USER ACCEPTANCE OF ARTIFICIAL INTELLIGENCE-BASED DENTAL SCREENING APPLICATION IN THE SCHOOL DENTAL HEALTH PROGRAM AT KEBAYORAN BARU HEALTH CENTER

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ABSTRACT
The Senyumin application, an AI-based dental screening tool, was introduced within the School Dental Health Program but faced limited adoption. This study aimed to evaluate the acceptance of the Senyumin application, focusing on perceived ease of use and perceived usefulness. An action research sequential exploratory design was employed from April 24th to May 21st, 2024, at Kebayoran Baru Health Center and 3 elementary schools. The research involved 30 health workers and 351 parents of students. Initial thematic analysis of Senyumin 1.0 identified issues related to complexity and user adaptation, guiding the development of Senyumin 2.0. Quantitative analysis, using linear regression and guided by the Technology Acceptance Model (TAM), examined the relationships between perceived ease of use, perceived usefulness, and user acceptance. Senyumin 2 with its improved design and features. Perceived ease of use and perceived usefulness showed the strongest correlation to user acceptance according to parents data (r= 0.923, F-test= 1008.431, p-value= 0.000) and strong correlation according to staff data (r= 0.631, F-test= 8.921, p-value= 0.001), both with p-values <0.05, indicating significant relationships. Senyumin 2.0,developed based on user feedback from version 1.0, demonstrated that perceived ease of use and perceived usefulness significantly positively influenced its acceptance.
Keywords*: Artificial Intelligence; Technology Acceptance Model; Dental Screening; User Acceptance*

ABSTRAK

Aplikasi Senyumin adalah alat skrining gigi berbasis AI yang dikembangkan untuk Program Kesehatan Gigi Anak Sekolah, namun mengalami keterbatasan dalam proses adopsi. Penelitian ini bertujuan mengevaluasi penerimaan aplikasi berdasarkan persepsi kemudahan dan kebermanfaatan yang dirasakan pengguna. Penelitian ini menggunakan sequential exploratory design pada 24 April hingga 21 Mei 2024, di Puskesmas Kebayoran Baru dan 3 sekolah dasar di wilayah Kebayoran Baru. Penelitian ini melibatkan 30 staf kesehatan dan 351 orang tua siswa. Analisis tematik dilakukan pada Senyumin 1.0 untuk mengidentifikasi masalah terkait kompleksitas dan adaptasi pengguna yang digunakan sebagai dasar pengembangan Senyumin 2.0. Analisis kuantitatif dilakukan pada Senyumin 2.0, menggunakan regresi linier dengan metode Technology Acceptance Model (TAM) untuk mengidentifikasi hubungan antara persepsi kemudahan, kebermanfaatan yang dirasakan, dan penerimaan pengguna. Pengembangan desain dan fitur pada Senyumin 2.0 menunjukkan bahwa persepsi kemudahan dan kebermanfaatan yang dirasakan memiliki korelasi terkuat terhadap penerimaan pengguna

menurut data orang tua (r = 0,923, F-test = 1008,431, p-value = 0,000) dan korelasi kuat menurut data staf (r = 0,631, F-test = 8,921, p-value = 0,001), keduanya dengan p-value <0,05, menunjukkan hubungan yang signifika. Pengembanga Senyumin 2.0 berdasarkan umpan balik pengguna dari versi 1.0, menunjukkan bahwa persepsi kemudahan dan kebermanfaatan yang dirasakan secara signifikan memengaruhi penerimaan pengguna.

***Keywords**: Artificial Intelligence; Technology Acceptance Model; Gigi; User Acceptance*

INTRODUCTION

Efforts in oral health are being carried out to achieve optimal oral health, particularly for students through the School Dental Health Program (UKGS) (Rohmah Lestari & Indarjo, 2016). Given the high prevalence of oral health problems in Indonesia, coordinated efforts to improve children's oral health are crucial. The World Health Organization (WHO) has launched the "Global School Health Initiative" designed to improve student health through schools (Nadie Fatimatuzzahro et al., 2016). Elementary school-aged children, aged 7 to 12, represent a high-risk group, particularly due to their developmental stage. Therefore, intensive efforts are needed to foster the development of healthy lifestyles, a critical component of primary school health education (Natalia & Anggraeni, 2022).

The increasing role of application development in modern society is evident (Sany & Arifin, 2023). Indonesia's focus on AI in healthcare, particularly the collaboration between dentists and AI, highlights the need for effective development methodologies (Badan Riset dan Teknologi Republik Indonesia, 2020). Agile development, with its emphasis on customer satisfaction, is well-suited for meeting the specific requirements of health applications (Choi et al., 2020)

Kebayoran Baru Health Center, in collaboration with Universitas Gadjah Mada, developed Senyumin, an AI-powered dental screening application, in 2020 to improve UKGS services. A survey among parents in the 2022-2023 academic year revealed a 62% willingness to continue using the application for self-screening. Additionally, 42% of elementary schools within the health center's area adopted the Senyumin application for their School Dental Health programs during the same academic year.

User acceptance is frequently a critical factor in the success or failure of new information systems (Ammenwerth, 2019). Optimal acceptance can be defined as the result of two elements: a technology with characteristics that align with user goals, and, on the user side, the presence of psychosocial tendencies that support the adoption of new behaviors, thereby

enabling the technology to be adopted and used (Menant et al., 2021). The Technology Acceptance Model (TAM), first introduced by Fred Davis in 1986, is one model designed to analyze and understand the factors influencing the acceptance of computer technology use (Rizky Wicaksono, 2022). TAM has two sides: the first, or beliefs, consists of perceived usefulness and perceived ease of use; and the second comprises attitude, behavioral intention to use, and usage behavior (Marasi et al., 2015).

The introduction of new applications inevitably leads to user acceptance or rejection (Rêgo et al., 2022). Therefore, to understand user acceptance, an analysis is required to determine whether the application is adopted or rejected (Negari & Eryando, 2021). This research seeks to empirically examine the impact of TAM principles on information system performance.

METHOD

This research is an implementation study employing an action research design using a mixed-methods approach with a sequential exploratory design.

The study was conducted at Kebayoran Baru Health Center, Cendrawasih II Elementary School in Melawai Village, SD 05 in Pulo Village, and SD 01 in Gunung Village within the Kebayoran Health Center area. The research commenced on April 24, 2024.

The qualitative sample consisted of 30 UKGS staffs, while the quantitative sample comprised 30 UKGS staffs and 351 parents of UKGS student participants in the study area. A total sampling technique was used for both qualitative and quantitative data collection.

The inclusion criteria for this study included UKGS staff at Kebayoran Baru Health Center who used the Senyumin 2.0 application and parents of grade 1-3 students who successfully conducted child dental screenings using the Senyumin 2.0 application. The exclusion criteria were UKGS staffs on leave and parents whose children were absent during the study period.

The variables examined in this study were the relationship between Perceived Ease of Use and Perceived Usefulness of the Senyumin 2.0 application and user acceptance of the

Senyumin 2.0 application in UKGS services in the Kebayoran Baru Health Center service area. This study has obtained approval from the Ethics Committee of the Faculty of Medicine, UGM.

Diagnosis

A deep interview based on the Technology Acceptance Model (TAM) was conducted to identify Senyumin 1.0 application among staff, as they are the primary users and play a crucial role in socializing and monitoring the application's use among parents. Qualitative data was analyzed using thematic analysis. To ensure data credibility, member checking was conducted after data interpretation. Once data credibility was established, data was presented using hierarchical tables and axial coding for further enrichment. The results of this qualitative research were used as a foundation for application development and as a basis for creating quantitative research instruments based on the Technology Acceptance Model (TAM).

Action Planning

The results of the in-depth interviews were used as the basis for the development of the Senyumin application. Researchers, Kebayoran Baru Health Center management, UKGS staffs, and developers collaboratively added features to the application to improve its acceptance during the fourth week of April to the first week of May 2024.

Action Taking

Researchers and participants collaborated in implementing the developed Senyumin 2.0 application to meet the needs of UKGS services at the Kebayoran Baru Health Center. The application was implemented in SD Cendrawasih II, Melawai, SD 05, Pulo, and SD 01, Gunung, within the Kebayoran Baru Health Center area.

Evaluation

At this stage, a quantitative data survey and analysis were conducted to evaluate the acceptance of the Senyumin 2.0 application post-implementation. The research population consisted of Senyumin application users, namely UKGS staffs and parents of UKGS participants in the Kebayoran Baru Health Center area. Quantitative data was collected through an online survey using Google Forms, which had previously undergone validity and reliability testing. Once validated, the instrument was distributed via personal WhatsApp chats with UKGS staffs and dedicated WhatsApp groups for parents, with the school's permission. Along with the questionnaire link, a research participation consent form was also distributed to respondents. The questionnaire contained questions about Perceived Usefulness, Perceived Ease of Use, and User Acceptance. 5-point Likert scale was used for measurement.

Quantitative data analysis will be conducted using simple and multiple linear regression, with the degree of correlation assessed through SPSS.

Questionnaire data will be analyzed using linear regression equations. The regression models to be developed are as follows: $Y = a + bX + e$ or $Y = a + b1X1 + b2X2 + e$

Y = Dependent variable

X = Independent variable

a = Constant

b = Regression coefficient

e = Error

Subsequently, Pearson Product Moment correlation analysis will be performed. This analysis will yield a correlation coefficient (R) value. The interpretation of this value will follow Guilford's criteria.

Upon obtaining the correlation coefficient (R), the coefficient of determination can be computed using the formula: $KD = R^2 \times 100\%$. This indicates that the proportion of variance in the dependent variable attributable to the independent variable is equal to the coefficient of determination, with the remaining variance explained by other, unmeasured factors.

To test the hypotheses, both t-tests and F-tests were employed. For the t-test, if the p-value is less than 0.05 ($\alpha = 0.05$), indicating statistical significance, the null hypothesis (H0) is rejected. Conversely, if the p-value exceeds 0.05, H0 is retained. The F-test was used to assess the overall significance of the model. A significant F-test indicates that at least one independent variable is significantly related to the dependent variable.

In-depth interviews were conducted with UKGS staffs post-implementation of the Senyumin 2.0 application. The interview guide was grounded in the Technology Acceptance Model (TAM). Thematic analysis was applied to the qualitative data, with member checking employed to ensure trustworthiness. The findings were presented in a hierarchical table and used to inform recommendations for future development of the Senyumin application.

Learning

This final phase involved iterative reflection and review to generate recommendations for enhancing future iterations of the Senyumin application.

RESULTS AND DISCUSSION

A. Senyumin 1.0 Identification

Table 1. Respondent Staffs Characteristics

Variable	Frequency	Persentage
Gender		
Male	5	17%
Female	25	83%
Age (Year)		
21-30 (A)	6	20%
31-40 (B)	10	33%
41-50 (C)	8	26%
51-60 (D)	6	20%
Profession		
General Practitioner	1	3%
Dentist	15	50%
Nurse	10	34%
Dental Nurse	4	13%
Education Level		
S1	16	53%
D3	14	47%
Working For A Long Time (Year)		
≤5	6	20%
6-10	9	31%
11-15	7	23%
16-20	1	3%
≥21	7	23%

Table 2. Respondent Parents Characteristics

Variable	Frequency	Persentage
Gender		
Male	133	38%
Female	218	62%
Age (Year)		
11-20	19	5%
21-30	204	58%
31-40	77	22%
41-50	51	15%
Education Level		
SMP	7	2%
SMA	116	33%
D3	123	35%
S1	105	30%

To inform the development of Senyumin 2.0, a qualitative study with thematic analysis was conducted to assess the application of Senyumin. The research, carried out in late April 2024, focused on identifying challenges, assessing the application's alignment with UKGS

service needs, understanding user adaptability, and identifying features for future development. Findings from this study served as a foundation for the development of the application.

Based on in-depth interviews, The challenges faced by UKGS staffs in using Senyumin 1.0 were identified as a manual reporting system, the requirement of active parental involvement, and the presence of excessive and disorganized general health data. The research found that the application's features do not align with the specific service requirements of UKGS. To address the identified challenges in application usage, the development of the Senyumin application should include the following features: a reporting system, a user guide, a hotline, a feature to view AI anomaly detections in parental accounts, completion rewards, improved AI detection accuracy, and a forgotten password feature.

Research on online health applications in Indonesia has shown that users generally have a positive reception towards applications that meet variables such as perceived ease of use and perceived usefulness, ultimately leading to acceptance, which consists of users' attitudes towards accepting or rejecting the application, intention to use, and actual usage characterized by repeated use or recommendations to others. This plays a crucial role in user acceptance of applications (Margono & Cassandra, 2022).

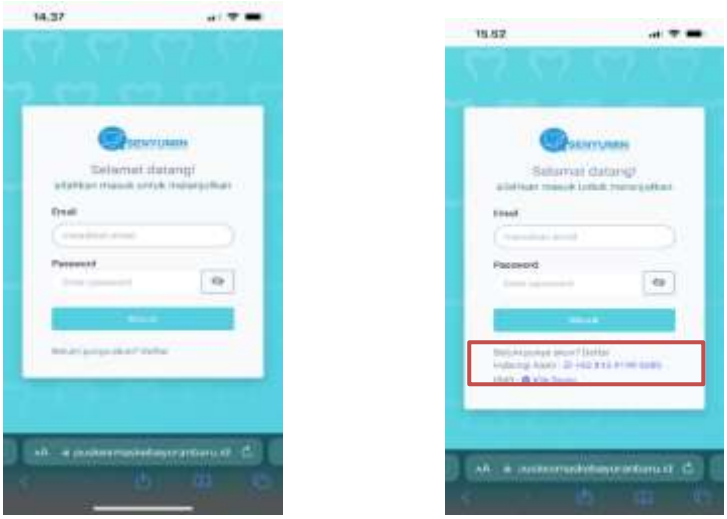
In the development of the Senyumin application, a stage of identifying Senyumin 1.0 was conducted to ensure it meets the needs of its users, aligning with user expectations. The identification process of the Senyumin application involved surveys and interviews to engage users of the application. This is in line with previous research that conducted identification processes and ensured the functionality of features to meet user needs, thereby stimulating user intention and ultimately leading to repeated use of the application (Lin & Chen, 2012).

B. Development Of Senyumin Application

Following the identification of Senyumin 1.0 and the subsequent decision-making process based on user needs, development of the application was initiated. This development decision was made with the approval of the management of Kebayoran Baru Health Center, UKGS staffs, and the development team. The application development took place from the 4th to the 1st week of May 2024.

The following are the feature changes implemented in the Senyumin 2.0 application:

Application Log-in Interface



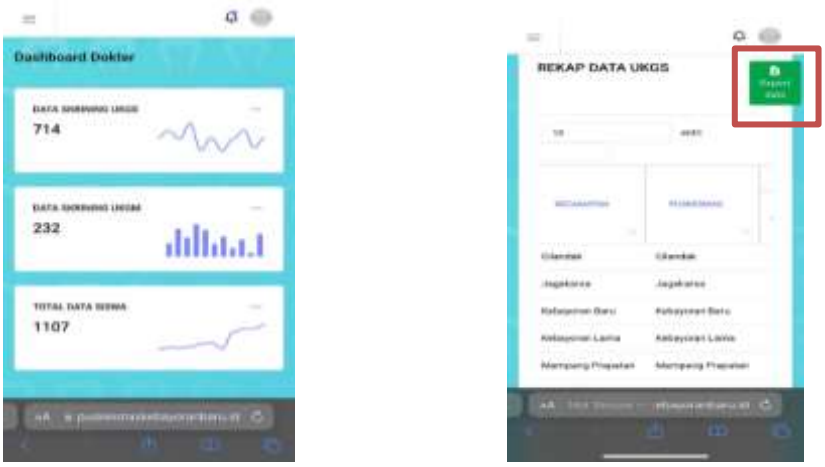
(a) *(b)*

Picture 1. Log-in Interface for Staffs and Parents Account: (a) Senyumin 1.0, (b) Senyumin 2.0.

The applications exhibit distinct features, particularly in the login page where a hotline menu and an online queuing system integrated with the EMR are included.

Senyumin 2.0 offers several novel features, including a login design equipped with a hotline number. This innovation allows users to contact the hotline if they encounter any difficulties while operating the application. The addition of a hotline aims to enhance users' perceived ease of use. Moreover, providing a hotline facilitates user reporting of any issues encountered during application usage. The inclusion of a feedback menu within the application can improve user acceptance, as it enables the application to provide solutions that meet user expectations (Farisa & Rochmawati, 2021).

Dashboard Application (Staffs Account)



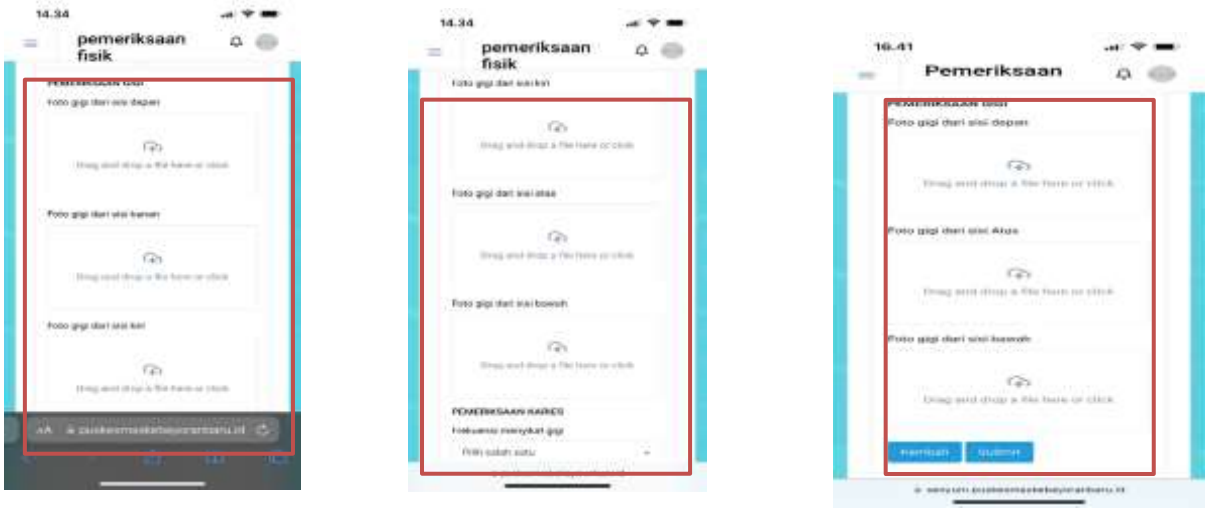
(a) *(b)*

Picture 2. Dashboard Application: (a) Senyumin 1.0, (b) Aplikasi Senyumin 2.0.

The Senyumin 2.0 dashboard provides UKGS staffs with an automated export function to Microsoft Excel for easy access to UKGS activity data.

The Senyumin 2.0 dashboard was redesigned to streamline UKGS service reporting, aiming to improve user experience. To address challenges in accessing comprehensive child dental health data and generating automated reports, an automated reporting feature was added. This feature, enabled by server optimization, enhances data management and accessibility, facilitating task completion for UKGS officers (Estai et al., 2017).

Dental Screening Features (Parents Account)

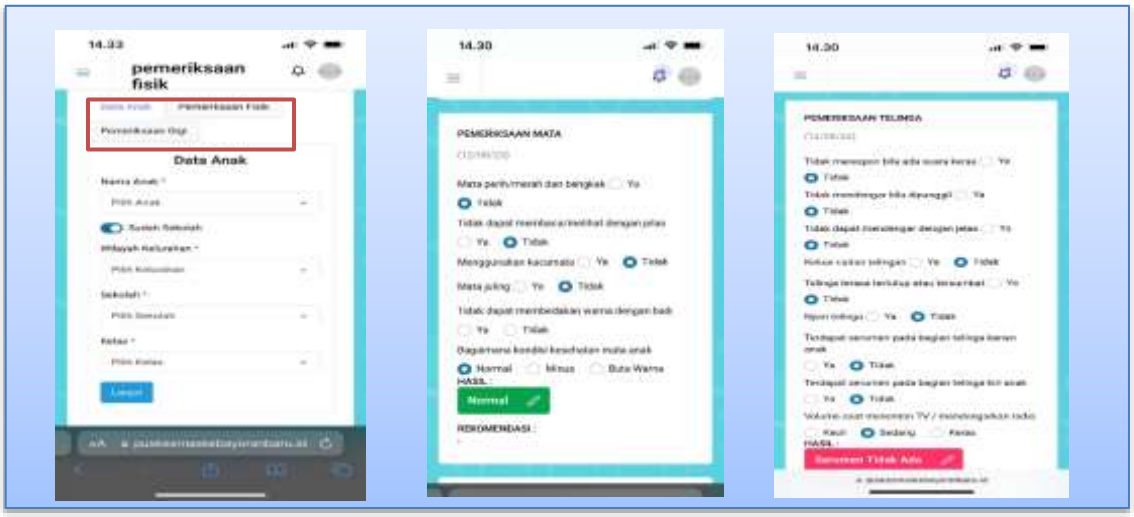


(a) (b) (c)

Picture 3. Dental Screening Features (a), (b) Senyumin 1.0, (c) Senyumin 2.0.

Senyumin 1.0 required five dental images (frontal, right, left, upper, and lower) for the dental examination feature in the parent's account. Based on recommendations, Senyumin 2.0 has reduced this to three images: frontal, upper, and lower.

Furthermore, the general health check feature within the examination feature of the Senyumin 2.0 application has also been removed.



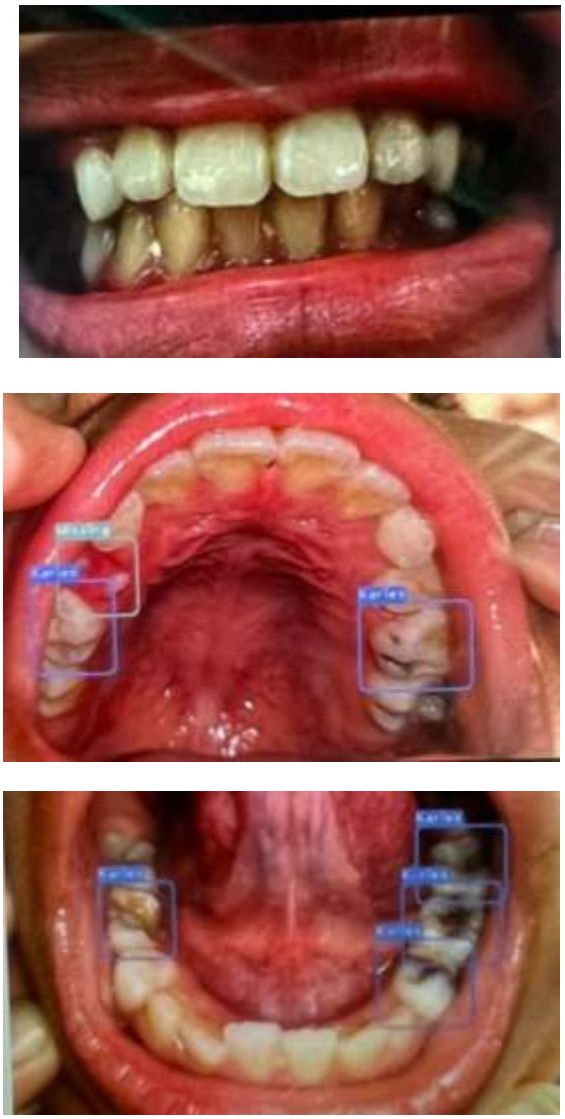
(a)

(b)

Picture 4. Screening Features (Parents Account):(a) Senyumin 1.0, (b) Senyumin 2.0.

Senyumin 1.0 included general examinations consisting of ear and eye examinations. However, to simplify the data input process, given that Senyumin is a screening application, there is a consideration to remove these general examinations.

Application development requires a user interface design that is easy to use and understand, and does not burden the user in its utilization (Hussain et al., 2016). The Senyumin application simplifies its features to create a perception of ease for users, but this simplification does not reduce the functionality of Senyumin 2.0. Feature simplification is also recommended in research conducted by Xiao et al., 2023, which states that simplifying usage steps in application development is necessary to reduce challenges and make the application more easily accepted.



Picture 5. Development AI Detection for dental Screening (Parents Account)

The addition of an AI-powered anomaly detection feature to parents' accounts also serves as an educational tool for parents, as the Senyumin application aims to raise parental awareness of their children's oral health conditions, thereby encouraging them to seek dental

care. These AI-detected anomalies are displayed on parents' accounts without prior validation by UKGS staffs, including dentists and dental hygienists

C. Evaluation Development

An evaluation phase was conducted following the implementation of the Senyumin 2.0 application in three elementary schools within the Kebayoran Baru Health Center's catchment area that had not previously implemented the UKGS program using the Senyumin 1.0 application during the 2023-2024 academic year. The research in this phase employed quantitative analysis for both parents and UKGS staffs.

Hypothesis Test : The Impact of Perceived Ease Of Use, Perceived of Usefulness On User Acceptance

Parents Data

Regression Analysis

Table 2. Regression Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.348	.320		1.088	.277
	Perceived Ease of Use	.380	.038	.432	10.012	.000
	Perceived of *Usefulness*	.678	.056	.521	12.078	.000

a. Dependent Variable: Keberterimaan Pengguna

Y = 0,348 + 0,380X1 + 0,678X2

Table 3. ANOVA Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3644.752	2	1822.376	1008.431	.000[b]
	Residual	628.885	348	1.807		
	Total	4273.637	350			

a. Dependent Variable: Keberterimaan Pengguna

b. Predictors: (Constant), *Perceived* of Usefulness, *Perceived Ease Of Use*

The calculated f-value for the Perceived Ease of Use variable was 1008,431 with a p-value of 0.000. Since the probability value (p-value) is less than 0.05 (significance level of 5%), the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted.

Table 4. Correlation Analysis

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.923[a]	.853	.852	1.34430
a. Predictors: (Constant), *Perceived* of Usefulness, *Perceived Ease of Use*				
b. Dependent Variable: Keberterimaan Pengguna				

The correlation coefficient (R) value of 0.923 indicates a very strong correlation.

Coefficient of Determination.

KD = R2 × 100% = (0,923)2 × 100% = 85,3%

Staffs Data

Regression Analysis

Table 5. Regression Analysis

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.211	1.867		1.720	.097
	Perceived Ease of Use	.221	.195	.276	1.134	.267
	Perceived of *Usefulness*	.445	.277	.390	1.604	.120
a. Dependent Variable: Keberterimaan Pengguna						

Y = 3,211 + 0,221X1 + 0,445X2

Table 6. ANOVA Test

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	99.179	2	49.590	8.921	.001[b]
	Residual	150.088	27	5.559		
	Total	249.268	29			
a. Dependent Variable: Keberterimaan Pengguna						
b. Predictors: (Constant), *Perceived* of Usefulness, *Perceived Ease Of Use*						

The calculated f-value for the Perceived Ease of Use variable was 8,921 with a p-value of 0.001. Since the probability value (p-value) is less than 0.05 (significance level of 5%), the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted.

Table 7. Correlation Analysis

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.631[a]	.398	.353	2.35772

a. Predictors: (Constant), *Perceived* of Usefulness, *Perceived Ease of Use*

b. Dependent Variable: Keberterimaan Pengguna

The correlation coefficient (R) value of 0.631 indicates a strong correlation.

Coefficient of Determination.

KD = R2 × 100% = (0,631)2 × 100% = 39,8%

Based on the Technology Acceptance Model (TAM), perceived ease of use and perceived usefulness can influence user acceptance of an application. Therefore, this study explored whether the developed application has an impact on user acceptance during the application evaluation stage.

Through simple linear regression analysis along with simultaneous hypothesis testing on several regression models, it was found that there is a positive and significant influence of perceived ease of use and perceived usefulness on user acceptance of Senyumin application in UKGS in the Kebayoran Baru Health Center area. This identifies a positive and significant influence between the oral health behavior change model and its acceptance and effectiveness (Xiao et al., 2023).

However, in the regression model for user data, the coefficient of determination was less than 40%, but the hypothesis test for the significance of independent variables on the dependent variable had a p-value less than 0.05. This means that the significance between the variables remains valid, but additional variables are needed according to TAM theory to create a more comprehensive model. This is in line with Xu et al., 2022 research. When a study shows a significant relationship between independent and dependent variables but produces a low coefficient of determination (R-squared), this indicates that the model can still explain the level of impact of the independent variables on the dependent variable, although it does not accurately predict specific values. The validity of the study is maintained, but additional variables may indeed be needed to increase the explanatory power of the model and improve the coefficient of determination (Xu et al., 2022).

CONCLUSION

Based on the analysis and discussion in the previous chapter, the following conclusions can be drawn:

Limitation Senyumin 1.0: The application had several shortcomings, including a manual reporting system, the need for active parental involvement, a lack of organization in the general health data, adaptation period, photo input and validation processes, forgotten passwords, and a complex user interface.

Additional features in Senyumin 2.0: The updated version includes automated UKGS activity reports, application usage guides, a hotline, and an AI-based anomaly detection feature for parents' accounts. Additionally, the application has been simplified by reducing features such as initial validation for UKGS officers, general health features for students (e.g., eye and ear health), and the number of dental photo inputs.

Evaluation of the application through a questionnaire and quantitative analysis: a. Both partial and simultaneous tests show that perceived ease of use and perceived usefulness, according to parent data, have a p-value < 0.05, indicating a significant positive impact on user acceptance of Senyumin 2.0 in UKGS services in the Kebayoran Baru Public Health Center area. b. Both partial and simultaneous tests show that perceived ease of use and perceived usefulness, according to officer data, have a p-value < 0.05, indicating a significant positive impact on user acceptance of Senyumin 2.0 in UKGS services in the Kebayoran Baru Public Health Center area. The coefficient of determination for user acceptance influenced by perceived ease of use and perceived usefulness in parent data is 85.3%, indicating a very strong relationship between the independent and dependent variables. The coefficient of determination for user acceptance influenced by perceived ease of use and perceived usefulness in UKGS officer data is 39.8%, indicating a strong relationship between the independent and dependent variables.

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