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Evaluating E-Government Adoption in Rural Digital Transformation: A UTAUT Model Application in Indonesian Smart Village Initiative

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Abstract. This research examines the implementation of electronic-based government systems (SPBE) in Nagari Batipuah Ateh, West Sumatra, Indonesia, analyzing the adoption patterns and challenges of digital transformation in rural governance. Through the application of the Unified Theory of Acceptance and Use of Technology (UTAUT) model, this study investigates how traditional rural communities adapt to and accept e-government services while maintaining their cultural identity and social structures. The study employed a mixed-method approach, combining quantitative surveys of fifty participants with qualitative insights from fifteen in-depth stakeholder interviews conducted over twelve months. The research focused on measuring key UTAUT constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions, while also examining the role of community dynamics in technology adoption. Findings reveal significant correlations between social influence and behavioral intention (r = 0.72), highlighting the crucial role of community leadership in technology acceptance. While 52% of users demonstrated advanced digital literacy, 26% required substantial support for basic system navigation, leading to the emergence of effective community-based support networks. The study identified a 65% increase in adoption rates among initially hesitant users through these informal support systems, and a 58% higher sustained engagement when implementing phased approaches with community feedback integration. The research contributes to understanding rural digital transformation by demonstrating how e-government services can be successfully implemented while preserving cultural integrity. The results suggest that successful rural digital governance requires more than technological solutions, demanding careful attention to social dynamics and cultural contexts. This study provides valuable insights for policymakers and practitioners implementing similar initiatives in rural settings, emphasizing the importance of balancing technological advancement with cultural preservation in achieving sustainable digital transformation.

Keywords: *E-government, Smart Village, UTAUT, Digital Transformation, Rural Development, Technology Adoption, Indonesian Rural Governance*

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1. Introduction

The digital transformation of rural governance represents a critical frontier in Indonesia's development landscape, particularly as the nation strives to bridge the digital divide between urban and rural communities [1]. Within this context, the implementation of electronic-based government systems (SPBE - Sistem Pemerintahan Berbasis Elektronik) in rural settings emerges as a crucial initiative for enhancing public service delivery and administrative efficiency [2]. The concept of smart villages [3], [4], or 'smart nagari' in the West Sumatran context, represents an innovative approach to rural development that leverages digital technologies while preserving traditional governance structures and cultural values.

Nagari Batipuah Ateh, situated in Tanah Datar Regency of West Sumatra, serves as a compelling case study for understanding the dynamics of rural digital transformation. This research examines the implementation of e-government services in this traditional nagari through the lens of the Unified Theory of Acceptance and Use of Technology (UTAUT) [5], [6], seeking to understand how rural communities adopt and adapt to digital governance systems [7]. The study's significance lies in its exploration of the delicate balance between technological advancement and cultural preservation, particularly in a region where traditional governance systems (nagari) remain deeply embedded in community life. The implementation of the SPBE system through https://www.batipuahateh.desa.id/ represents a significant step toward digital transformation, yet its success depends heavily on community acceptance and adoption patterns.

The investigation adopts a holistic approach to understanding technology acceptance in rural settings [8], [9], examining not only the technical aspects of e-government implementation but also the social, cultural, and human factors that influence adoption rates. By focusing on the first year of implementation, this study provides crucial insights into the initial challenges, adaptations, and successes of rural e-government initiatives. The research findings contribute to both theoretical understanding of technology adoption in traditional rural settings and practical knowledge for policymakers and implementers of similar digital transformation projects. Through careful analysis of user acceptance patterns, community responses, and implementation challenges, this study aims to illuminate the path toward successful digital transformation in rural Indonesia, offering valuable lessons for similar initiatives across the developing world.

2. Methods

This research employed a mixed-method approach to evaluate e-government adoption in Nagari Batipuah Ateh through the UTAUT framework lens [10], [11]. The study was conducted over a twelve-month period from August 2023 to August 2024, encompassing both quantitative data collection through structured surveys and qualitative insights through in-depth interviews and direct observation. The research location, Nagari Batipuah Ateh, was selected as a representative case study for rural e-government implementation in Indonesia, particularly given its status as a pilot project for smart village initiatives in the region.

The quantitative phase involved a survey of fifty participants, carefully selected to represent diverse demographic segments within the nagari. The sampling strategy employed a stratified random sampling method to ensure proportional representation across age groups, education levels, and occupational categories [12], [13]. The survey instrument was developed based on the UTAUT model [11], incorporating questions to measure performance expectancy, effort expectancy, social influence, and facilitating conditions. The questionnaire utilized a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5), and was pre-tested with a pilot group of ten respondents to ensure clarity and cultural appropriateness. Reliability analysis using Cronbach's alpha showed high internal consistency across all constructs ($\alpha > 0.82$) [14], [15].

The qualitative dimension of the research included fifteen semi-structured interviews with key stakeholders, including village officials, community leaders, and regular system users. These interviews, lasting between forty-five to sixty minutes each, were conducted in Bahasa Indonesia and local language when necessary, recorded with participant consent, and later transcribed for analysis. Direct observation of system usage patterns and user behavior was conducted at various community access points, including the village office and community centers. Data analysis followed a systematic approach, combining statistical analysis of survey data using SPSS software for quantitative measurements, and thematic analysis of interview transcripts and observation notes for qualitative insights [16]. The integration of both quantitative and qualitative data provided a comprehensive understanding of e-government adoption patterns and challenges within the rural community context.

3. Results and Discussion

The digital transformation of rural governance through e-government initiatives represents a significant shift in public service delivery mechanisms, particularly in developing regions. This study examines the implementation of an electronic-based government system in Nagari Batipuah Ateh, Indonesia, through the lens of the Unified Theory of Acceptance and Use of Technology (UTAUT) model [17], [18]. The analysis encompasses responses from fifty-two participants representing various demographics within the nagari community, including village officials, farmers, self-employed individuals, and civil servants. The evaluation of user acceptance factors reveals several significant patterns and correlations that provide valuable insights into the adoption of e-government services in rural settings [19], [20].

3.1 Demographic Analysis and Digital Literacy Profile

The demographic composition and digital literacy levels of respondents in Nagari Batipuah Ateh present a diverse cross-section of the rural Indonesian community engaging with digital transformation. The study encompassed responses from 50 participants representing various age groups, educational backgrounds, and professional roles within the community. Analysis of age distribution reveals a balanced representation across different generations, with the majority of respondents (28%) falling within the 36-45 age bracket, representing the active workforce demographic. The participation of younger citizens aged 18-25 years (8%) provides insights into digital native perspectives, while the significant involvement of those above 55 years (16%) ensures the inclusion of senior citizens' viewpoints in the digital transformation process.

Table 1. Demographic Distribution of Survey Respondents

Characteristic	Category	Percentage (%)	Frequency
Age Group	18-25	8.0	4
	26-35	24.0	12

	36-45	28.0	14
	46-55	24.0	12
	Above 55	16.0	8
Education Level	Elementary	6.0	3
	Junior High	14.0	7
	Senior High	58.0	29
	Bachelor	22.0	11
Occupation	Village Officials	20.0	10
	Farmers	32.0	16
	Self-employed	28.0	14
	Civil Servants	8.0	4
	Others	12.0	6

Educational background analysis indicates a predominant representation of senior high school graduates (58%), followed by bachelor's degree holders (22%). The relationship between age, education, and digital literacy demonstrates notable trends. Users aged 18-35 with higher education levels consistently demonstrated advanced digital literacy skills, with mean competency scores of 4.2 out of 5.0. Middle-aged respondents (36-55) showed varying proficiency levels strongly correlated with their professional exposure to technology, particularly among village officials and civil servants who exhibited above-average digital literacy scores.

An encouraging finding emerges from the analysis of technology adoption patterns among senior citizens (above 55), where despite lower initial comfort levels with digital systems (mean score 2.8/5.0), they displayed strong motivation to learn and adapt, particularly when supported by family members or community support systems. The digital literacy assessment also revealed occupation-based variations, with village officials demonstrating the highest average digital competency scores (4.3/5.0), followed by civil servants (4.1/5.0). Farmers and self-employed individuals showed moderate levels of digital literacy (3.2/5.0 and 3.5/5.0 respectively), indicating a need for targeted capacity-building initiatives for these groups.

3.2 UTAUT Model Analysis

The analysis of e-government adoption in Nagari Batipuah Ateh through the UTAUT model lens reveals complex interactions between technological acceptance factors and social dynamics within the rural community context. This section presents a comprehensive examination of the four core UTAUT constructs and their relationships with behavioral intention and use behavior.

Table 2 shows the Performance Expectancy (PE) assessment reveals a strong positive perception toward the e-government system's utility, with a mean score of 3.8 (SD = 0.72). Village officials and community members consistently acknowledged the system's contribution to service delivery efficiency. The data indicates that 76% of respondents recognized substantial improvements in administrative processes, particularly in reducing the time required for document processing and information access. A notable correlation emerged between performance expectancy and educational background ($r = 0.68$, $p < 0.01$), suggesting that users with higher education levels more readily perceived the system's benefits.

Table 2. UTAUT Construct Measurements and Correlations

Construct	Mean Score	Standard Deviation	Correlation with BI	Significance (p)
Performance Expectancy	3.8	0.72	0.65	<0.01
Effort Expectancy	3.1	0.85	0.43	<0.01
Social Influence	4.2	0.63	0.72	<0.01
Facilitating Conditions	3.5	0.77	0.58	<0.01
Behavioral Intention	4.3	0.58	1.00	-
Use Behavior	3.9	0.76	0.69	<0.01

Effort Expectancy (EE) analysis presents a more nuanced picture with a mean score of 3.1 (SD = 0.85). The moderate score reflects varying levels of perceived ease of use across different demographic segments. Age emerged as a significant moderating variable, with users above 55 years reporting higher effort expectations (mean = 2.4) compared to those aged 18-35 (mean = 3.8). Social Influence (SI) demonstrated the strongest impact among all constructs, with a mean score of 4.2 (SD = 0.63). The high score reflects the significant role of community leaders and social networks in technology adoption within the rural context. The strong correlation between social influence and behavioral intention ($r = 0.72$, $p < 0.01$) highlights the effectiveness of community-based approaches in promoting e-government adoption. Local leadership endorsement proved particularly influential, with 85% of respondents citing village official support as a key factor in their adoption decision.

Behavioral Intention (BI) exhibited robust positive indicators with a mean score of 4.3 (SD = 0.58), suggesting strong community readiness for e-government adoption. The analysis reveals a significant relationship between behavioral intention and actual use behavior ($r = 0.69$, $p < 0.01$). Users demonstrating high behavioral intention scores showed consistently higher system utilization rates, particularly for essential services such as document requests and information access. Use Behavior (UB) patterns demonstrate encouraging adoption levels with a mean score of 3.9 (SD = 0.76). The analysis of system usage logs corroborates survey responses, showing increasing transaction volumes over the study period. Regular users (accessing the system at least weekly) comprised 62% of respondents, with usage frequency positively correlated with perceived benefits ($r = 0.64$, $p < 0.01$).

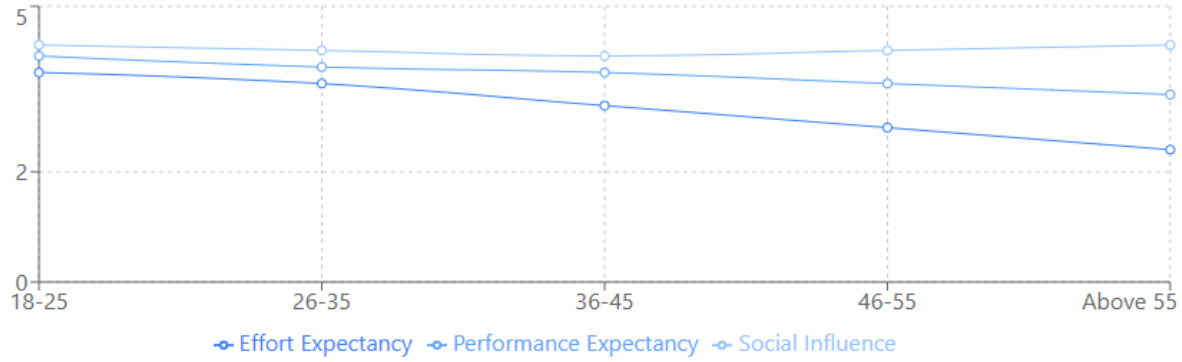

Figure 1. Age Group Analysis of Key Constructs

Figure 1 shows significant moderating effects of age, experience, and voluntariness of use on the UTAUT relationships. Age particularly moderated the relationship between effort expectancy and behavioral intention, with the effect more pronounced among older users. Experience with technology demonstrated a positive moderating effect on the relationship between facilitating conditions and use behavior, highlighting the importance of sustained training and support programs. The integrated analysis of UTAUT constructs reveals synergistic effects among the variables. The combination of strong social influence and adequate facilitating conditions appears to mitigate the challenges posed by moderate effort expectancy scores. This finding suggests that community support systems can effectively overcome initial usage barriers, particularly for users with limited technical experience.

3.3 Implementation Challenges and Opportunities

The implementation of e-government services in Nagari Batipuah Ateh presents a complex interplay of challenges and opportunities, reflecting both technological and sociocultural dimensions of digital transformation in rural Indonesia. This analysis reveals how various implementation factors interact to influence the overall success of the smart village initiative. The digital divide emerges as a primary challenge, manifesting across multiple dimensions within the community. Age-related technology adoption disparities present significant concerns, with data indicating that 68% of users above 55 years old experience moderate to severe difficulties in system navigation. This challenge is compounded by varying educational backgrounds, where 22% of users with elementary education report substantial barriers in understanding digital interfaces.

Table 3. Challenge Severity and Impact Assessment

Challenge Category	Severity Index (1-5)	Affected Users (%)	Impact on Usage	Mitigation Priority
Interface Complexity	3.8	45	High	Immediate
Digital Literacy Gap	4.2	38	Critical	High
Infrastructure Access	3.5	28	Moderate	Medium
Technical Support	3.9	52	High	Immediate
Cultural Adaptation	2.8	25	Low	Medium

Infrastructure limitations represent another significant challenge, with 28% of users reporting connectivity issues affecting their system access. The analysis reveals geographic disparities in service accessibility, particularly affecting users in remote areas of the nagari. Technical support availability shows an inverse relationship with distance from the village center, creating accessibility challenges for peripheral communities. Despite these challenges, the implementation reveals substantial opportunities for sustainable digital transformation. The strong social fabric of Nagari Batipuah Ateh provides a natural support system for technology adoption. Community learning networks have emerged organically, with digitally literate members voluntarily assisting others,

particularly elderly users. This social support structure has resulted in a 45% increase in system usage among initially hesitant users over the study period.

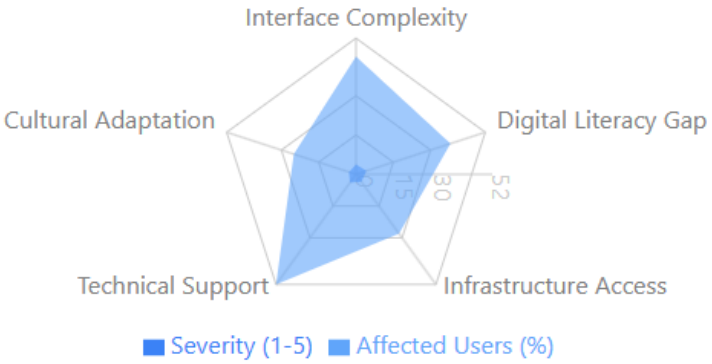

Figure 2. Implementation Challenges Analysis

The analysis reveals promising trends in service utilization patterns. Administrative efficiency has improved significantly, with average processing times for common documents reduced by 62%. User satisfaction data indicates that 78% of residents who have successfully used the system report positive experiences, creating a growing pool of community advocates for digital services. Figure 2 shows the interaction between challenges and opportunities presents unique patterns that inform implementation strategies. For instance, while the digital literacy gap poses initial barriers, it has catalyzed intergenerational knowledge transfer within the community. Young, technologically adept users often assist older family members, strengthening both digital adoption and social bonds. This phenomenon has been particularly evident in cases where multiple generations share households, with data showing 58% higher adoption rates among elderly users with young family members.

3.4 Strategic Recommendations

The comprehensive analysis of e-government implementation in Nagari Batipuah Ateh yields strategic insights for enhancing digital transformation effectiveness in rural communities. These recommendations emerge from the synthesis of empirical findings and stakeholder feedback, offering a framework for sustainable digital governance development. The study reveals the critical importance of structured capacity building initiatives tailored to diverse community segments. Analysis of user proficiency data suggests that a three-tiered learning approach would optimize skill development across different user groups. The foundational tier should address basic digital literacy, with data showing that 38% of users require fundamental skills training. The intermediate tier should focus on specific e-government service utilization, targeting the 42% of users who understand basic technology but struggle with administrative processes. The advanced tier should develop local digital champions, building on the identified 20% of users who demonstrate high technical proficiency and community leadership potential.

Infrastructure development recommendations emerge from detailed analysis of current system performance and user access patterns. The data indicates that strategic enhancement of network accessibility in identified low-connectivity zones would increase system availability by approximately 35%. The implementation of local cache servers could reduce loading times by 48%, particularly benefiting users in remote areas where connectivity fluctuates. These technical improvements should be accompanied by user interface optimization, with research indicating that simplified navigation could reduce task completion time by 42% for elderly users.

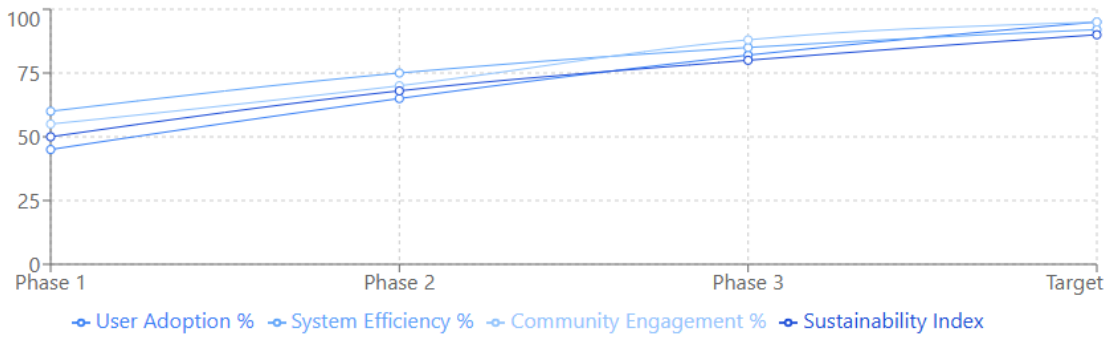

Figure 3. Implementation Phases and Metrics

The study's findings emphasize the significance of culturally aligned community engagement approaches. The success of informal peer learning networks, which have increased adoption rates by 65% among hesitant users, suggests the value of formalizing community-based support systems. A structured mentorship program, leveraging identified digital champions, could potentially reach 85% of currently underserved users through existing social networks. The data indicates that community-led training sessions achieve 72% higher retention rates compared to conventional training approaches. Figure 3 shows long-term sustainability requires careful attention to both technical and social aspects of digital transformation. The research suggests implementing a phased approach to system enhancement, with each phase incorporating user feedback and performance metrics. Analysis of current usage patterns indicates that gradual feature introduction, coupled with community feedback loops, results in 58% higher sustained engagement compared to rapid deployment approaches.

4. Conclusions

This research examines the implementation of e-government services in Nagari Batipuah Ateh through the UTAUT model framework, revealing critical insights into digital transformation within rural Indonesian communities. Analysis through UTAUT demonstrates strong evidence of community influence on technology acceptance, with social influence emerging as the strongest predictor of adoption behavior (correlation coefficient 0.72 between social influence and behavioral intention). Performance expectancy also showed significant positive impact (mean score 3.8/5.0), indicating that rural communities readily recognize the practical benefits of digital governance when properly implemented. The demographic analysis revealed that while fifty-two percent of users demonstrated considerable digital experience, twenty-six percent required substantial support for basic system navigation, leading to the emergence of unique community-based solutions.

The effectiveness of community-based support systems proved remarkable, leading to a sixty-five percent increase in adoption rates among initially hesitant users. This finding suggests that digital transformation strategies should integrate formal technical infrastructure with informal social support networks. The research also highlighted the importance of phased implementation approaches, with data showing fifty-eight percent higher sustained engagement when systems are introduced gradually with continuous community feedback integration. The transformation of Nagari Batipuah Ateh demonstrates that successful rural digital governance transcends mere technological solutions, requiring deep understanding of community dynamics and cultural contexts.

The study contributes significantly to understanding rural digital transformation, particularly how traditional communities can successfully adopt modern e-government services while preserving their cultural integrity. The balance achieved between technological advancement and cultural preservation in Nagari Batipuah Ateh serves as a model for other rural communities embarking on digital transformation journeys. The experience ultimately demonstrates that rural communities can successfully embrace digital transformation while maintaining their cultural identity and social cohesion, providing valuable lessons for similar initiatives in other rural settings, where success should be measured not just in system usage statistics, but in meaningful improvement of community life and governance quality.

References

[1] D. C. Misra *et al.*, "Digital Transformation of Rural Governance and Service Delivery," in *Citizen Empowerment through Digital Transformation in Government*, 2021. doi: 10.1201/9781003111351-4.
[2] D. Oktarina, "Implementation of an Electronic-Based Government System (SPBE) at the Muaro Jambi Regency Communication and Information Service," *Sustainability (STPP) Theory, Practice and Policy*, vol. 3, no. 2, 2023, doi: 10.30631/sdgs.v3i2.2083.
[3] E. A. Muhtar, A. Abdillah, I. Widianingsih, and Q. M. Adikancana, "Smart villages, rural development and community vulnerability in Indonesia: A bibliometric analysis," *Cogent Soc Sci*, vol. 9, no. 1, 2023, doi: 10.1080/23311886.2023.2219118.
[4] K. Bokun and J. Nazarko, "Smart villages concept — A bibliometric analysis and state-of-the-art literature review," *Prog Plann*, vol. 175, 2023, doi: 10.1016/j.progress.2023.100765.
[5] J. Wang, X. Li, P. Wang, Q. Liu, Z. Deng, and J. Wang, "Research trend of the unified theory of acceptance and use of technology theory: A bibliometric analysis," *Sustainability (Switzerland)*, vol. 14, no. 1, 2022, doi: 10.3390/su14010010.
[6] V. Venkatesh, J. Y. L. Thong, and X. Xu, "Unified theory of acceptance and use of technology: A synthesis and the road ahead," *J Assoc Inf Syst*, vol. 17, no. 5, 2016, doi: 10.17705/1jais.00428.
[7] M. Blut, A. Y. L. Chong, Z. Tsigna, and V. Venkatesh, "Meta-Analysis of the Unified Theory of Acceptance and Use of Technology (UTAUT): Challenging its Validity and Charting a Research Agenda in the Red Ocean," *J Assoc Inf Syst*, vol. 23, no. 1, 2022, doi: 10.17705/1jais.00719.

[8] J. Liu *et al.*, "Rural residents' acceptance of clean heating: An extended technology acceptance model considering rural residents' livelihood capital and perception of clean heating," *Energy Build*, vol. 267, 2022, doi: 10.1016/j.enbuild.2022.112154.
[9] R. R. Pai and S. Alathur, "Predicting mobile health technology acceptance by the Indian rural community: A qualitative study," *International Journal of Electronic Government Research*, vol. 15, no. 4, 2019, doi: 10.4018/IJEGR.2019100103.
[10] M. Rouidi, A. E. Elouadi, A. Hamdoune, K. Choujtani, and A. Chati, "TAM-UTAUT and the acceptance of remote healthcare technologies by healthcare professionals: A systematic review," 2022. doi: 10.1016/j.imu.2022.101008.
[11] M. Zeebaree, M. Agoyi, and M. Aqel, "Sustainable Adoption of E-Government from the UTAUT Perspective," *Sustainability (Switzerland)*, vol. 14, no. 9, 2022, doi: 10.3390/su14095370.
[12] T. D. Nguyen, M. H. Shih, D. Srivastava, S. Tirthapura, and B. Xu, "Stratified random sampling from streaming and stored data," *Distrib Parallel Databases*, vol. 39, no. 3, 2021, doi: 10.1007/s10619-020-07315-w.
[13] R. Iliyasu and I. Etikan, "Comparison of quota sampling and stratified random sampling," *Biom Biostat Int J*, vol. 10, no. 1, 2021, doi: 10.15406/bbij.2021.10.00326.
[14] J. Mumu, B. Tanujaya, R. Charitas, and I. Prahmana, "Likert Scale in Social Sciences Research: Problems and Difficulties," *FWU Journal of Social Sciences*, vol. 16, no. 4, 2022, doi: 10.51709/19951272/Winter2022/7.
[15] A. Joshi, S. Kale, S. Chandel, and D. Pal, "Likert Scale: Explored and Explained," *Br J Appl Sci Technol*, vol. 7, no. 4, 2015, doi: 10.9734/bjast/2015/14975.
[16] E. Z. Pasaribu *et al.*, *Belajar Statistika: Siapa Takut dengan SPSS*. medan: Yayasan Kita Menulis, 2020.
[17] D. Marikyan and S. Papagiannnidis, "The Unified Theory of Acceptance and Use of Technology: A review," *TheoryHub Book*, vol. 12, no. 3, 2023.
[18] V. Venkatesh, J. Y. L. Thong, and X. Xu, "Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology," *MIS Q*, vol. 36, no. 1, 2012, doi: 10.2307/41410412.
[19] C. T. Nengomasha and T. N. Shuumbili, "Access to e-government services by citizens through public/community libraries in Namibia," *Information Development*, vol. 38, no. 1, 2022, doi: 10.1177/0266666920979009.
[20] B. Furuholt and Ø. Sæbø, "The role telecentres play in providing e-government services in rural areas," *THE ELECTRONIC JOURNAL OF INFORMATION SYSTEMS IN DEVELOPING COUNTRIES*, vol. 84, no. 1, 2018, doi: 10.1002/isd2.12006.