing the need to address technical issues and equity concerns. The perceived ease of use and usefulness of virtual clinic technologies, as noted in the Technology Acceptance Model by Davis (1989), significantly impact their adoption. Ensuring that virtual clinics are user-friendly and demonstrate clear benefits is crucial.

Gagnon et al. (2006) emphasized that robust technological infrastructure is necessary for successful implementation, especially in expanding virtual dietetic consultations in rural areas. Additionally, Kruse et al. (2017) highlighted the importance of robust security measures to protect patient data and build trust in virtual clinics, particularly in Malaysia.

The TOE framework suggests that innovation's compatibility with existing systems influences its adoption (Tornatzky & Fleischer, 1990). Several studies, including Almathami et al. (2020), Kamal et al. (2020), and Hossain et al. (2019), have consistently found technological compatibility to be a crucial factor in telehealth adoption. In Malaysia, Mohd Salleh et al. (2020) identified it as a significant predictor of hospital information system adoption, with similar implications for dietitians.

Hypothesis 1 (H1): Technological compatibility significantly influences the perception of adopting virtual clinics among dietitians in the Klang Valley.

Organizational Readiness

The organizational context is vital for adopting virtual clinics, especially in establishing virtual dietetic clinics in Malaysia. The Technology-Organization-Environment (TOE) framework offers a comprehensive view of how factors like leadership support, organizational culture, resources, and readiness for change influence this process.

Organizational readiness, including infrastructure and support mechanisms, is crucial for integrating virtual clinics into healthcare systems (Kruse et al., 2016). Leadership commitment and staff engagement are essential drivers of successful adoption. The pandemic accelerated this shift, requiring organizational agility and resilience (Stamenova et al., 2022; Reilly et al., 2020).

Studies highlight the need for effective change management and stakeholder engagement (Ng et al., 2023), with organizational collaboration identified as key for the sustainable integration of virtual clinics (Reeves et al., 2021).

The TOE framework posits that organizational characteristics, such as resources, capabilities, and culture, significantly impact the adoption of innovations (Tornatzky & Fleischer, 1990). Studies consistently emphasize the importance of organizational readiness, including infrastructure and staff preparedness (Kho et al., 2020; Holmner et al., 2020). In Malaysia, organizational factors are crucial for e-health adoption, especially in rural areas (Mauco et al., 2020; Edirippulige et al., 2019). These studies collectively indicate that organizational readiness, encompassing infrastructure, staff training, leadership support, and resource allocation, is key to dietitians' adoption of virtual clinics in the Klang Valley.

Hypothesis 2 (H2): Organizational readiness significantly influences the perception of adopting virtual clinics among dietitians in the Klang Valley.

Government Policies

The environmental context, including regulatory frameworks and external influences, significantly impacts the adoption of virtual clinics in Malaysia. Bruintjies and Njenga (2024) emphasize this influence, aligning with Zhu et al. (2006), who suggest extending the TOE framework to explore environmental factors in technology adoption. Iftikhar et al. (2021) similarly stress the importance of these factors in their study on blockchain technology in Malaysian education.

In Malaysia, patient trust, regulations, and external influences are crucial for virtual clinic adoption. Research by Sukardi et al. (2021) and Ngah et al. (2019) highlights these environmental factors' roles, supported by findings from Alaboudi et al. (2016) and Matias and Hernandez (2019) in similar contexts.

The TOE framework posits that government policies shape innovation adoption (Tornatzky & Fleischer, 1990). Government regulations are consistently shown to drive telehealth adoption, as demonstrated by Malhotra et al. (2021), Khatri et al. (2020), and Kiberu et al. (2017). Studies specific to dietetics, such as those by Khoury et al. (2019) and Nambiar et al. (2019), further affirm the importance of supportive government policies in virtual clinic adoption.

Hypothesis 3 (H3): Government policies significantly influence the perception of virtual clinic adoption among dietitians in the Klang Valley.

Methodology

This study utilized a convenience sampling technique due to its cost-effectiveness and ease of access to participants. Data collection was carefully designed to maintain validity and reliability. A structured questionnaire utilized a 5-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"), to capture respondents' perceptions and attitudes. The use of a 5-point Likert scale is well-supported in the literature for its simplicity, ease of use, and ability to produce reliable and valid data (Joshi et al., 2015).

The questionnaire was distributed online through Google Forms, targeting dietitians via email and social platform. The criteria of respondents including registered dietitians currently practicing in the Klang Valley, individuals familiar with emerging healthcare technologies, and individuals who are willing to complete the survey. Demographic details of the respondents are presented in Table 1.

Table 1
Demographic Profile

Variables	Items	n=155	Percentage (%)
Age	21-30 years old	66	42.6
	31-40 years old	68	43.9
	41-50 years old	21	13.5
Gender	Male	61	39.4
	Female	94	60.6
Professional Experience as Dietitian	5 years and below	63	40.6
	6-10 years	41	26.5
	11-15 years	28	18.1
	16-20 years	20	12.9
	21-25 years	3	1.9
Practice Setting	Public Hospital	34	21.9
	Public Clinic	27	17.4
	Private Hospital	45	29.0
	Private Clinic/Practise	38	24.5
	Educational Institution	11	7.1
Education Level	Degree	132	85.2
	Master	23	14.8
Familiarity Using Virtual Clinics	Not familiar at all	1	0.6
		24	15.5
		33	21.3

	Not very familiar	68	43.9
		29	18.7
	Neutral		
	Somewhat familiar		
	Very familiar		
Confidence Using Virtual Clinic	Strongly disagree	0	0
		14	9.0
	Disagree	55	35.5
	Neutral	63	40.6
	Agree	23	14.8
	Strongly agree		

Results and Findings

Analysis and findings were conducted using the Statistical Package for Social Sciences (SPSS). To examine the relationships between the key variables in this study, a Pearson correlation analysis was conducted. This analysis provides insights into the strength and direction of linear relationships between technological compatibility, organizational readiness, government policies, and the adoption intention of virtual clinics among dietitians in the Klang Valley. The results of the correlation analysis provide valuable insights into the factors associated with perception of virtual clinic adoption among dietitians and guide the focus of further statistical analyses in this study.

Table 2
Pearson Correlation Coefficient

Factors Influencing the Perception of Adoption Virtual Clinics	TC	OR	GP	AV
Technological Compatibility	1.000	0.600**	0.495**	0.694**
Organizational Readiness	-	1.000	0.582**	0.666**
Government Policies	-	-	1.000	0.558**
The Perception of Adoption of Virtual Clinics	-	-	-	1.000

Note: ** denotes significant at 1% level

The correlation analysis between factors influencing the perception of the adoption of virtual clinics reveals several significant relationships. The correlation coefficient between technological compatibility and organizational readiness is 0.600, which indicates a 36.0% positive relationship (0.6662 = 0.360), significant at the 1% level. Similarly, the correlation coefficient between technological compatibility and government policies is 0.495, indicating a 24.5% positive relationship (0.4952 = 0.245), also significant at the 1% level. Furthermore, the correlation between organizational readiness and government policies is 0.582, showing a 33.9% positive relationship (0.5822 = 0.339), significant at the 1% level. These results suggest that improving technological compatibility, organizational readiness, and supportive

government policies are positively associated with the perception of the adoption of virtual clinics.

The correlation coefficient between technological compatibility and the perception of adoption of virtual clinics is 0.694, indicating a 48.2% positive relationship (0.6942 = 0.482), which is significant at the 1% level. Additionally, the correlation coefficient between organizational readiness and the perception of adoption of virtual clinics is 0.666, indicating a 44.4% positive relationship (0.6662 = 0.444), significant at the 1% level. The correlation coefficient between government policies and the perception of the adoption of virtual clinics is 0.558, showing a 31.1% positive relationship (0.5582 = 0.311), significant at the 1% level.

Table 3 explains the R and R^2 values from the multiple regression analysis. The multiple correlation coefficient (R) is 0.772, indicating a strong positive relationship between the predictors (technological compatibility, organizational readiness, and government policies) and the perception of the adoption of virtual clinics. This suggests that these independent variables collectively have a substantial impact on the dependent variable.

The coefficient of determination (R^2) is 0.596, meaning that approximately 59.6% of the variance in the perception of adoption of virtual clinics can be explained by the model. This high R^2 value signifies a good fit for the regression model, highlighting the combined explanatory power of the predictors.

Table 3
Regression Model Summary

Model	R	R Square	Adjusted R Square	Std Error of the Estimate
1	0.772a	0.596	0.588	1.82837

a.Predictors: (Constant), Technological compatibility, Organizational Readiness, Government Policies

Table 4 shows ANOVA Test Results. The F-value of 74.147, with a p-value of 0.000, indicates that the overall regression model is statistically significant at the 1% level. This confirms that the independent variables reliably predict the perception of adoption of virtual clinics.

Table 4
ANOVA Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	743.603	3	247.868	74.147	.000b
	Residual	504.784	151	3.343		
	Total	1248.387	154			

a. Dependent Variable: The Perception of Adoption of Virtual Clinics
b. Predictors: (Constant), Technological compatibility, Organizational Readiness, Government Policies

The Table 5 multiple regression analysis shows the following standardized coefficients:
Technological Compatibility (β=0.422, $p < 0.001$): This indicates that technological compatibility has a significant and positive impact on the perception of adoption of virtual

clinics. For each standard deviation increase in technological compatibility, the perception of the adoption of virtual clinics increases by 0.422 standard deviations. The t value is 6.351, and the p value is <0.001, denoting high statistical significance at the 1% level.

Organizational Readiness (β=0.317, p < 0.001): This coefficient suggests that organizational readiness also significantly influences the perception of adoption of virtual clinics. A one standard deviation increase in organizational readiness leads to a 0.317 standard deviation increase in perception of virtual clinic adoption. The t value is 4.463, and the p value is <0.001, also significant at the 1% level.

Government Policies (β=0.165, p < 0.05): This variable has a positive but relatively smaller effect compared to technological compatibility and organizational readiness. Each standard deviation increases in government policies results in a 0.165 standard deviation increase in the perception of virtual clinic adoption. The t value is 2.533, and the p value is 0.012, which is significant at the 5% level.

Table 5
Variables in the Multiple Regression Analysis

Variables	Unstandardized coefficient		Standardized coefficients (Beta)	t value	P value
	B	Std Error			
Constant	1.596	0.965	-	1.654	0.100
Technological Compatibility	0.324	0.051	0.422	6.351	<0.001**
Organizational Readiness	0.250	0.056	0.317	4.463	<0.001**
Government Policies	0.192	0.076	0.165	2.533	0.012*

Note: ** Denotes significant at 1% level, * Denotes significant at 5% level

The regression analysis indicates that technological compatibility has a standardized coefficient (Beta) of 0.422, which is statistically significant at the 1% level (p < 0.001). This high beta value and significance level demonstrate that technological compatibility is a strong predictor of the adoption of virtual clinics. Additionally, the correlation coefficient between technological compatibility and the perception of adoption of virtual clinics is 0.694, indicating a 48.2% positive relationship (0.6942 = 0.482). This supports the hypothesis that technological compatibility significantly influences the perception of virtual clinic adoption.

The standardized coefficient (Beta) for organizational readiness is 0.317, with a significance level of p < 0.001. This indicates that organizational readiness significantly influences the perception of the adoption of virtual clinics. The correlation coefficient between organizational readiness and the perception of adoption of virtual clinics is 0.666, reflecting a 44.4% positive relationship (0.6662 = 0.444). These results support the hypothesis that organizational readiness plays a critical role in the perception of the adoption of virtual clinics.

The regression analysis shows that the standardized coefficient (Beta) for government policies is 0.165, with a p-value of 0.012, indicating significance at the 5% level. This suggests that government policies do have a significant influence on the perception of adoption of virtual clinics, although the effect is not as strong as technological compatibility or organizational readiness. The correlation coefficient between government policies and the perception of the adoption of virtual clinics is 0.558, indicating a 31.1% positive relationship (0.5582 = 0.311). This supports the hypothesis that government policies significantly impact the perception of virtual clinic adoption.

The findings from the regression and correlation analyses confirm that technological compatibility, organizational readiness, and government policies significantly influence the perception of the adoption of virtual clinics among dietitians in the Klang Valley. Technological compatibility and organizational readiness have a particularly strong impact, highlighting the importance of these factors in the successful implementation of virtual clinics. Government policies, while also significant, have a relatively moderate influence, suggesting that supportive policies are necessary but not sufficient on their own for widespread adoption.

Conclusion

This study explored how dietitians in the Klang Valley perception of virtual clinic adoption, focusing on three main factors: technological compatibility, organizational readiness, and government policies. The findings emphasize that technological compatibility plays a key role, as virtual clinic technologies must seamlessly integrate with existing workflows to be adopted effectively. Organizational readiness, including the availability of resources, training, and ongoing support, is also crucial, emphasizing the need for healthcare institutions to foster environments conducive to technology adoption. Government policies were shown to significantly impact adoption by providing the necessary regulatory and technical support.

To improve adoption, organizations should focus on aligning virtual clinic technologies with current work processes, enhancing organizational readiness through targeted training and resource allocation, and leveraging government support for smoother implementation. These strategies can guide healthcare providers in successfully integrating virtual clinics, ultimately improving healthcare delivery and patient outcomes in the Klang Valley.

The study faced several limitations, including sampling method and a limited data collection timeframe, which constrained the ability to capture long-term trends. Additionally, reliance on self-reported data posed the risk of response bias, and focusing solely on dietitians in the Klang Valley may not represent other regions in Malaysia. These limitations highlight the need for future studies. Additionally, future research should explore patient perspectives, offering a more comprehensive view of virtual clinic adoption. Incorporating new variables into the TOE framework, such as ethical considerations and patient characteristics, would further enrich the understanding of factors influencing adoption.

References

Ahmad, A., Jamaluddin, N. A., Hashim, N., & Sidek, M. H. M. (2020). The adoption of telehealth services in Malaysia: A systematic review. *International Journal of Advanced Science and Technology*, 29(6s), 1159-1169.

Ahmad, B. I., Yusof, M. M., Khair, E. Z. M., & Mahayuddin, Z. R. (2020). Telehealth in Malaysia: Prospects and potential issues in dermatology. *Dermatologic Therapy*, 33(4), e13328. https://doi.org/10.1111/dth.13328

Alaboudi, A., Atkins, A., Sharp, B., Balkhair, A., Alzahrani, M., & Sunbul, T. (2016). Barriers and challenges in adopting Saudi telemedicine network: The perceptions of decision makers of healthcare facilities in Saudi Arabia. *Journal of Infection and Public Health*, 9(6), 725–733. https://doi.org/10.1016/j.jiph.2016.09.001

Ali, O., Shrestha, A., Osmanaj, V., & Muhammed, S. (2020). Cloud computing technology adoption: an evaluation of key factors in local governments. *Information Technology & People*, 34(2), 666–703. https://doi.org/10.1108/itp-03-2019-0119

Almathami, H. K. Y., Win, K. T., & Vlahu-Gjorgievska, E. (2020). Barriers and facilitators that influence telemedicine-based, real-time, online consultation at patients' homes: Systematic literature review. *Journal of Medical Internet Research*, 22(2), e16407. https://doi.org/10.2196/16407

Alshamaila, Y., Papagiannidis, S., & Li, F. (2019). Cloud computing adoption in healthcare: A TOE framework investigation. *International Journal of Medical Informatics*, 131, 103966. https://doi.org/10.1016/j.ijmedinf.2019.103966

Aziz, N. A. , Ng, C. J., Saidin, H., & Saidin, N. (2019). The state of health policy and systems research in Malaysia: A scoping review. PloS One, 14(5), e0216842.

Ayoobzadeh, M. (2021). Factors influencing telehealth adoption: A TOE framework analysis of Canadian hospitals. *Health Policy and Technology*, 10(2), 100518. https://doi.org/10.1016/j.hlpt.2021.100518

Baral, M. M., Chittipaka, V., Pal, S. K., Mukherjee, S., & Shyam, H. (2023). Investigating the factors of blockchain technology influencing food retail supply chain management: a study using TOE framework. *Statistics in Transition*, 24(5), 129–146. https://doi.org/10.59170/stattrans-2023-067

Bokolo, A. J. (2021). Exploring the adoption of telemedicine and virtual software for care of outpatients during and after COVID-19 pandemic. Irish Journal of Medical Science, 190(1), 1-10.

Bruintjies, A. N., & Njenga, J. (2024). Factors affecting Big Data adoption in a government organisation in the Western Cape. *South African Journal of Information Management*, 26(1). https://doi.org/10.4102/sajim.v26i1.1690

Cichosz, S. L., Johansen, M. D., & Hejlesen, O. (2020). Toward big data analytics: Review of predictive models in management of diabetes and its complications. *Journal of Diabetes Science and Technology*, 14(3), 439-450. https://doi.org/10.1177/1932296819865519

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, 13(3), 319. https://doi.org/10.2307/249008

Deris, J. B. (2023). Utilization of telemedicine services for mental health care in Malaysia during the COVID-19 Pandemic: A Cross-Sectional Study. *Journal of Community Health Provision*, 3(1), 8–13. https://doi.org/10.55885/jchp.v3i1.218

Edirippulige, S., Armfield, N. R., & Smith, A. C. (2019). Sustainability of telehealth services in rural and remote Australia: Lessons from a study of telepaediatric burns services. *Journal of Telemedicine and Telecare*, 25(3), 193-201. https://doi.org/10.1177/1357633X18774960

Fakih El Khoury, C., Karavetian, M., Halfens, R. J. G., Crutzen, R., Khoja, L., & Schols, J. M. G. A. (2019). The Effects of Dietary Mobile Apps on Nutritional Outcomes in Adults with Chronic Diseases: A Systematic Review and Meta-Analysis. *Journal of the Academy of Nutrition and Dietetics*, 119(4), 626-651. https://doi.org/10.1016/j.jand.2018.11.010

Gagnon, M., Duplantie, J., Fortin, J., & Landry, R. (2006). Implementing telehealth to support medical practice in rural/remote regions: what are the conditions for success? *Implementation Science*, 1(1). https://doi.org/10.1186/1748-5908-1-18

Holmner, Å., Ebi, K. L., Lazuardi, L., & Nilsson, M. (2020). Carbon footprint of telemedicine solutions--unexplored opportunity for reducing carbon emissions in the health sector. PloS One, 15(9), e0237105. https://doi.org/10.1371/journal.pone.0237105

Hossain, N., Yokota, F., Sultana, N., & Ahmed, A. (2019). Factors influencing rural end-users' acceptance of e-health in developing countries: A study on portable health clinic in Bangladesh. *Telemedicine and e-Health*, 25(3), 221-229. https://doi.org/10.1089/tmj.2018.0039

Iftikhar, W., Vistro, D. M., & Mahmood, Z. (2021). Blockchain technology adoption by Malaysian Higher Education Institutes: A perspective of Integrated TAM Model and TOE Framework. *Atlantis Highlights in Computer Sciences/Atlantis Highlights in Computer Sciences*. https://doi.org/10.2991/ahis.k.210913.077

Ismail, M. S., & Razak, S. A. (2023). Educating Optometry Undergraduates Through Telemedicine: The Optometry Educator's Perspectives. *International Journal of Academic Research in Progressive Education and Development*, 12(1). https://doi.org/10.6007/ijarped/v12-i1/16105

Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert scale: explored and explained. *British Journal of Applied Science and Technology*, 7(4), 396–403. https://doi.org/10.9734/bjast/2015/14975

Kamal, S. A., Shafiq, M., & Kakria, P. (2020). Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM). *Technology in Society*, 60, 101212. https://doi.org/10.1016/j.techsoc.2019.101212

Khatri, V., Peterson, C. B., Kyriazakos, S., & Prasad, N. R. (2020). A Review of Telemedicine Services in Finland. In 2020 32nd International Teletraffic Congress (ITC 32) (pp. 1-8). IEEE. https://doi.org/10.1109/ITC3249928.2020.00029

Kho, J., Gillespie, N., & Martin-Khan, M. (2020). A systematic scoping review of change management practices used for telemedicine service implementations. *BMC Health Services Research*, 20(1), 815. https://doi.org/10.1186/s12913-020-05657-w

Kiberu, V. M., Mars, M., & Scott, R. E. (2017). Barriers and opportunities to implementation of sustainable e-Health programmes in Uganda: A literature review. *African Journal of Primary Health Care & Family Medicine*, 9(1), e1-e10. https://doi.org/10.4102/phcfm.v9i1.1277

Kruse, C. S., Krowski, N., Rodriguez, B., Tran, L., Vela, J., & Brooks, M. (2018). Telehealth and patient satisfaction: A systematic review and narrative analysis. *BMJ Open*, 7(8), e016242. https://doi.org/10.1136/bmjopen-2017-016242

Kruse, C. S., Smith, B., Vanderlinden, H., & Nealand, A. (2017). Security techniques for the electronic health records. *Journal of Medical Systems*, 41(8).

https://doi.org/10.1007/s10916-017-0778-4

Malhotra, N., Zisman-Ilani, Y., Zaho, C., O'Donovan, A., Kotz, M., & Mueser, K. T. (2021). Applying the technology-organization-environment (TOE) framework to understand facilitators and barriers of tele-mental health implementation in rural settings. *Journal of Technology in Behavioral Science*, 6(2), 287-297. https://doi.org/10.1007/s41347-020-00182-3

Matias, J. B., & Hernandez, A. A. (2019). Cloud computing adoption intention by MSMEs in the Philippines. *Global Business Review*, 22(3), 612–633. https://doi.org/10.1177/0972150918818262

Mauco, K. L., Scott, R. E., & Mars, M. (2020). Validation of an e-health readiness assessment framework for developing countries. *BMC Health Services Research*, 20(1), 575. https://doi.org/10.1186/s12913-020-05448-3

Mohamad Shariff, A. N., & Singam, A. S. T. (2023). Telemedicine Abortion During Covid – 19 And The Challenges In Its Applicability In Malaysia. *Russian Law Journal*, 11(3), 964–973. https://doi.org/10.52783/rlj.v11i3.1385

Mohd Salleh, M. I., Abdullah, R., & Zakaria, N. (2020). Evaluating the effects of electronic health records system adoption on the performance of Malaysian health care providers. *BMC Medical Informatics and Decision Making*, 20(1), 61. https://doi.org/10.1186/s12911-020-1075-6

Mohd Salleh, N. F., Mahayuddin, Z. R., Jaafar, M. H., Zakaria, N. Z., & Ahmad, B. I. (2020). Factors influencing the adoption of hospital information system (HIS) among medical practitioners: A cross-sectional study in Malaysia. *BMC Medical Informatics and Decision Making*, 20(1), 1-11. https://doi.org/10.1186/s12911-020-01264-y

Nambiar, D., Lim, H. C., Tan, L. L., & Chan, Y. H. (2019). Driving telemedicine forward in Malaysia: An analysis from an ethical perspective. *Journal of Bioethical Inquiry*, 16(3), 417-427. https://doi.org/10.1007/s11673-019-09937-9

Ng, S. H., Babar, M. G., Ahmed, S. I., Hasan, S. S., & Yang, W. Y. (2023). Measuring empathic behaviour among undergraduate dietetics students. *Journal of Evaluation in Clinical Practice*, 30(2), 153–161. https://doi.org/10.1111/jep.13913

Ngah, A. H., Ramayah, T., Ali, M. H., & Khan, M. I. (2019). Halal transportation adoption among pharmaceuticals and comestics manufacturers. *Journal of Islamic Marketing*, 11(6), 1619–1639. https://doi.org/10.1108/jima-10-2018-0193

Oliveira, T., Martins, R., Sarker, S., Thomas, M., & Popovič, A. (2019). Understanding SaaS adoption: The moderating impact of the environment context. *International Journal of Information Management*, 49, 1-12. https://doi.org/10.1016/j.ijinfomgt.2019.02.009

Ramírez-Correa, P., Ramírez-Rivas, C., Alfaro-Pérez, J., & Melo-Mariano, A. (2020). Telemedicine Acceptance during the COVID-19 Pandemic: An Empirical Example of Robust Consistent Partial Least Squares Path Modeling. *Symmetry*, 12(10), 1593. https://doi.org/10.3390/sym12101593

Ramos, I., Sousa, C., Basto, M., Rodrigues, D., & Almeida, H. A. (2021). Virtual consultations in dietetic practice: A narrative overview. *Journal of Telemedicine and Telecare*. https://doi.org/10.1177%2F1357633X211048748

Reeves, J. J., Ayers, J. W., & Longhurst, C. A. (2021). Telehealth in the COVID-19 Era: A balancing Act to avoid harm. JMIR. *Journal of Medical Internet Research/Journal of Medical Internet Research*, 23(2), e24785. https://doi.org/10.2196/24785

Reilly, M. F. O., Merghani, K., & Sheehan, E. (2020). Virtualised care and COVID-19. *Irish Journal of Medical Science*, 190(1), 39–40. https://doi.org/10.1007/s11845-020-02269-5

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

Ross, J. W., Beath, C. M., & Goodhue, D. L. (1996). Develop long-term competitiveness through IT assets. *Sloan Management Review*, 38(1), 31-42.

Sabrina, M. I., & Defi, I. R. (2021b). Telemedicine guidelines in South East Asia—A scoping review. Frontiers in Neurology, 11. https://doi.org/10.3389/fneur.2020.581649

Snoswell, C. L., Chelberg, G., De Guzman, K. R., Haydon, H. H., Thomas, E. E., Caffery, L. J., ... & Smith, A. C. (2020). Direct-to-patient telehealth services in Australia and their relationship with longitudinal health care costs. *Journal of Telemedicine and Telecare*, 26(7-8), 419-428. https://doi.org/10.1177/1357633X19869406

Stamenova, V., Budhwani, S., Soobiah, C., Fujioka, J., Khan, R., Liu, R., Halperin, I., Bhatia, R. S., & Desveaux, L. (2022). Hospital-based ambulatory clinic adoption of video and telephone visits before and during the COVID-19 pandemic: a convergent mixed-methods study. *Journal of Integrated Care*, 30(4), 413–433. https://doi.org/10.1108/jica-01-2022-0011

Sukardi, Hasyim, & Supriyantoro. (2021). Using the Technology-Organization-Environment Framework approach in the acceptance of telemedicine in the health care industry. *European Journal of Business and Management Research*, 6(3), 47–54. https://doi.org/10.24018/ejbmr.2021.6.3.837

Thong, H. K., Wong, D. K. C., Gendeh, H. S., Saim, L., Athar, P. P. B. S. H., & Saim, A. (2021). Perception of telemedicine among medical practitioners in Malaysia during COVID-19. *Journal of Medicine and Life*, 14(4), 468–480. https://doi.org/10.25122/jml-2020-0119

Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. Lexington

Vasista, S., & Yap, H. W. (2018). Investigating the determinants of mHealth acceptance in rural areas of Thailand: A multi-group study. *International Journal of Innovation and Technology Management*, 15(6), 1850043. https://doi.org/10.1142/S0219877018500430

Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: A Technology Diffusion Perspective on E-Business. *Management Science*, 52(10), 1557–1576. https://doi.org/10.1287/mnsc.1050.0487

Yin, C. W., Hao, Y., Zhao, Y., & Xu, X. (2022). Exploring factors influencing patients' intention to use telemedicine services: An extended technology acceptance model. International Journal of Environmental *Research and Public Health,* 19(5), 2672.