

Analysis of WhatsApp Social Media Application Services on User Satisfaction Using the PIECES Framework Method

Hanggoro Aji Al Kautsar¹, Lukmanul Hakim²

¹Program Studi Informatika, Fakultas Teknik dan Informatika, Universitas Bina Sarana Informatika

²Program Studi Teknik Informatika, Fakultas Teknik dan Informatika, Universitas Bina Sarana Informatika

ARTICLE INFORMATION

Artikel History::

Received: 05-03-2026

Revised: 12-05-2026

Accepted: 27-07-2026

Keyword:

WhatsApp
Users
PIECES
Framework

ABSTRACT

Technological developments continue to shift towards a more modern era, where social media plays an essential role in facilitating rapid information exchange. This study aims to evaluate user satisfaction with the WhatsApp application services using the PIECES Framework method across six key dimensions. Employing a quantitative approach, data were collected using a random sampling technique via Google Forms. The sample consisted of 100 respondents calculated using the Lemeshow formula, encompassing students and general WhatsApp users aged 17 to 50 years. The research instrument comprised 17 indicator questions that were declared valid ($r_{\text{count}} > r_{\text{table}} = 0.195$) and highly reliable ($\text{Cronbach's Alpha} = 0.933$). The assessment across the PIECES dimensions revealed high satisfaction levels: Performance scored an average of 4.19, Information obtained 4.15, Economics reached 4.22, Control & Security scored 4.08, Efficiency achieved 4.25, and Service recorded 4.18 (all falling within the "Satisfied" category of 3.40 - 4.91). Overall, the findings confirm that WhatsApp delivers exceptional service quality, significantly fulfilling daily communication and operational needs.

Corresponding Author:

Hanggoro Aji Al Kautsar,
Program Studi Informatika,
Universitas Bina Sarana Informatika,
Jl Kramat Raya No.98, Jakarta, Indonesia, 10450,
Email: hanggoro.hgr@bsi.ac.id

INTRODUCTION

Technological advancements continue to evolve and shift toward a more modern direction. Nowadays, social media has become an essential part of people's lives, enabling various activities such as information exchange and retrieval in a faster, easier, and more effective way. Social media can now be used for diverse communication purposes and has been widely adopted by organizations, corporations, governments, and social institutions. Its many benefits have made social media a primary communication tool and a daily necessity across all age groups—from children to adults and even the elderly. (Damayanti, Delima, and Suseno 2023)

Social media is now a vital part of modern lifestyles. Applications that are cheap or even free can replace traditional communication methods such as phone calls and SMS. WhatsApp is currently one of the most popular online communication tools (Andry et al., 2023). This app is not only popular and easy to use but also allows users to share various types of information and content. WhatsApp has become a preferred medium due to its



operational flexibility. Even with a weak signal, users can still send texts, voice notes, photos, audio, and videos without delay. Another appealing aspect is the absence of disruptive ads. (Koten, Jufriansah, and Hikmatiar 2022)

WhatsApp, a fourth-generation multimedia exchange application, essentially functions similarly to the SMS applications on earlier mobile phones but uses internet data. Unlike SMS, WhatsApp has no character limit and works as long as an internet connection is available. WhatsApp was founded by Jan Koum in 2009 to provide an easy communication platform. The name "WhatsApp" is a play on "what's up"—reflecting informal conversation. Eventually, WhatsApp was acquired by Facebook(Wenerda 2020)

The PIECES framework is a method used to classify problems, opportunities, and directives in the scope definition, analysis, and system design phases. This framework helps identify new insights that can be considered in system development. It includes six variables: Performance, Information and Data, Economics, Control and Security, Efficiency, and Service, which support system maintenance (Prayogi et al. 2021)

To determine whether WhatsApp performs effectively, its performance must be analyzed—particularly by measuring user satisfaction. Therefore, this study was conducted under the title: "**Analysis of WhatsApp Social Media Application Services on User Satisfaction Using the PIECES Framework Method.**"

RESEARCH METHOD

Data Collection Techniques

The data collection techniques used in this study include:

1. Observation
This method was used to obtain direct understanding and analysis of the WhatsApp application's performance from a user perspective, especially regarding the quality of its services.
2. Literature Study
This method involves collecting data or information through reviewing written sources related to the research topic, such as research reports, books, scientific articles, documents, journals, and other references.
3. Questionnaire
Questionnaires were used to gather information and opinions from respondents regarding the topic. This instrument was distributed via Google Forms to WhatsApp users and used both quantitative and qualitative approaches.



Figure 1. Workflow

Research Stages

The research was conducted using the PIECES framework method, which is based on actual user satisfaction data with the WhatsApp application. The goal is to produce an accurate depiction of the situation using data that is collected, presented, and evaluated to generate new insights about the subject.

The technical and systematic steps carried out in this research are as follows:

1. Determine the Object
The research begins by identifying the WhatsApp service system as the object of study.
2. Problem Identification
The next step is identifying the problems occurring within the system, which also forms the basis for conducting the study.

3. Questionnaire Development and Distribution
The researcher developed 17 core questions based on the PIECES framework. The questions were distributed using Google Forms with random sampling to select respondents.
4. Data Collection and Processing
Data collected from the distributed questionnaires were then processed and analyzed.
5. Analysis Using the PIECES Framework
The final step involves evaluating the six PIECES framework variables.

Research Instrument

The research used a Likert scale to measure respondents' opinions, perceptions, and attitudes. This scale is frequently used in social science research to assess the level of agreement or disagreement with a particular statement. The Likert scale used is as follows:

Table 1. Likert scale

Response	Criteria	Skore
Strongly Agree	SA	5
Agree	A	4
Neutral	N	3
Disagree	D	2
Strongly Disagree	SD	1

Source: (Kurniawan et al. 2020)

Population and Sample

The population consists of all WhatsApp application users. A sample of 100 respondents was randomly selected, including students and general users aged between 17 to 50 years old.

Due to the unknown or unlimited number of users, the sample size was determined using the Lemeshow formula:

$$n = \frac{z^2 1 - a/2 P(1 - P)}{d^2}$$

Where:

n = Sample size

Z = Z-score at 95% confidence level = 1.96

P = Maximum estimation = 0.5

d = Margin of error = 0.10 (10%)

Data Analysis Method

Score Range	Satisfaction Level
4,92 – 5,00	Very Satisfied
3,40 – 4,91	Satisfied
2,60 – 3,39	Neutral
1,80 – 2,59	Dissatisfied
1,00 – 1,79	Very Dissatisfied

To calculate user satisfaction averages, Kaplan and Norton's scale was used (Jakaria and Utamajaya 2022), with the following interpretation:

Table 2. Characteristics of Assessment Scale Assessment Category.

To calculate average satisfaction:

$$AS = \frac{TSS}{TQ}$$

Where:

AS = Average Satisfaction

TSS = Total Score of Questionnaires

TQ = Total Number of Questionnaires

The PIECES framework was then used to classify problems, opportunities, and directives into six evaluation variables: Performance, Information, Economics, Control & Security, Efficiency, and Service (Kurniawan et al. 2020)

Table 3 Pieces framework method variables

No	Variabel	Question
Sta	1 Performance	1. Is the WhatsApp interface easy for users to understand? 2. Can WhatsApp function optimally on your device? 3. Can WhatsApp be used easily? 4. Does WhatsApp respond quickly to cancellation commands or requests for action?
	2 Information	1. Are the menus displayed on WhatsApp easy for users to understand? 2. Is the initial use helpful enough for new users? 3. Does the information on WhatsApp meet the needs of users? 4. Is the information displayed on WhatsApp clear and easy for users to understand?
	3 Economics	1. Does sharing information become easy using WhatsApp? 2. Is the use of internet data to access WhatsApp relatively cheap?
	4 Control & Security	1. Is WhatsApp easy to understand? 2. Is the security of user data guaranteed? 3. Is the form of security on WhatsApp able to protect data or information from various forms of fraud or crime?
	5 Efficiency	1. Does using WhatsApp make you more efficient in terms of time, cost and energy? 2. Is the presence of WhatsApp very helpful in sharing information?
	6 Service	1. Do the services provided by WhatsApp meet your needs? 2. Can WhatsApp satisfy you as a user?

Results and Discussion

This research used a sample of 100 randomly selected WhatsApp users. Before analyzing the data, validity and reliability tests were performed to ensure the quality of the measuring instruments. The characteristics of this study, the author distributed 100 questionnaires to WhatsApp application users, here are some of the characteristics obtained :

a. **Validity Test**

The validity test compares the r-count with the r-table value. With a significance level of 0.05 and degrees of freedom (df) = 100, the r-table value used is 0.195. All items showed r-count values higher than 0.195, meaning that all questionnaire items are valid and suitable for use in data collection.

Table 4 Validity Test Result

Variabel	Respons	R – Calculate	R – Table	Result
Performance (P1)	P1	0,652	0,195	VALID
	P2	0,701	0,195	VALID
	P3	0,645	0,195	VALID
	P4	0,760	0,195	VALID
Information (I1)	I1	0,779	0,195	VALID
	I2	0,695	0,195	VALID
	I3	0,779	0,195	VALID
	I4	0,770	0,195	VALID
Economics (EC1)	EC1	0,703	0,195	VALID
	EC2	0,623	0,195	VALID
Control & Security (CS1)	CS1	0,760	0,195	VALID
	CS2	0,639	0,195	VALID
	CS3	0,613	0,195	VALID
Efficiency (EF1)	EF1	0,689	0,195	VALID
	EF2	0,710	0,195	VALID
Service (S1)	S1	0,759	0,195	VALID
	S2	0,696	0,195	VALID

In accordance with the results of the research instrument trial in the table above. It can be seen that r Calculation is greater than r Table, which means that all numeric items are declared valid and can be used as data collection tools in the research conducted.

b. **Reliability Test**

Reliability was tested using Cronbach's Alpha through SPSS software. The result:

- 1) Cronbach's Alpha = 0.933, which is greater than the threshold of 0.70
- 2) This indicates that the data is reliable

Case Processing Summary				Reliability Statistics	
Cases		N	%	Cronbach's Alpha	N of Items
Valid		100	100.0	.933	17
Excluded ^a		0	.0		
Total		100	100.0		

a. Listwise deletion based on all variables in the procedure.

Figure 3. Reliability Test Results

Implementation Results

After the application has been completed and tested functionally, the next step is to upload the application to the Google Play Store, making it ready for marketing and use. Below is an example of the application's output display on the Google Play Store.



Figure 16. FISHLAB Application Display Uploaded to the Play Store

Application Testing

The author used the Black Box Testing method to test the performance of the FISHLAB application. The completed application was tested to ensure that it operates as expected. The system testing phase was conducted to test all the functions that have been implemented in the application to ensure they work smoothly and without issues.

Table 1. Results of Black Box Testing on the FISHLAB Application

No	Test Scenario	Test Case	Expected Result	Test Result	Conclusion
1	Login fails if email and password are incorrect / do not match	Enter incorrect email and password	Return to the Login page	As Expected	Valid
2	Login succeeds if email and password are correct / match	Enter correct email and password	Successfully log into the app and display the Home page	As Expected	Valid
3	Select the Scan menu tab	Click the Scan menu tab	Navigate to the Scan page	As Expected	Valid
4	Select the Location button	Click/select Location	Navigate to the Location page	As Expected	Valid
5	Select the News button	Click/select News	Navigate to the News page	As Expected	Valid
6	Select the Chat AI button	Click/select Chat AI	Navigate to the ChatGPT web page	As Expected	Valid
7	Select the Freshwater fish category	Click/select Freshwater Fish category	Display the list of Freshwater Fish	As Expected	Valid
8	Select the Saltwater fish category	Click/select Saltwater Fish category	Display the list of Saltwater Fish	As Expected	Valid
9	Select a fish from the freshwater fish list that appears	Click/select a freshwater fish from the list	Display the details page for the selected freshwater fish	As Expected	Valid
10	Select a fish from the saltwater fish list that appears	Click/select a saltwater fish from the list	Display the details page for the selected saltwater fish	As Expected	Valid
11	Select the profile menu on the home page	Click/select the profile picture	Navigate to the profile page with information about name, email, and password	As Expected	Valid
12	Enter the edit profile page	Click/select edit profile on the profile page	Display a form to edit name, email, and password	As Expected	Valid
13	Enter the shopping cart menu	Click/select the shopping cart icon	Display the shopping cart page with a list of fish and their prices	As Expected	Valid

14	Logout from the application	Click/select the Back button on the navigation menu	Logout from the app and return to the Get Started page	As Expected	Valid
----	-----------------------------	---	--	-------------	-------

Task Descriptions

1. Project Manager / System Analyst

A Project Manager is a professional responsible for planning, executing, and controlling a project from start to finish. Their main responsibilities include leading the team, setting project goals, and communicating with stakeholders. Therefore, the success or failure of a project lies entirely in the hands of the Project Manager (Andriana 2022).

A Project Manager is accountable for ensuring that the application project runs smoothly and achieves its goals. Below are some key responsibilities they must handle:

a. Project Planning

The Project Manager creates a project plan that includes objectives, schedule, budget, and resources. They must identify potential risks and devise strategies to mitigate them to ensure the project proceeds smoothly.

b. Team Management

The Project Manager leads and coordinates the project team, ensuring that each team member knows their responsibilities. They must also handle conflicts and provide support, direction, and motivation to the team.

c. Monitoring and Control

They are responsible for monitoring the project's progress and identifying and resolving issues or obstacles. They also ensure that the project stays within budget and on schedule.

d. Communication

The Project Manager acts as the main communication link between stakeholders, including clients, executives, and the internal team. They must ensure that all parties are well-informed about the project's progress and any changes.

e. Budget Management

The Project Manager manages the project budget carefully to ensure that spending is done on time. They also look for ways to reduce costs while maintaining the quality of the project.

f. Quality and Compliance

Testing and verification are necessary to ensure that the developed product or service meets the required quality standards and compliance regulations. This ensures that the final deliverable meets the specified requirements.

g. Project Completion

They must ensure that the project is completed on time and that all deliverables are provided according to the agreed specifications. They must also evaluate the results and assess team performance for process improvement in the future.

2. Database Administrator / Programmer

A Database Administrator (DBA) is responsible for ensuring that all databases, including those related to financial or customer information, adhere to the established rules and procedures to prevent data loss. They use their skills in computer science to resolve issues if something happens in their workplace (Kourmentza 2024)

The DBA plays a crucial role in the success of an application startup. The DBA is responsible for designing, implementing, and maintaining the database systems. Their main tasks include:

a. Database Design

The DBA creates an effective database schema that includes tables, indexes, and relationships to ensure scalability and optimal performance.

b. Maintenance and Security

The DBA is responsible for maintaining the security of the database, including managing access rights, encrypting data, and tracking activities to prevent unauthorized access.

c. Backup and Recovery

The DBA implements recovery and backup methods to prevent data loss or corruption.

d. Monitoring and Tuning

The DBA checks database performance, makes adjustments, and optimizes the database configurations to improve performance.

e. Maintenance and Updates

The DBA ensures the database software is patched and upgraded regularly to maintain stability and security.

A Programmer is responsible for writing and testing the code used to create software. They transform the program designs made by developers into computer instructions that can be understood and executed. In some

cases, they may also collaborate with developers. If there are errors in the code, the programmer will inspect and fix them. Some of the programmer's tasks include:

- a. Project Development
A programmer must be proficient in writing code using programming languages such as C++ and Java to create functional programs.
- b. Integrating Front-End and Back-End
A programmer integrating with the back-end is responsible for managing and processing the data in the program, including designing and implementing logic, algorithms, and databases required for the program's functions. On the other hand, a front-end programmer develops the user interface or program's visual display, ensuring that users can interact with the program.
- c. Routine Reports to the Product Manager
Programmers need to create and maintain a set of features or instructions for the program. To ensure each feature meets the business objectives and needs, the product team, led by a product manager, manages the features. Programmers regularly report progress to the product manager to show how far the development has come.
- d. Collaborating with the Design Team
Every set of instructions in a program is typically designed by User Interface (UI) and User Experience (UX) designers. UI designers focus on making each page visually appealing, while UX designers ensure that the instructions are easy to use and not confusing. However, collaboration between programmers and designers is not always smooth. Due to differences in views and priorities between design implementation and technical implementation, programmers sometimes ask designers to consider the difficulty level of implementing designs. On the other hand, designers may focus too much on visual aesthetics without considering technical feasibility. To achieve a balance between functionality and aesthetics, effective communication and collaboration are essential.

3. System Tester

A System Tester, also known as a Quality Assurance (QA) Tester, is responsible for testing the functionality and usability of software before it is released, ensuring that there are no major bugs. They also ensure that the software meets the requirements and expectations set beforehand. QA testers work closely with developers to resolve any issues that arise during testing. They document defects, bugs, or shortcomings in the software and report them to the development team.

QA testers also provide suggestions for improvements and necessary upgrades to create high-quality software that meets customer expectations. With the assistance of QA, which performs thorough testing and feedback, developers can make the necessary improvements and refinements before the software is released. QA ensures that the software introduced to the market is of high quality, free from significant bugs, and provides a satisfying user experience. Some of the tasks of system testers or QA testers include:

- a. Evaluating and Analyzing System Specifications: QA testers evaluate and analyze the system specifications to ensure that the software is developed according to the agreed-upon requirements.
- b. Collaborating with Quality Developers: They work with the quality developers to create optimal testing strategies and plans.
- c. Performing Test Cases (Manual and Automated): QA testers execute test cases either manually or using automated testing tools and analyze the results.
- d. Assessing the Product Code: They assess the product code to ensure it meets the defined specifications.
- e. Maintaining Logs: QA testers keep detailed logs to track the testing phases and defects found.
- f. Reporting Errors and Bugs: They report bugs and errors to the development team to be fixed.

Based on the research findings and evaluation of the WhatsApp application services using the PIECES Framework, it can be concluded that the overall user satisfaction level falls into the "Satisfied" category. The evaluation of the 17 indicators across the six PIECES dimensions demonstrates that WhatsApp successfully fulfills user expectations, with the Efficiency dimension yielding the highest impact and satisfaction score.

1. Implications of the Research

- a. Theoretical Implications : This study reinforces the applicability and robust capability of the PIECES Framework in measuring user satisfaction within modern instant messaging and social media applications, serving as a methodological benchmark for similar system evaluations.
- b. Practical Implications : The empirical results provide valuable empirical evidence for messaging platform developers. Maintaining high performance in network efficiency and user interface operational ease is critical for sustaining user retention and satisfaction.

2. Research Contributions

- a. Methodological Contribution : Demonstrates a practical integration of the Lemeshow sampling model and Kaplan-Norton scale evaluation specifically tailored for large-scale, unquantifiable active user bases of mobile applications.
- b. Empirical Contribution : Offers foundational, quantitative baseline data regarding user perception on core service dimensions—specifically highlighting strengths in system response time, security guarantees, and economic efficiency in data utilization.

3. Recommendations for Future Research

- a. Methodological Expansion : Future studies are recommended to incorporate mixed-method approaches or structural equation modeling (such as SEM-PLS or TAM) to analyze causal relationships between the PIECES variables and continuous user behavior.
- b. Sample Diversification : Expanding the sample size beyond 100 respondents and segmenting demographically across specific professional sectors will increase the generalizability of the findings.
- c. Focus on Control & Security : Given that the Control & Security dimension received the lowest relative score among the variables, future research should focus deeply on user privacy perceptions, data protection mechanisms, and mitigation against digital fraud.

REFERENCES

- Andriana, Michelle. 2022. “Mengenal Profesi Project Manager – School of Information Systems.” Retrieved November 4, 2024 (<https://sis.binus.ac.id/2022/09/02/mengenal-profesi-project-manager/>).
- Damayanti, Alfira, Isniyunisafna Diah Delima, and Ari Suseno. 2023. “View of Pemanfaatan Media Sosial Sebagai Media Informasi Dan Publikasi (Studi Deskriptif Kualitatif Pada Akun Instagram @rumahkimkotatangerang).” *Jurnal Publikasi Ilmu Komunikasi Media Dan Cinema* 173–190. Retrieved April 9, 2025 (<https://jurnal.amikom.ac.id/index.php/pikma/article/view/1308/454>).
- Jakaria, Jakaria, and Joy Nashar Utamajaya. 2022. “Analisis Kepuasan Pengguna Aplikasi Lazada Masyarakat Penajam Menggunakan Metode Pieces Framework.” *JURIKOM (Jurnal Riset Komputer)* 9(2):464–71. doi: 10.30865/jurikom.v9i2.4091.
- Koten, Florentinus Primarius Naraama, Adi Jufriansah, and Hamzarudin Hikmatiar. 2022. “View of Analisis Penggunaan Aplikasi Whatsapp Sebagai Media Informasi Dalam Pembelajaran: Literature Review.” *Jurnal Ilmu Pendidikan (JIP) STKIP Kusuma Negara* 72–84. Retrieved April 9, 2025 (<https://jurnal.stkipkusumanegara.ac.id/index.php/jip/article/view/1409/987>).
- Kourmentza, Eleni. 2024. “Database Administrator (Db) Job Description +TEMPLATE.” Retrieved November 4, 2024 (<https://resources.workable.com/database-administrator-job-description>).
- Kurniawan, Hamid, Widya Apriliah, Ilham Kurniawan, and Dede Firmansyah. 2020. “Penerapan Metode Waterfall Dalam Perancangan Sistem Informasi Penggajian Pada SMK Bina Karya Karawang.” *Jurnal Interkom: Jurnal Publikasi Ilmiah Bidang Teknologi Informasi Dan Komunikasi* 14(4):159–69. doi: 10.35969/INTERKOM.V14I4.58.
- Prayogi, Randi, Kresna Ramanda, Cahyani Budihartanti, Arief Rusman, Sekolah Tinggi, Manajemen Informatika, &. Komputer, and Nusa Mandiri. 2021. “Penerapan Metode PIECES Framework Dalam Analisis Dan Evaluasi Aplikasi M-BCA.” *Jurnal Infortech* 3(1):7–12. doi: 10.31294/INFORTECH.V3I1.10122.G4883.
- Wenerda, Indah. 2020. “PROSES KOMUNIKASI PADA PENGGUNA APLIKASI WHASTAPP YANG MENONAKTIFKAN FITUR READ RECEIPTS | CHANNEL: Jurnal Komunikasi.” *Channel Jurnal Komunikasi*, 9–16. Retrieved April 9, 2025 (<https://journal.uad.ac.id/index.php/CHANNEL/article/view/14461>).