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Evaluating user experience of a mobile website and redesigning its user interface using goal-directed design method

Aang Subiyakto[1], Muhammad R. Alghifari[2], Nuryasin N.[2], Muhammad Q. Huda[1], Nashrul Hakiem[1], Viva Arifin[3], Dwi Yuniarto[4], Hadi Rahman[5], Thosporn Sangsawang[6], Naeem Atanda Balogun[7]

[1]Department of Information Technology, UIN Syarif Hidayatullah, Jakarta, Indonesia
[2]Department of Information Systems, UIN Syarif Hidayatullah, Jakarta, Indonesia
[3]Department of Informatics Engineering, UIN Syarif Hidayatullah, Jakarta, Indonesia
[4]Department of Informatics Engineering, Sebelas April University, Sumedang, Indonesia
[5]National Center of Reform on Economics, Jakarta, Indonesia
[6]Rajamangala University of Technology Thanyaburi, Pathum Thani, Thailand
[7]Confluence University of Science and Technology, Osara, Nigeria

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ABSTRACT

This study evaluated the usability of the user interface (UI) of a mobile website using its user experience (UX) perspectives. The website serves as an information portal intended for access via smartphones and other handheld devices. The objective of the study was to assess the usability of its current interface, redesign it using the goal-directed design (GDD) method, and compare the usability performance before and after the redesign. The study was conducted in five main steps using the cognitive walkthrough, think-aloud, post-study system usability questionnaire (PSSUQ), and interview techniques with five representative participants and 50 respondents. The most important findings of the study were that the redesigned mobile website showed improved usability of the website, as indicated by increased effectiveness and efficiency values, enhanced PSSUQ satisfaction scores, and more positive user feedback.

Corresponding Author:

Aang Subiyakto
Department of Information Technology, UIN Syarif Hidayatullah
Jakarta, Indonesia
Email: aang_subiyakto@uinjkt.ac.id

1. INTRODUCTION

In today's knowledge-driven digital era, websites have become vital tools for organizations, serving not only as online representations but also playing critical roles in communication, service delivery, branding, and stakeholder engagement [1]-[3]. As web technologies have advanced, developing websites has become technically more accessible. However, success no longer depends solely on development capabilities but on how well users can interact with the site. Usability—how effectively, efficiently, and satisfactorily users achieve their goals—has become a defining factor in a website's acceptance and performance [4], [5]. Usability plays a central role in influencing user satisfaction, retention, and trust. A user-centric website ensures that users can navigate, understand, and complete their tasks with minimal effort. Poor usability may result in user frustration, abandonment, and ultimately, organizational failure in leveraging its digital presence. Therefore, modern website design emphasizes UX by incorporating user needs, preferences, and behavioral patterns throughout the design process [6], [7]. Various methods have been developed to evaluate usability. These fall into two broad categories: expert-based evaluations and user-based evaluations.

Cognitive walkthrough, used in this study, is an expert-based method that simulates user interactions to identify potential usability issues [7], [8]. In contrast, think-aloud protocols and the post-study system usability questionnaire (PSSUQ) are user-based methods designed to capture real user experiences (UX), including emotional and cognitive responses during interaction [9]-[12]. Each approach serves different purposes and complements one another in producing comprehensive usability insights.

Several prior studies have assessed the usability of websites and demonstrated that structured evaluations lead to significant design improvements. For example, usability testing could identify critical design flaws, prompting functional enhancements that increased user task success rates. Similarly, found that websites redesigned based on user-based feedback achieved significantly higher satisfaction scores. These studies highlight the impact of usability evaluations in refining digital interfaces and informing data-driven design strategies. This study evaluates the usability of the CORE Indonesia mobile website, a platform offering economic policy research, analysis, and publications aimed at researchers, policymakers, and the public. Despite the importance of its content, preliminary observations and anecdotal user feedback suggest low engagement and usability issues, particularly on mobile devices. Given the increasing reliance on mobile access, it is crucial to assess and improve the mobile user interface (UI) to ensure accessibility and effectiveness. By identifying usability barriers and applying an iterative redesign process using goal-directed design (GDD) method, this study aims to enhance the mobile website's interface to better meet user needs. Ultimately, this research provides insights into how expert- and user-based usability evaluation methods can be integrated to drive improvements in mobile website design.

2. METHOD

This study was conducted through five main stages, incorporating an iterative process during the usability testing phase, as illustrated in Figure 1. The object of the study was the mobile version of the CORE Indonesia website (https://coreindonesia.org/). To evaluate the website's usability, the researchers employed four techniques: cognitive walkthrough [13]-[16], think-aloud protocol [16]-[18], the PSSUQ [8], [19], [20], and closed interview techniques [17], [21].

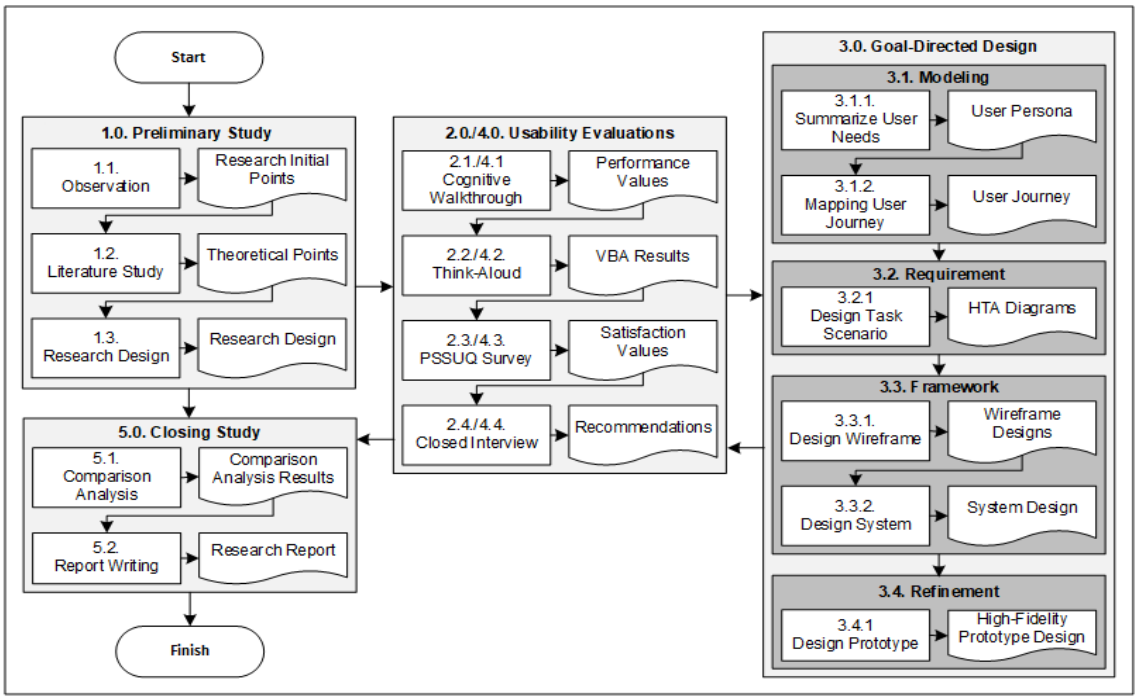


Figure 1. Research procedure

In the initial stage, the cognitive walkthrough method was used to measure the performance of the website in terms of effectiveness and efficiency, with calculation formulas adapted from Privitera [13], Schaarup *et al.* [14], and Weninger *et al.* [15]. Five representative user tasks were developed and executed by the participants to evaluate these aspects as shown in Table 1. During the performance of these tasks,

participants were instructed to verbalize their thoughts using the think-aloud technique, enabling the researchers to collect real-time data on UX, behavior, and thought processes [17], [21]. Following these tasks, participants completed the PSSUQ to assess their satisfaction with the website. This questionnaire applied a seven-point Likert scale to measure four key dimensions of usability: system usefulness (SYU), information quality (IFQ), interface quality (ITQ), and overall satisfaction (OST) aspects [8], [19], [20] as shown in Table 2. After completing the questionnaire, participants participated in closed interviews to provide further insights and suggestions. These interviews were designed based on the frameworks and included five structured questions as shown in Table 3.

Table 1. List of the cognitive walkthrough tasks

Code	Tasks
T1	Find information about what services mobile websites offer!
T2	Find email that can be used to contact the website admin!
T3	Search Google Maps which showing the office location!
T4	Find posts about investment!
T5	Find information about a manager/researcher.

Table 2. List of the PSSUQ statements

Code	Questions
SYU1	I am satisfied with how easy it is to use this website.
SYU2	It was simple to use this website.
SYU3	I was able to complete the tasks and scenarios quickly.
SYU4	I felt comfortable using this website.
SYU5	It was easy to learn to use this website.
SYU6	I believe, I could become productive using this website.
IFQ1	The system gave error messages to fix problems.
IFQ2	Whenever I made a mistake, I could recover easily.
IFQ3	The information provided on this website was clear.
IFQ4	It was easy to find the information I needed.
IFQ5	I know useful information to complete tasks/scenarios.
IFQ6	The organization information on the website was clear.
ITQ1	The interface of this website was pleasant.
ITQ2	I liked using the interface of this website.
ITQ3	This website has functions and capabilities as I expected.
OST1	Overall, I am satisfied with this website.

Table 3. List of the interview questions

Code	Questions
Q1	What is your first impression when using the mobile website?
Q2	Are there any problems using it? If there are, please explain!
Q3	Are there any features to be added to make more comfortable?
Q4	What do you think about the aesthetics of the website's UI?
Q5	Is there anything that needs to be improved?

Participants were selected using purposive sampling, focusing on individuals who frequently browse the web and demonstrate proficiency in using mobile devices. The selection process followed criteria outlined in previous research by Anderson *et al.* [21] and Atoum [22]. A total of five participants took part in the cognitive walkthrough, think-aloud, and interview sessions, all of which were conducted online via the Zoom platform. Meanwhile, the PSSUQ survey was distributed via Google Forms and received responses from approximately 50 individuals, including the initial five participants. All participants contributed to both the pre-design and post-design usability evaluations. For data analysis, the researchers used Microsoft Word 2016 and QDA Miner Lite to analyze qualitative data obtained from the cognitive walkthrough, think-aloud sessions, and interviews. Quantitative data from the PSSUQ survey were analyzed using Microsoft Excel 2016. Based on the findings from the first usability evaluation stage, the website was redesigned using the GDD approach [10], [11], [23]. This method includes four sub-stages: modeling, requirements gathering, framework development, and refinement. The redesign process was carried out using Figma (https://www.figma.com/) to create interactive prototypes of the improved website design. To determine the effectiveness of the redesigned website, the researchers compared the usability evaluation results from the pre-design and post-design phases. This comparison aimed to assess whether the usability improvements in the proposed design surpassed those of the original version.

3. RESULTS AND DISCUSSION

The five participants consisted of four male and one female. They were the five of 50 respondents and these sampled people were involved in both usability evaluations. The respondents were dominated by males (27 people, ±54%), aged 22-26 years (29 people, ±58%) with a tendency to access the internet using smartphones compared to other devices such as laptops and desktops (42 people, ±84%). Besides, all people frequently use web browsers and proficiently operated smartphones, they have also bachelor's degrees in information systems. In addition, Tables 4 to 6, and Figure 2 present sequentially the results of the cognitive walkthrough, PSSUQ, interview, and think-aloud evaluations. Figure 3 maps the UXs when used the website. Lastly, Figure 4 presents a comparison between the before and after the design of two sample web pages: the navigation menu in Figures 4(a) and 4(b) and sub menu pages in Figures 4(c) and 4(d).

Table 4. Result of the cognitive walkthrough assessments

Participants	Pre-design (s)						Post-design (s)					
	T1	T2	T3	T4	T5	∑	T1	T2	T3	T4	T5	∑
P1	150*	3	31	15	9	208	33	14	2	18	12	79
P2	119*	2	10	12	168	311	27	4	1	24	14	70
P3	50	3	45	68	21	187	14	4	1	33	13	65
P4	140*	4	5	189*	25	363	86	15	1	26	23	151
P5	32	4	10	115	20	181	25	4	1	86	22	138
Average (s)	98.2	3.2	20.2	79.8	48.6		37.0	8.2	1.2	37.4	16.8	
Effectiveness						84%						100%
Efficiency						52.16%						100%

*) Failed tasks

Table 5. Results of the PSSUQ

Variable	Threshold value			Pre-design	Post-design
	Lowest	Mean	Highest		
SYU	2.79	3.02	3.24	3.17	2.51
IFQ	2.28	2.49	2.71	3.13	2.49
ITQ	2.62	2.82	3.02	3.15	2.57
OST	2.57	2.80	3.02	3.16	2.50

Table 6. Suggestions for UI/UX improvement

No	Recommendations
1	In the sub-menu navigation design, they are organized downwards and when clicked the changed content is underneath so it is not visible and makes some participants think it is a lag.
2	There is no search button, don't know why it is omitted for the mobile web.
3	Confusing content grouping, what is on the homepage is different from what is on the navigation menu.
4	The homepage is too crowded and needs to be curated.
5	The basic UI/UX, such as spacing, layout, font selection, font size, and color contrast is still not appropriate.

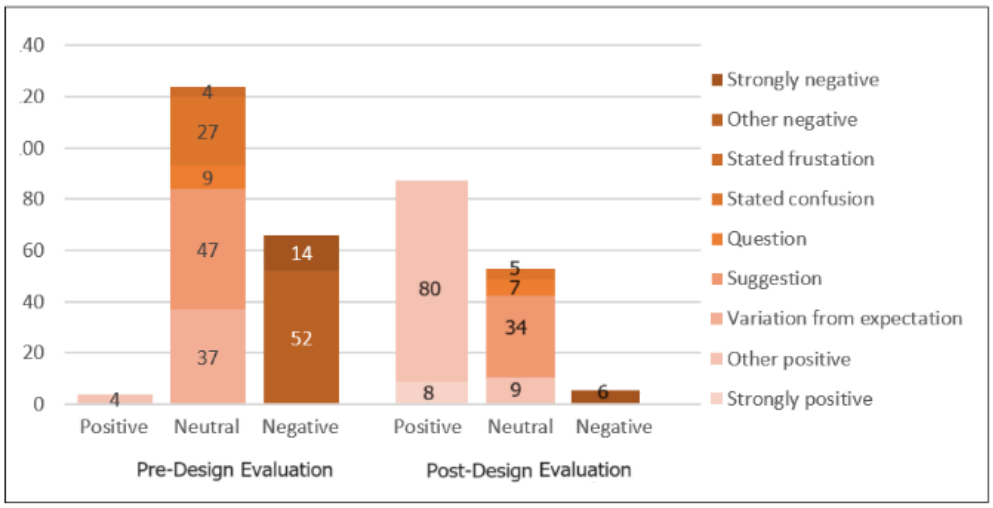


Figure 2. Results of the think-aloud assessments

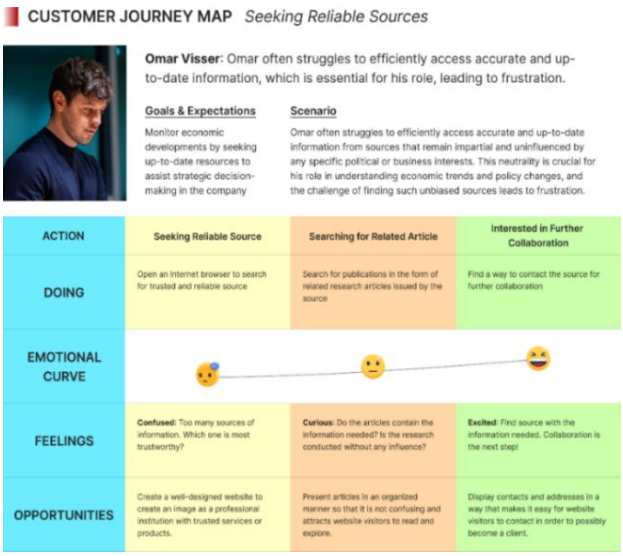
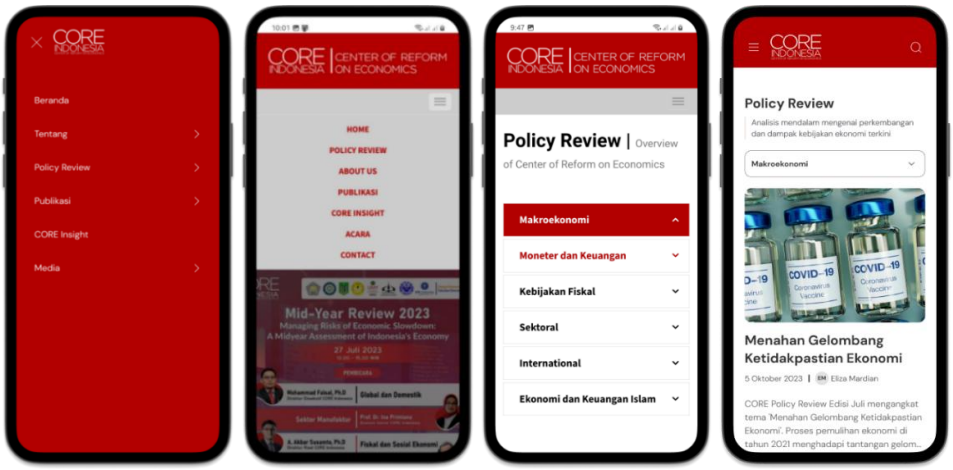


Figure 3. User journey



(a) (b) (c) (d)

Figure 4. The current and proposed designs of: (a) and (b) the navigation menu and (c) and (d) sub menu

To discuss, the findings of the initial usability evaluation revealed that the effectiveness and efficiency values of the original website design were approximately 84% and 52%, respectively. Based on the standard usability benchmarks [13]-[18], the effectiveness score exceeded the acceptable threshold, whereas the efficiency score was below the recommended level. Moreover, the PSSUQ analysis showed that the ITQ and OST dimensions surpassed the highest threshold limits [8], [19], [20]. suggesting that while users found certain elements useful, issues with clarity and navigation remained. This was further confirmed by the think-aloud responses, which revealed a high frequency of negative comments regarding visual structure, information layout, and navigation flow (Figure 2). In addition, the interview results (Table 6) summarized five major recommendations from users regarding necessary improvements. In response to these findings, the researchers conducted a redesign process using the GDD method.

The new prototype was developed through modeling, requirement gathering, framework structuring, and refinement using Figma. The subsequent usability testing on the redesigned prototype showed improvements across all measured dimensions. Both effectiveness and efficiency values increased significantly, as shown in Table 4. The PSSUQ results post-redesign also indicated improvements across all categories, with satisfaction scores now meeting or exceeding the defined usability thresholds (Table 5). Additionally, qualitative data from the post-design think-aloud protocol showed a marked shift toward more positive user responses (Figure 2), suggesting that the redesigned interface better aligned with user expectations and usability standards [24], [25].

These results underscore two key points. First, the structured and measurable approach to usability testing allowed the researchers to systematically detect, analyze, and address usability issues. This iterative process not only enhanced the clarity and functionality of the proposed design but also contributed to its scalability, maintainability, and alignment with quality standards related to cost, risk, and timeline management [5], [7], [12], [17]. Second, the active involvement of users in both evaluation and redesign phases ensured that the final prototype was aligned with actual user needs and expectations. This user-centered approach played a crucial role in improving OST, as supported by earlier literature [17], [22]. Despite its contributions, this study has several limitations. The relatively small sample size for the cognitive walkthrough and qualitative evaluations, along with the reliance on purposive sampling, may affect the generalizability of the results. The choice of data collection platforms (Zoom and Google Forms), analysis tools (MS Word, Excel, QDA Miner Lite), and researcher subjectivity in interpreting think-aloud and interview data may also influence the findings. Additionally, the interface design skills and prior assumptions of the researchers might have introduced bias during the redesign phase. Looking forward, future research can explore usability testing across more diverse user groups and different organizational website types. The integration of automated usability analytics and machine learning-based interaction logging may also offer deeper insights. Moreover, iterative testing could be expanded into long-term implementation phases to monitor actual user behavior over time.

In conclusion, this study provides evidence that a structured, user-involved, and iterative approach to usability evaluation and redesign can significantly enhance the effectiveness, efficiency, and user satisfaction of a website. The proposed prototype not only meets higher usability standards but may also serve as a practical model for future website development projects, especially within the non-profit and public information sectors.

4. CONCLUSION

UX is a critical factor in modern website design, directly influencing usability, user satisfaction, and the overall success of digital platforms. This study was conducted through five key stages: evaluating the usability of an existing mobile website, redesigning the interface using the GDD method, re-evaluating the revised version, and comparing usability metrics between the initial and improved versions. The evaluation utilized both expert-based (i.e., cognitive walkthrough) and user-based (i.e., think-aloud, interview, and PSSUQ) methods, providing a comprehensive understanding of usability issues from multiple perspectives. The results demonstrate a notable improvement in usability after the redesign, with increased values in effectiveness, efficiency, and user satisfaction. This confirms the potential of structured, user-centered approaches in addressing usability challenges and optimizing interface design. For stakeholders, especially web development teams and decision-makers in content-driven organizations, the findings serve as a practical guideline for improving mobile UIs, particularly for research-based or information-heavy platforms such as CORE Indonesia.

From a methodological standpoint, the study offers two key innovations that justify its relevance for international publication. First, it combines expert-based and user-based evaluation techniques in a structured sequence aligned with the GDD framework. Second, it emphasizes iterative design based on actual user feedback—an approach still underutilized in many usability studies within developing contexts. These aspects contribute to a replicable model for usability enhancement that other researchers can adopt or adapt in similar contexts. However, this study also has several limitations. The sample size and demographic scope of participants were relatively narrow, which may limit the generalizability of the findings. Additionally, data collection was constrained by subjective user input and the interpretative nature of qualitative methods. Variability in the researchers' design skills and limited access to alternative design validation tools may have also influenced the outcome. Future studies could address these issues by expanding participant diversity, employing additional usability metrics, and incorporating automated usability testing tools. In conclusion, this study provides empirical evidence that structured, user-centered design and evaluation can significantly enhance website usability. The approach and findings offer actionable insights for practitioners and a methodological foundation for researchers aiming to improve mobile web interfaces in diverse domains.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Aang Subiyakto	✓	✓		✓	✓	✓				✓	✓		✓	
Muhammad R. Alghifari			✓		✓	✓			✓		✓			
Nuryasin N.	✓	✓		✓	✓			✓				✓		✓
Muhammad Q. Huda	✓			✓										✓
Nashrul Hakiem	✓			✓										✓
Viva Arifin	✓			✓										✓
Dwi Yuniarto	✓			✓										✓
Hadi Rahman				✓			✓					✓		
Thosporn Sangsawang										✓		✓		
Naeem Atanda Balogun										✓		✓		

C : **C**onceptualization
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D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author, [AS]. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.

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BIOGRAPHIES OF AUTHORS

Aang Subiyakto received his undergraduate degree in IS in 2003, master degree in informatics in 2007, and the Ph.D. degree in IS from the IIUM, Malaysia in 2018. He is currently an Associate Professor in IS, UIN Syarif Hidayatullah, Jakarta, Indonesia. He has been also an adjunct senior lecture in School of Science and Technology, Asia e University, Malaysia, since 2021. His main research interests focus on IS, social computing, and human computer interaction. He can be contacted at email: aang_subiyakto@uinjkt.ac.id.

Muhammad R. Alghifari received his first degree from Department of Information Systems, Faculty of Science and Technology, UIN Syarif Hidayatullah, Jakarta, Indonesia in 2024. He is currently undertaking an internship in the Non-ERP Solution function at PT. Pertamina (Persero). His main research interests focus on information systems and technology, particularly human-computer interaction (UI/UX designer). He can be contacted at email: muhammad.ridhoa19@mhs.uinjkt.ac.id.

Nuryasin N. is a lecturer at the Department of IS, UIN Syarif Hidayatullah, Jakarta, Indonesia. He completed his master's degree in computer science in 2010. He holds the position of lecturer with expertise in management information systems (MIS), database systems, data mining, and computational social sciences. He has published 24 research papers. He can be contacted at email: nuryain@uinjkt.ac.id.

Muhammad Q. Huda received his both bachelor degree in computer engineering and master degree in informatics in Indonesia, in 1993 and 999 respectively. He holds Ph.D. degree in IT from the IIUM, in 2017. He is currently an associate professor in the Department of IT, UIN Syarif Hidayatullah Jakarta, Indonesia. His main research interests focus on IS, IT innovation diffusion and organizational performance. He can be contacted at email: mqomarul@uinjkt.ac.id.

Nashrul Hakiem holds bachelor's degree in computer science from the Universitas Gadjah Mada, master's degree in informatics from ITB, Ph.D. in electrical and computer engineering from the IIUM, Malaysia, and engineer professional degree from the University of Indonesia. Dr. Ir. Hakiem is an Associate Professional at UIN Syarif Hidayatullah Jakarta, Indonesia. Previously, he worked in the Indonesian Aerospace and Balicamp, Indonesia. His research interests include software engineering, software quality assurance, and cybersecurity. He can be contacted at email: hakiem@uinjkt.ac.id.

Viva Arifin is a lecturer at the Department of Informatics Engineering, Faculty of Science and Technology, UIN Syarif Hidayatullah Jakarta. She completed her Master's degree in management information systems in 2001 and later earned her Ph.D. from the International Islamic University Malaysia, Malaysia in 2023. She holds the position of senior lecture in her department with areas of expertise include operation and system tools, IT services management, among others. She can be contacted at email: viva_arifin@uinjkt.ac.id.

Dwi Yuniarto received his first degree from Padjadjaran University, Computer Engineering, Indonesia, in 1999. He has also master's degree from STTI BI Jakarta, Informatics Engineering, Indonesia, in 2008. The Ph.D. degree from the ICT in Asia E University (AEU) Malaysia, Malaysia in 2022. He is currently a computer science researcher. His main research interests focus on human-computer interaction, social engineering, and IT risk management. He can be contacted at email: dwiyuniarto@unsap.ac.id.

Hadi Rahman commonly known as Hadi, possesses numerous skills, especially in communication as a management function and problem-solving. His extensive experience as a journalist with high-ranking positions and the production of over 30 works in book form demonstrates his high creativity and innovation. Hadi is also a former echelon 1 official in a ministry, managing 235,344 civil servants across 4,593 units. Currently, he is taking on the role of Business Development Director at CORE Indonesia. He can be contacted at email: hadirahman@coreindonesia.org.

Thosporn Sangsawang is an Assistant Professor at the Department of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. She serves as the Head of the Center of Innovation Learning and Technology. Her research interests include the IoT, educational robotics, and computer technology. She has contributed to various publications focusing on the integration of technology in education to enhance learning experiences. She actively shares her expertise and insights on educational technology advancements. She can be contacted at email: sthosporn@rmutt.ac.th.

Naeem Atanda Balogun received his first degree in computer science in 2004 from the Usmanu Danfodiyo University Sokoto, Nigeria, Master and Ph.D. in information technology in 2009 and 2016 from the International Islamic University Malaysia, respectively. He is currently associate professor of information technology in the Confluence University of Science and Technology, Osara, Kogi State, Nigeria. His are of research are e-learning, technology in education and cybersecurity. He can be contacted at balogunna@custech.edu.ng.