

Conceptual model of internet banking adoption with perceived risk and trust factors

Waleed A. Hammood^{1,2}, Afrig Aminuddin³, Omar A. Hammood⁴, Khairul Hafezad Abdullah⁵, Davi Sofyan⁶, Majid Rahardi³

¹Department of Information Systems, Faculty of Computer Science and Information Technology, University of Anbar, Ramadi, Iraq

²Department of Computer Science, College of Science and Engineering, Bayan University, Erbil, Iraq

³Faculty of Computer Science, Universitas Amikom Yogyakarta, Sleman, Indonesia

⁴Business Administration Department, Faculty of Administration and Economics, University of Fallujah, Fallujah, Iraq

⁵Department of Academic Affairs, Universiti Teknologi MARA, Perlis Branch, Malaysia

⁶Faculty of Teacher Training and Education, Universitas Majalengka, Majalengka, Indonesia

Article Info

Article history:

Received Sep 08, 2022

Revised Nov 27, 2022

Accepted Feb 22, 2023

Keywords:

Internet banking

Perceived risk

Technology acceptance model

Technology adoption

Trust

ABSTRACT

Understanding the primary factors of internet banking (IB) acceptance is critical for both banks and users; nevertheless, our knowledge of the role of users' perceived risk and trust in IB adoption is limited. As a result, we develop a conceptual model by incorporating perceived risk and trust into the technology acceptance model (TAM) theory toward the IB. The proper research emphasized that the most essential component in explaining IB adoption behavior is behavioral intention to use IB adoption. TAM is helpful for figuring out how elements that affect IB adoption are connected to one another. According to previous literature on IB and the use of such technology in Iraq, one has to choose a theoretical foundation that may justify the acceptance of IB from the customer's perspective. The conceptual model was therefore constructed using the TAM as a foundation. Furthermore, perceived risk and trust were added to the TAM dimensions as external factors. The key objective of this work was to extend the TAM to construct a conceptual model for IB adoption and to get sufficient theoretical support from the existing literature for the essential elements and their relationships in order to unearth new insights about factors responsible for IB adoption.

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



Corresponding Author:

Waleed A. Hammood

Department of Information Systems, Faculty of Computer Science and Information Technology

University of Anbar, Ramadi, Iraq

Email: engwaleed54@yahoo.com

1. INTRODUCTION

The technology is a recent trend in today's corporate performance, the internet has grown in popularity, allowing businesses to use a variety of web-based applications to retain clients and give them new products [1]. This recognition has promoted industry competitiveness while also forcing enterprises to use comparable strategies in their daily operations. In comparison to the banks' prior way of operating, the financial services industry, notably internet banking (IB). IB is one of the most efficient and important types of internet commerce, experiencing significant technological advancements. IB acceptance is not as high a percentage as first thought [2], [3]. Because all transactions require some level of trust, those conducted over the unreliable and impersonal nature of the internet call for substantial levels of trust due to the high level of risk frequently associated with online transactions, low levels of customer trust are frequently cited as one of the common barriers to the rapid acceptance of internet banking. To strengthen the purpose of implementing IB,

the bank must guarantee personal information and financial information. The IB service must also be error-free and transaction-secure, according to banks. IB is a system that allows users to conduct financial transactions from their homes via the internet. It enables consumers and businesses to use bank services without relying on the bank's premises or physical location. The growing use of technology in the banking industry helps banks to improve client satisfaction, increase retention, and increase profits. Many benefits of IB include ease, security, and utility in financial operations. The rise in popularity of IB has aided the development and expansion of the banking sector throughout the world. Information and communication technology (ICT) advancements have resulted in significant changes in the delivery of financial services, particularly retail banking services, not only in industrialized nations but also in developing economies. The banks have been required to supply their services in accordance with the changing demands and preferences of their clients as a result of the ICT revolution. For banks, using online banking to service their clients has become a strategic instrument for gaining a competitive edge in the business. Even though IB has several advantages, it still needs improved performance [4]. IB, for example, is still not well accepted. As a result, it is research of significance and relevance, particularly for Iraqi consumers. In Iraq, the number of IB users is still few. IB may have a number of flaws that need to be addressed. IB, for example, has a security influence (SI) and trust. Then there's a lot of room for study and enhancement to help customers adopt the SI. Marakarkandy *et al.* [5] examined technology acceptance model (TAM) model incorporates elements to determine internet banking adoption in India. Perceived risk, perceived ease of use, trust, and perceived risk are among the characteristics considered. According to Sukkar and Hasan [6] thought it was necessary to investigate information system (IS) models created in western nations in a non-western surrounding, they emphasized that the situations and conditions in developing countries are not comparable to those in wealthy countries where these models were formed. Bagozzi and Yi [7] also believed that validating models produced in one nation in other countries is necessary for expanding the body of knowledge in the field of user behavior. All countries that would to succeed in the global economy must encourage their citizens to utilize internet banking more use [8]. Questions concerning the application of study findings gained in industrialized nations to African countries are raised by the glaring differences between consumers from these continents and those in developing countries, notably in Africa. It is important to note that consumers have various expectations for trust in online transactions depending on their country of origin and culture. Therefore, there is a need for a study that examines the components of online trust and how this trust influences consumers' behavior in different nations' online environments.

Risk issues with IB services are becoming more widespread worldwide. The consumer's impression of the unpredictability of outcomes largely related to gathering and evaluating information about goods and/or services prior to making any purchase decisions is reflected in perceived risk. Customers will perceive a higher risk and stop using the product or service in issue if they discover any discrepancy between their actual purchasing experiences and their desired purchasing outcomes. Since the majority of internet services operate in an open environment, security and privacy concerns like phishing, spoofing, malware, password, and spyware sniffing. Might affect their applications and results. Internet-based attacks have significantly expanded over the past several years, bringing to light numerous instances of theft or fraud, invasions of privacy, and hacker attacks. Customers believe that using online services like internet banking, e-ticket booking, and online buying. May threaten their personal security since they perceive these services to be riskier than any other traditional transaction services.

There has long been research and development in developed nations investigating the capabilities and acceptability of internet banking solutions made in and for such countries. Much of the study into technology diffusion has been based on Davis [9] TAM, although practically all of it has been done in the United States (US) and other countries. Due to this constraint in TAM's application, it may be required to question its suitability for study into the adoption of new technologies such as IB, in Middle East. As a result, it may be claimed that the largest hurdle for this technology's success is persuading people to utilize it as a full replacement for existing channels. Taking the premise that buying IB services is considered as riskier than buying existing banking services.

2. THEORETICAL BACKGROUND

Several scholars and economists analyzed the user's IB using various methods. Because there is no grounded theory in the subject of information technology (IT), academics have had to rely on models produced in other fields. The literature of internet banking connected intention models from social psychology as the cornerstone of their study in order to anticipate an individual's intention to embrace IT. These theories presented several models for predicting IB dynamics in diverse contexts. The TAM and the theory of reasoned action were among these theories. Ajzen and Fishbein [10] theory of planned behavior, Rogers [11] theory of innovation diffusion. However, due to the complexities of behavior study and the limitations of researchers, no single framework can outperform all or even most of the aspects. As a result,

attempts were undertaken to combine the ideas so that their limits might be reduced. Modern IS research suggests that they should focus their emphasis on coupling diverse theoretical models in forecasting IT acceptability, implying that a wide perspective is required [12]. Urged more user-focused internet research as well as an expansion of TAM financial services, implying that comprehending information systems employed in online contexts is a crucial issue. Additionally, pinpointing a specific group of business users with distinct requirements aids the bank in determining which products should be prioritized to appeal to this group and increases operational effectiveness [3]. Over a wide range of IS contexts, the statistical validity and resilience of the TAM have been validated. To this end, the current study integrates the framework of literature's famous TAM theory with perceived risk and trust factors to describe the notion of online banking acceptability in Iraq.

3. TECHNOLOGY ACCEPTANCE MODEL

Many studies have been conducted on the adoption and usage of IT systems, and recently, various theories have evolved at both the human and organizational levels, focusing on a nation or a group of countries [1], [13]. The dependent variable, usage or intention to use, is the same in all of the models reported in the literature, but the antecedents to explain acceptance of technology are different. The TAM is one of the most well-known theoretical models at the individual level that has attempted to explain the link between user beliefs, attitudes, and intentions [9]. TAM was created to predict workplace adoption and usage of IT, with perceived ease of use and usefulness as the primary factors of attitudes [14].

According to Davis [9], perceived ease and usefulness are the main reasons why people utilize or don't use IT. TAM's main proposition is that a user's adoption desire to utilize new technology determines whether or not that technology gets adopted. Davis also claims that behavioral intent is influenced by attitude and two specific beliefs which is perceived ease of use (PEOU) and perceived usefulness (PU), Figure 1 shows the TAM framework. TAM is a well-established model that has been well evaluated in prior research. This demonstrates the framework's acceptability in the literature. Other factors added to TAM help researchers obtain a better understanding of the technology by decreasing its volatility during the acceptance phase. The model is still applied in current studies for many technologies and is developed and refined by the Mishra *et al.* [15].

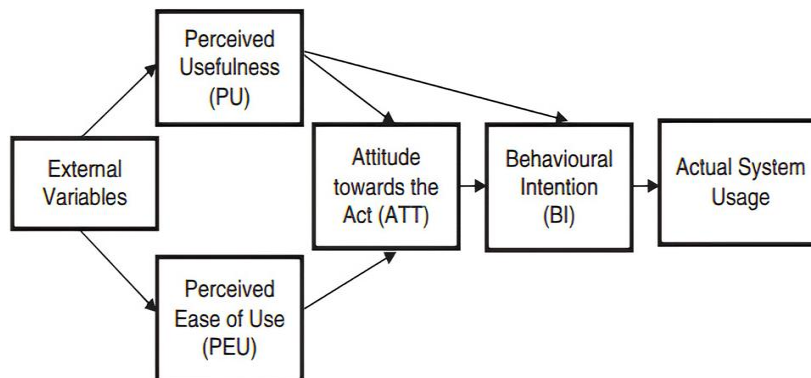


Figure 1. Technology acceptance model

For instance, Pai and Huang [16] used TAM for healthcare adoption, Han and Sa [17] examined TAM in online education, Faisal *et al.* [18] implemented TAM in online learning, and Usman *et al.* [19] evaluated TAM in e-banking. To evaluate the effect of perceived risk and trust in the adoption of Iraq's IB, the current study proposed a conceptual extended model of TAM framework with the perceived risk and trust dimensions. To our knowledge, no studies have combined TAM with the dimensions of perceived risk and trust. By using extended TAM in the country's newly growing online banking, the current research fills this gap.

4. RESULTS AND DISCUSSION

This section discussed the results of the conceptual model along with their hypothesis. The following subsection explains the affection of perceived ease of use towards the IB adoption. PEOU's influence on IB adoption is generally acknowledged.

4.1. PEOU

PEOU is defined as the degree to which an individual feels that utilizing a specific system will be effortless and simple. According to Venkatesh and Davis [20] PEOU is not a major predictor of consumers' attitudes toward technology adoption when compared to PU. PEOU, on the other hand, became increasingly important as the duration of usage increased. According to several research, PEOU has a positive influence on attitudes toward technology use. PEOU has also been identified as a key factor of lot IT adoption, Figure 2 shown the conceptual model along with hypothesis. PEOU's influence on IB adoption is generally acknowledged, and a large number of previous research have experimentally investigated this relationship and found that PEOU plays a major role in influencing IB adoption. The more user-friendly a technology is, the more valuable it is thought to be, and the more likely it is to be accepted. Therefore, the following hypothesis of PEOU:

- H1: PEOU will positively be affecting the IB adoption.

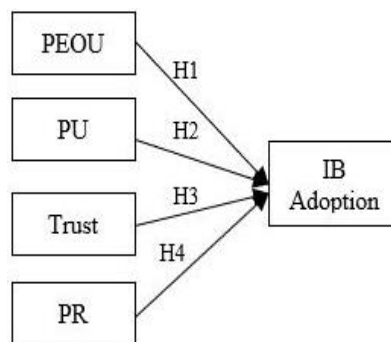


Figure 2. The conceptual model

4.2. PU

PEOU is defined as the degree to which an individual feels that utilizing a specific system will be effortless and simple. According to Venkatesh and Davis [20] PEOU is not a major predictor of consumers' attitudes toward technology adoption when compared to PU. PEOU, on the other hand, became increasingly important as the duration of usage increased. According to several research, PEOU has a positive influence on attitudes toward technology use. PEOU has also been identified as a key factor of lot IT adoption, Figure 2 shown the conceptual model along with hypothesis. PEOU's influence on IB adoption is generally acknowledged, and a large number of previous research have experimentally investigated this relationship and found that PEOU plays a major role in influencing IB adoption. The more user-friendly a technology is, the more valuable it is thought to be, and the more likely it is to be accepted. Therefore, the following hypothesis of PEOU:

- H2: PEOU will positively be affecting the IB adoption.

4.3. Trust

A user's confidence in a bank's honesty toward them might be characterized as trust. Customers' lack of trust and insufficient government laws and regulations are cited as factors for not embracing IB in terms of trust. Any financial transaction requires confidence, and new technology cannot be trusted until clients can trust it. Many publications in the fields of banking and e-commerce discuss trust, but trust concerns in the Middle East are likely to differ from those in rich Western countries. Chandio *et al.* [21] utilized an extended TAM to look into IB adoption and discovered that trust has a significant impact on perceived usefulness and IB adoption. Customers are frequently placed in very unpredictable situations after engaging in business with suppliers, which may deter them from continuing these activities in the future. Customers would be reluctant to engage in trading operations with suppliers if this uncertainty wasn't reduced. Once more, it is believed that building trust is a key component of efforts to lessen client uncertainty. An interdisciplinary approach may be used to define and analyze the idea of trust. The abundance of study in a variety of areas, including sociology, IT, and marketing provides evidence of this. Numerous definitions of trust have emerged as a result of the multidisciplinary perspective on the topic. According to this study, trust will have a significant impact on IB adoption. Therefore, the hypothesis of trust:

- H3: trust will have significant impact on IB adoption.

4.4. Perceived risk (PR)

The risk of losing money when using an IB to achieve a desired result. It's critical to get clients interested in using a certain system but keeping them as users is even more crucial. IB adoption is influenced by the user's confidence in using the system in order to maintain the user. Therefore, in addition to having intents, if the consumer believes that the bank ensures the security of transactions through IB. The goal of their study was to see how crucial risk perceptions are in the overall choice to use an IB. Previous research has shown PR as negatively impact to IB adoption. A significant driving force behind several online financial transactions is perceived danger. Customers will feel increased risk if there is any discrepancy between their actual purchasing experiences and their intended purchases, and this perceived risk will depend on how subjectively ambiguous the results are. Due to the physical and temporal distance between customers and online businesses as well as the unpredictable nature of internet services, there is inherent uncertainty surrounding online transaction [22]. Threats of hacking and phishing efforts have been observed to influence users to choose not to participate in a variety of internet-based activities, such as giving personal and sensitive information to websites. Internet banking's primary value proposition depends on keeping transactions safe from such major security flaws. Consumers' intent to utilize online marketplaces for transactions should decrease when risk is recognized, according to expectations. For instance, customers are unlikely to conduct online business with an e-retailer they perceive to be opportunistic. In a similar vein, doubts that an e-retailer has taken sufficient measures to lower infrastructure-related risks would have a negative impact on transaction intents. The idea of perceived behavioral control can be used to explain the connection between perceived risk and transaction intentions [23].

Increasing the likelihood that a customer would buy from an online shop would need lowering the risk involved. It has been demonstrated that transaction intentions with an e-retailer are negatively impacted by perceived risk. Because of the perceived risk involved with online transactions, consumers may sense less behavioral and environmental control, and this lack of control is likely to have a negative impact on consumers' intentions to make a purchase. However, customers are more inclined to do business online if their perceptions of risk related to environmental and behavioral uncertainty are reduced and they feel more in control of their online transactions [19], [24].

Cunningham *et al.* [25] discovered that IB has a risk that is higher than the typical banking channel. Customers' perceptions of the implications of using IB may be harmed by perceived risk, and hence adoption of such technology may be harmed. Customers' willingness to engage in online transactions is influenced by their perception of risk. Social behavior is based on subjective ideas such as PR and trust. The characteristics of PR have a direct and considerable impact on PU and IB adoption. However, the following hypothesis of perceived risk:

- H4: PR will have a negatively impact on the decision to use IB.

5. CONCLUSION

Provide in the IT/IS literature, IT adoption is one of the most studied topics. Adoption models and frameworks are increasingly being used in a variety of human and organizational situations to investigate variables influencing a technology's intention to use or actual use. This study proposed the conceptual model for IB by extending TAM theory with perceived risk and trust. TAM is useful for determining the link between elements that influence IB adoption. There is a need to choose a theoretical basis that may explain the adoption of IB from the customer's perspective, according to the past literature on IB and the deployment of such technology in Iraq. Thus, the TAM served as the basis for the developed conceptual model. To further this, perceived risk and trust were included as external elements among TAM dimensions. The TAM is a frugal approach, but in the context of IB adoption, the low value for IB adoption is a restriction. Our study aimed to uncover the factors that influence IB adoption by extending the TAM with perceived risk and trust. This research adds new factors to a well-known TAM and applies it to the IB context. Even web shops that want to accept online payments should understand that customer trust and perceived danger may operate as a barrier to online transactions, in addition to the financial institutions offering internet banking services. In contrast, if online merchants can increase consumer confidence and reduce perceived risk, it will have a favorable impact on their intents and behavior. Several trust-building strategies might be used by online merchants to influence positive consumer views and eventual transaction behavior.

This study omitted other customer groups that denied utilizing internet banking, such as postponers, rejecters, and opponents in favor of focusing on IB adopters and potential adopters. The primary barriers to IB adoption, however, may be better understood by researching those types of clients. Additionally, this study concentrated only on the customers' perspective and did not examine the issue from the perspective of the service providers. Therefore, this can be a drawback because it doesn't fully describe the key factors that will contribute to the successful implementation and acceptance of IB from both the perspective of customers and service providers (banks).




Additionally, the demographic disparities (such as gender, age, and technological experience) may indicate various degrees of the influence that social influence has on a person's behavior intention. Future research should thus pay more attention to the moderating effects of gender, age, and experience on the link between social influence and behavioral intention. Moreover, the future research will test the hypothesis by qualitative method and questionnaire instruments.

REFERENCES




- [1] W. A. Hammood, R. A. Arshah, S. M. Asmara, and O. A. Hammood, "User authentication model based on mobile phone IMEI number: a proposed method application for online banking system," in *2021 International Conference on Software Engineering & Computer Systems and 4th International Conference on Computational Science and Information Management (ICSECS-ICOCSIM)*, 2021, pp. 411-416, doi: 10.1109/ICSECS52883.2021.00081.
- [2] W. A. Hammood, R. A. Arshah, S. M. Asmara, H. A. Halbusi, O. A. Hammood, and S. A. Abri, "A systematic review on flood early warning and response system (FEWRS): a deep review and analysis," *Sustainability*, vol. 13, no. 1, 2021, doi: 10.3390/su13010440.
- [3] R. A. Arshah, W. A. Hammood, and A. Kamaludin, "An integrated flood warning and response model for effective flood disaster mitigation management," *Advanced Science Letters*, vol. 24, no. 10, pp. 7819-7823, 2018, doi: 10.1166/asl.2018.13024.
- [4] C. Lupu, V. -G. Găitan, and V. Lupu, "Security enhancement of internet banking applications by using multimodal biometrics," *2015 IEEE 13th International Symposium on Applied Machine Intelligence and Informatics (SAMi)*, 2015, pp. 47-52, doi: 10.1109/SAMI.2015.7061904.
- [5] B. Marakarkandy, N. Yajnik, and C. Dasgupta, "Enabling internet banking adoption: An empirical examination with an augmented technology acceptance model (TAM)," *Journal of Enterprise Information Management*, vol. 30, no. 2, pp. 263-294, 2017, doi: 10.1108/JEIM-10-2015-0094.
- [6] A. A. Sukkar and H. Hasan, "Toward a model for the acceptance of internet banking in developing countries," *Information Technology for development*, vol. 11, no. 4, pp. 381-398, 2005, doi: 10.1002/itdj.20026.
- [7] R. P. Bagozzi and Y. Yi, "On the evaluation of structural equation models," *Journal of the academy of marketing science*, vol. 16, pp. 74-94, 1988. [Online]. Available: <https://link.springer.com/article/10.1007/bf02723327>
- [8] P. Bhatnagar and A. Rajesh, "Neobanking adoption—An integrated UTAUT-3, perceived risk and recommendation model," *South Asian Journal of Marketing*, 2023. [Online]. Available: <https://www.emerald.com/insight/content/doi/10.1108/SAJM-06-2022-0040/full/html>
- [9] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319-340, 1989, doi: 10.2307/249008.
- [10] I. Ajzen and M. Fishbein, *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ, USA: Prentice-Hall, 1980. [Online]. Available: <https://www.worldcat.org/title/understanding-attitudes-and-predicting-social-behavior/oclc/5726878>
- [11] E. M. Rogers, "Lessons for guidelines from the diffusion of innovations," *The Joint Commission Journal on Quality Improvement*, vol. 21, no. 7, pp. 324-328, 1995, doi: 10.1016/s1070-3241(16)30155-9.
- [12] T. Oliveira, M. Faria, M. A. Thomas, and A. Popovič, "Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM," *International Journal of Information Management*, vol. 34, no. 5, pp. 689-703, 2014, doi: 10.1016/j.ijinfomgt.2014.06.004.
- [13] O. A. Hammood, M. N. M. Kahar, M. N. Mohammed, W. A. Hammood, and A. A. Ayoob, "Enhance video quality through VANET based on transmit packet coding (TPC)," *International Journal of Advanced Manufacturing Technology*, 2018. [Online]. Available: <https://core.ac.uk/download/pdf/188217496.pdf>
- [14] E. T. Lwoga, "Critical success factors for adoption of web-based learning management systems in Tanzania," *International Journal of Education and Development using ICT*, vol. 10, no 1, pp. 4-21, 2014. [Online]. Available: <https://files.eric.ed.gov/fulltext/EJ1071193.pdf>
- [15] D. Mishra, I. Akman, and A. Mishra, "Theory of reasoned action application for green information technology acceptance," *Computers in human behavior*, vol. 36, pp. 29-40, 2014, doi: 10.1016/j.chb.2014.03.030.
- [16] F. -Y. Pai and K. -I. Huang, "Applying the technology acceptance model to the introduction of healthcare information systems," *Technological Forecasting and Social Change*, vol. 78, no. 4, pp. 650-660, 2011, doi: 10.1016/j.techfore.2010.11.007.
- [17] J. -H. Han and H. J. Sa, "Acceptance of and satisfaction with online educational classes through the technology acceptance model (TAM): The COVID-19 situation in Korea," *Asia Pacific Education Review*, vol. 23, pp. 403-415, 2022, doi: 10.1007/s12564-021-09716-7.
- [18] A. Faisal, F. Handayanna, and I. Purnamasari, "Implementation technology acceptance model (TAM) on acceptance of the Zoom application in online learning," *Jurnal Riset Informatika*, vol. 3, no. 2, pp. 85-92, 2021, doi: 10.34288/jri.v3i2.195.
- [19] H. Usman, N. W. K. Projo, C. Chairy, and M. G. Haque, "The exploration role of Sharia compliance in technology acceptance model for e-banking (case: Islamic bank in Indonesia)," *Journal of Islamic Marketing*, vol. 13, no. 5, pp. 1089-1110, 2022, doi: 10.1108/JIMA-08-2020-0230.
- [20] V. Venkatesh and F. D. Davis, "A theoretical extension of the technology acceptance model: Four longitudinal field studies," *Management Science*, vol. 46, no. 2, pp. 186-204, 2000. [Online]. Available: <https://www.jstor.org/stable/2634758>
- [21] F. H. Chandio, Z. Irani, M. S. Abbasi, and H. A. Nizamani, "Acceptance of online banking information systems: an empirical case in a developing economy," *Behaviour & Information Technology*, vol. 32, no. 7, pp. 668-680, 2013, doi: 10.1080/0144929X.2013.806593.
- [22] W. A. Hammood, K. Z. Zamil, and A. M. Ali, "A Review of bio-inspired algorithm," in *Conference:(SOFTEC Asia 2017)*, 2017, vol. 12. [Online]. Available: https://www.researchgate.net/publication/318959313_A_Review_of_Bio-inspired_Algorithm
- [23] G. Poels and S. S. -S. Cherfi, "Information quality, system quality and information system effectiveness: introduction to QoIS'06," in *International Conference on Conceptual Modeling*, 2006, pp. 325-328, doi: 10.1007/11908883_39.
- [24] A. M. V. Valkengoed and L. Steg, "Meta-analyses of factors motivating climate change adaptation behaviour," *Nature Climate Change*, vol. 9, pp. 158-163, 2019. [Online]. Available: <https://www.nature.com/articles/s41558-018-0371-y>
- [25] L. F. Cunningham, J. H. Gerlach, M. D. Harper, and C. E. Young, "Perceived risk and the consumer buying process: internet airline reservations," *International Journal of Service Industry Management*, vol. 16, no. 4, pp. 357-372, 2005, doi: 10.1108/09564230510614004.

BIOGRAPHIES OF AUTHORS






Waleed A. Hammood    holds a PhD in Computer Engineering, currently working as Assistant Professor at Faculty of Engineering, Gilgamesh Ahliya University, Baghdad, Iraq. Waleed received his master's degree in information science from National University of Malaysia, Malaysia 2016. He obtained his PhD from the Faculty of Software Engineering and Computer Systems, University of Malaysia Pahang, Malaysia. 2021. His interests lie in the areas of information systems, technology adoption, network simulation, innovation, e-learning, technology acceptance. He has published numerous scientific journal articles and conference papers. He is a regular reviewer of numerous prestigious journals. He can be contacted at email: engwaleed54@yahoo.com.






Afrig Aminuddin    was born in Ketapang, Indonesia in 1992. He received the bachelor's degree in informatics engineering from Universitas Amikom Yogyakarta, Indonesia in 2014. He receives master's degree in information technology from the Faculty of Engineering, Universitas Gadjah Mada, Indonesia in 2017. Since 2017, he has been a Lecturer with the Faculty of Computer Science, Universitas Amikom Yogyakarta. His research interests include digital watermarking, image processing, and computer vision. He can be contacted at email: afrig@amikom.ac.id.






Omar A. Hammood    was born in Iraq. He received PhD in Computer science from the University of Malaysia Pahang. He is currently working in Information management and monitoring in the private sector, for more than 3 years. Dr. Omar is also actively writing and publishing numerous scientific journal articles and conference papers in many disciplines. These fields have been his best-loved research domains. He can be contacted at email: omer_almajeed@yahoo.com.






Khairul Hafezad Abdullah    was born in Malaysia. He received PhD in Occupational Safety and Health Management from Universiti Utara Malaysia. He is currently working as Senior Science Officer at Universiti Teknologi MARA, Arau Campus, for more than 12 years. Dr Khairul is also actively writing bibliometrics and scientometrics articles in many disciplines. These fields have been his best-loved research domains. He has vast experience reviewing more than 100 research articles published in reputable journals worldwide. He can be contacted at email: khairul085@uitm.edu.my.



Davi Sofyan    was born in Puralaksana, West Lampung, Indonesia, in 1987. He earned his bachelor's degree in education from Majalengka University, West Java, Indonesia, in 2009. He received his master's degree in education from the Postgraduate School of the Indonesian University of Education, Bandung, West Java, Indonesia, in 2014. In 2017, he continued his doctoral programme studies in the field of sports education at the Indonesian University of Education. Since 2009, it has become a physical education study program at the Faculty of Teacher Training and Education at Majalengka University. His research interests include physical education and sports, bibliometrics, and scientometrics. He can be contacted at email: davisofyan@unma.ac.id.



Majid Rahardi    was born in Riau, Indonesia in 1992. He received the bachelor's degree in informatics engineering from Universitas Amikom Yogyakarta, Indonesia in 2014. He receives master's degree in information technology from the Faculty of Engineering, Universitas Gadjah Mada, Indonesia in 2017. Since 2017, he has been a Lecturer with the Faculty of Computer Science, Universitas Amikom Yogyakarta. His research interests include image processing, machine learning and deep learning. He can be contacted at email: majid@amikom.ac.id.