

A Comprehensive Analysis of Information Quality in E-Learning: An Example of Online Learning with Brainly

Koko Srimulyo¹, Imam Yuadi¹, Chih-Chien Hu², Imroatus Sholehah Afifah Indarwati¹, Endang Gunarti¹, Friska Dwi Pratiwi²

¹ Department of Information and Library Science, Airlangga University, Airlangga Street 4-6, Surabaya, Indonesia

² Department of Information Management, Tatung University, Zhongshan District, Taipei City, 10491, Taiwan

Abstract – Evaluating information quality within these applications becomes paramount to ensure student satisfaction, involving assessments of completeness, relevance, and other factors. To address this concern, the study employs the quality of information system (QIS) model, focusing on characteristics that enhance the value of information. An analysis, grounded in time, content, and form dimensions, offers a comprehensive and quantitative understanding of the current state of information quality in e-learning applications such as Brainly. Consequently, many students in various regions, particularly Madiun, expressed satisfaction with the time, content, and form of the information provided by Brainly, resulting in an information quality score of 81%. This study contributes to the dimensions of time and form within the Brainly application. Emphasizing these dimensions yields valuable insights into the application's advantages from the users' perspective and provides recommendations for enhancing the Brainly application's capacity to deliver timely information and offer a user-friendly experience.

Keywords – Information quality; e-learning; library management; quality of information systems; quality education.

1. Introduction

The quality of information in online educational applications has emerged as a critical concern due to the growing popularity of online learning [1]. These applications, particularly electronic books, have revolutionized how information education is accessed and shared, facilitated by the advancements in information technology [2], [3]. This transformation has given rise to the concept of e-learning, adopted by platforms like the Brainly application in Indonesia for its effectiveness and efficiency [4]. However, the increasing use of Brainly has raised concerns, particularly regarding the difficulty of screening through the quality of information and the rise of plagiarism behaviour among students [5]. Consequently, evaluating the quality of information in these applications becomes crucial to ensure student satisfaction, considering aspects like completeness and relevance.

Recent studies have explored information quality evaluation in educational contexts, recognizing its impact on the learning process and the usefulness of system quality, information quality, and teaching material [6]. Information quality indirectly influences the actual usage of e-learning systems, enhancing the learning experience for university students [7]. However, some studies have primarily focused on technical difficulties and practical use, employing evaluation methods such as task-technology fit, technology acceptance model, learning management systems, and information system success models [1], [8], [9], [10], [11], [12].

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Corresponding author: Koko Srimulyo,
Department of Information and Library Science, Airlangga
University, Airlangga Street 4-6, Surabaya, Indonesia.


Email: koko.srimulyo@fisip.unair.ac.id

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Notably, some of these studies lack a comprehensive discussion of user satisfaction based on information quality in e-learning. To address this, certain studies have evaluated user satisfaction using structural equation modeling and partial least squares structural equation modeling [13], [14], [15], [16]. On the other hand, evaluating the quality of information in an application like Brainly necessitates a robust analysis and data. Consequently, it requires a model that can comprehensively assess every aspect faced by users to gain a deeper understanding. Based on several studies, the use of a quantitative approach is essential to objectively describe the situation [17]. When it comes to information quality in the context of e-learning within an information system, a comprehensive analysis is needed. This analysis should encompass factors such as reliability, timeliness, completeness, relevance, accuracy, and flexibility to develop a theoretical framework [18].

Accordingly, the use of the QIS model by Marakas and O'Brien is performed to answer the question entirely since it focuses on the characteristics that increase the value of information [19]. The implementation of the model is to evaluate the quality and usefulness of information produced by an effective information system [20]. Some studies use it to evaluate accounting software in terms of a positive impact on the information quality of their system [21]. This article adopts a distinctive approach to assess the influence of information quality on user satisfaction in e-learning applications, thereby examining its impact on user engagement. While existing literature has explored information quality in various contexts, a limited number of studies have applied the James O'Brien and Marakas model to evaluate information value by considering specific characteristics [19]. Utilizing a comprehensive analysis encompassing time, content, and form dimensions, this study offers a quantitative understanding of the current state of information quality in e-learning applications, exemplified by Brainly. Nevertheless, the study is constrained by its focus on a specific e-learning context and a limited sample size, which may affect the generalizability of the results. Furthermore, an exploration of specific strategies promoting information quality and their effects on learning domains would yield valuable insights for educators and policymakers. Hence, this framework aims to address the following research questions:

RQ1. - How is the information quality in the Brainly application?

Q2. – How does user satisfaction with information quality on Brainly vary by region, and what factors contribute to these differences?

2. Literature Review

The relationship between information quality and user pleasure is closely connected in the digital era, as the provision of high-quality information is essential for improving user experiences and fulfilling their requirements. The literature on this subject frequently examines how the precision, pertinence, and comprehensiveness of information impact user contentment across different platforms and circumstances. Gaining insight into these dynamics is beneficial for developing systems and services that prioritize both the accuracy of information and the overall user experience.

2.1. Information Quality

The quality of information can be interpreted in various ways, encompassing an intrinsic view, a context-based view, and a representational [22]. In the context of this discussion, quality is defined as the ability of a product, including services, to meet or exceed user expectations [23]. Users rely on quality information to plan, control, and operate their businesses effectively [18]. Therefore, the higher the quality of exchanged information, the more likely communities and their members are to thrive [24]. Users seek high-quality information as it enhances the value of decision-making processes [19]. High-quality information is characterized by correctness, reliability, currency, and appropriateness in format [23]. Consequently, the quality of information is categorized into three dimensions:

- Time Dimension: Encompasses timeliness, currency, frequency, and period.
- Content Dimension: Involves accuracy, relevance, completeness, conciseness, scope, and performance.
- Form Dimension: Includes clarity, detail, order, presentation, and media.

Numerous studies across various fields, including accounting [18], governance [25], health [26], [27], and agriculture [28], have investigated the quality of information. This emphasis on quality information is attributed to its paramount importance in facilitating information flow and communication speed, especially with the prevalence of the Internet access [29].

2.2. Quality of Education Information

The quality of information in the field of education is critically important as it has a significant impact on students [30]. Research has shown that the quality of information is a robust predictor of its influence on end-users of educational platforms [31].

While the widespread use of information, communication, and technology has brought numerous benefits to the education sector, it also necessitates thorough preparation to avoid potential drawbacks. Challenges arise when teachers are not adequately prepared in their subject matter, face difficulties in changing students' habits, and encounter challenges in networking during the learning process [32].

Despite substantial progress in developed countries, higher education institutions in underdeveloped economies continue to lag in the adoption of educational technology applications. These advances have had a profound impact on the educational system [33]. However, individual students are increasingly embracing e-learning technologies, particularly with the growing importance of distance learning in a post-pandemic environment, yielding successful results from the students' perspective [34].

2.3. User Satisfaction

In the digital era, the integration of digital technology is essential for various aspects of life, particularly in education. Modern learning incorporates tools that facilitate effective communication between teachers and students in school-based teaching and learning [35]. However, the success, utility, and system adoption are contingent on the perceived usefulness of the e-learning system [36]. If learners believe that the system enhances their learning, activities, and performance, making them more successful, they are more likely to use the e-learning system or tool. This perspective is equally applicable to students, as their success in learning activities and performance influences their acceptance of the platforms used and, consequently, the current education system [37].

Moreover, the anticipated impact of a technology's functional advantage, even in uncertain situations, is termed performance expectation. The efficacy of e-learning and user satisfaction is heavily influenced by the caliber of content and the level of support offered for course materials. Consequently, this contributes to achieving a level of performance that fulfills their expectations. [7]. Therefore, variables such as usability, information quality, service interaction, and user satisfaction play a significant role in influencing online learning [38]. Additionally, use intention and user satisfaction exhibit a positive and mediating effect on learning engagement [39], indicating that user satisfaction and collaborative involvement positively influence the use of e-learning systems [12].

Furthermore, research suggests that student happiness is significantly influenced by three components of service quality: information quality, instructional quality, and service efficiency [30]. This underscores the influential role of user satisfaction in shaping the long-term online education environment and system.

3. Results

The framework of QIS models is a powerful tool for assessing the quality of information, especially in educational settings that use apps such as Brainly. These models evaluate essential aspects such as precision, significance, and coherence, which are vital for the efficient development of educational tasks. By incorporating QIS models, instructors may optimize the learning experience, guaranteeing that students actively participate with top-notch material and derive maximum benefit from their interactions with the Brainly platform.

3.1. The Framework of QIS Models to Evaluate Quality Information

A descriptive quantitative study design will be used to assess the quality of the information in the Brainly application. This research design systematically collects and analyzes numerical data to describe and summarize the phenomenon under investigation. Moreover, it facilitates the collection of numerical data that can be statistically examined to achieve the study objectives [40]. In this case, the research design will enable the exploration and accurate depiction of the quality of information based on the QIS model developed by James O'Brien and Markah (Fig. 1). Through the use of surveys and statistical analysis, the study will provide a comprehensive quantitative assessment of the information quality within the Brainly application.

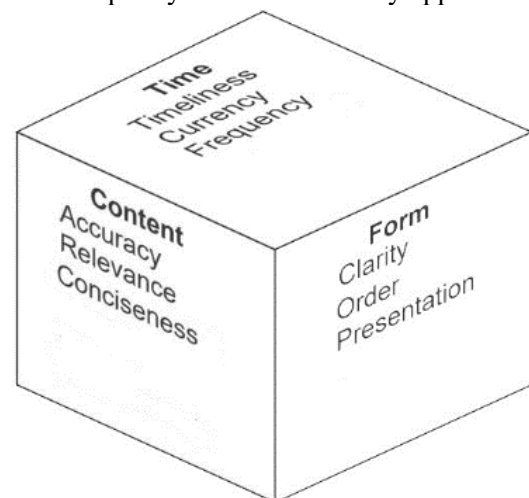


Figure 1. The QIS model developed by O'Brien and Marakas

Therefore, it will be adapted to create a conceptual framework, as illustrated in Fig. 2. This framework delineates three aspects of information quality: time dimension (TD), content dimension (CT), and form dimension (FD). The time dimension assesses how promptly information is delivered, its relevance to the current context, and the frequency of updates using metrics such as timeliness, currency, and frequency. The content dimension evaluates the validity and precision of the information, its applicability to specific concerns or situations, and the clarity and conciseness of the material. Finally, the form dimension assesses characteristics such as clarity, order, and presentation, emphasizing the comprehensibility, logical structure, and aesthetic appeal of the information. This conceptual framework serves as a valuable tool for researchers to analyze and comprehend the quality of information within the Brainly application. It enables them to design surveys, collect relevant data, and conduct statistical analyses to provide a comprehensive assessment.

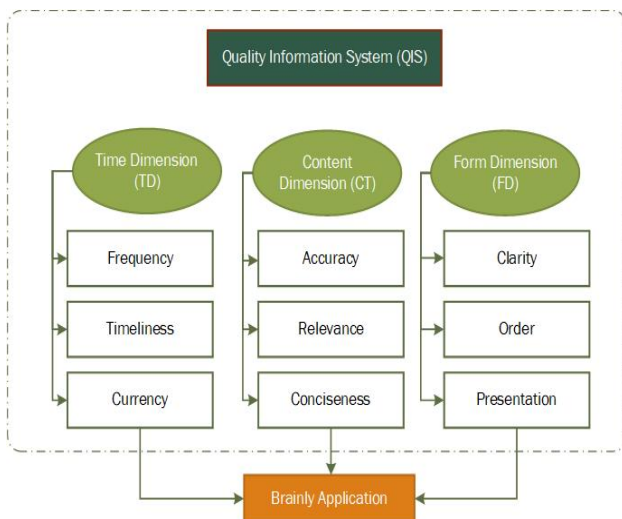


Figure 2. The conceptual framework for information quality assessment in Brainly

3.2. The Design of Learning Activities with Brainly Applications

Brainly is an online learning platform that facilitates students in seeking assistance and finding solutions to academic concerns, fostering a collaborative environment for knowledge sharing. The step-by-step process of learning exercises using Brainly, as illustrated in Fig. 3, is explained below:

1. Determining the problem: When a student encounters difficulty or has a query related to their learning activities, such as understanding a concept or needing clarification, they can turn to Brainly for help.

2. Posting the question: Students utilize the Brainly platform to upload their inquiry. They provide details about the specific topic or subject area, ensuring that the question is directed to the relevant users.
3. Choosing a course: If the topic falls under a specific course or subject category, the student can select the relevant course or subject area before submitting their question. This helps in categorizing the question and directing it to users with expertise in that particular topic.
4. Publishing the question: After selecting the course, the student posts their question on Brainly, making it accessible to other users who can contribute answers.
5. Receiving answers: Once the question is published, other online users, including teachers or fellow students with knowledge in the subject area, can view the question and provide their answers. Responses may include explanations, step-by-step solutions, or relevant resources to enhance the student's understanding of the concept.
6. Evaluating satisfaction: After receiving an answer, the student has the opportunity to evaluate its helpfulness and determine if it adequately addresses their question or problem. If satisfied, the student can conclude the process at this stage. However, if further clarification is needed or if the answer is not satisfactory, the student may wait for additional responses. Brainly encourages collaborative learning, enabling students to benefit from diverse perspectives and approaches to the same problem.

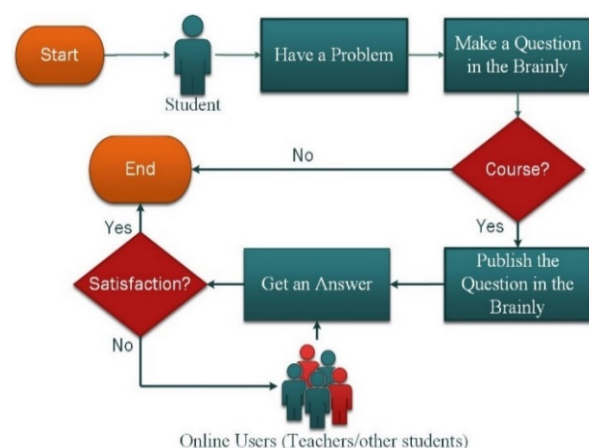


Figure 3. The process of learning exercises using Brainly

4. Experiment

The experiment had a heterogeneous cohort of participants, encompassing both students and educators, who utilized the Brainly program for a predetermined duration.

The data gathering process involved the use of questionnaires to gauge user satisfaction and engagement, along with analytic tools to evaluate the accuracy and reliability of the information produced by the application.

4.1. Participants

In this research, a total of 484 respondents participated. Table 1 presents the frequencies and percentages of the items. It is noteworthy that more than 64.9% of the participants are female. The majority of the participants, 317 in total, attend Senior High School. Regarding the major item, the majority of participants (47.1%) are in the natural sciences category, while mechanical engineering has the lowest representation with only 10 participants (2.1%).

Table 1. Characteristics of participants

Item	Category	Number of participants	%
Gender	Male	170	35.1
	Female	314	64.9
School	Senior High School	317	65.5
	Islamic Senior High School	57	11.8
	Vocational High School	110	22.7
Major	Natural Sciences	228	47.1
	Social Science	170	35.1
	Language Studies	25	5.2
	Religious Studies	14	2.9
	Accounting	23	4.8
	Mechanical Engineering	10	2.1
	Light Vehicle Engineering	14	2.9

4.2. Instruments

The QIS model's evaluated criteria for this approach are outlined in Table 2. To enhance the research process and simplify data organization and analysis, specific codes have been assigned to each dimension. For instance, variables related to the time dimension are denoted as TD, content dimension variables as CT, and form dimension variables as FD.

These codes serve as a succinct and unambiguous method to reference variables within the research study, facilitating seamless data organization and analysis. Researchers can easily identify and refer to specific variables using these codes, streamlining data management and analysis processes.

This coding system not only ensures a more efficient and organized research workflow but also promotes consistency in labeling and referencing variables across different dimensions. This consistency is crucial for accurate data interpretation and enables meaningful comparisons across various aspects of the study.

Furthermore, these criteria will be incorporated into a questionnaire employing a Likert scale. Responses on this scale have been assigned numerical codes, with "1" representing "strongly agree" and "5" indicating "strongly disagree" [41], [42]. Following this, a reliability test will be conducted.

Table 2. The evaluated criteria of QIS model

Dimension	Criteria	Definition
Time Dimension (TD)	Timeliness	The data provided is current and up to date.
	Currency	Users may obtain information anytime they require it.
	Frequency	Material is consistently provided within a specific timeframe to ensure users receive information promptly
Content Dimension (CT)	Accuracy	The available information is precise, error-free, and avoids misleading users preventing incorrect decisions
	Relevance	The information supplied is pertinent to the basic user requirements.
Form Dimension (FD)	Conciseness	The evidence is concise, solid, and presented clearly
	Clarity	Sentences that are simple and easy to grasp are used to convey information.
	Order	Information is presented in a logical sequence, enabling users to comprehend the flow of information effortlessly
	Presentation	To persuade the user to continue researching information is presented interestingly, employing captivating imagery or compelling words.

This study designed an online survey questionnaire consisting of 22 questions to assess the quality of information in the Brainly application. The questionnaire was based on the model proposed by James O'Brien and Marakas and is provided in an appendix (Table 9). Google Forms, a widely used online survey platform, was utilized to create the questionnaire.

Reliability, in this context, refers to the consistency and stability of measurements and is assessed using various methodologies, including Cronbach's alpha, which evaluates the internal consistency of research instruments. A value exceeding 0.9 indicates high reliability [43]. Accordingly, Table 3 presents the results of an assessment of the reliability of the research tools used in this study. This analysis helps the study identify any potential issues or biases in the instrument, enabling appropriate modifications or enhancements to improve the quality of data collection.

Table 3. Reliability test

α	Cronbach Alpha based on Standardized item	N of items
0.961	0.9	22

5. Data Analysis

The analysis of data in this experiment consists of two primary elements: the gathering of data and the measurement of information quality. Data collection encompasses the process of acquiring user input and interaction data, whereas Information Quality Measurement assesses the precision, pertinence, and lucidity of the information presented on the Brainly application.

5.1. Data Collection

To gather research samples, this study employed a purposive sampling technique. This technique allowed for the consideration of various factors, including individuals, herds, and regions, ensuring that the sample accurately represented the target population, which, in this case, comprises high school students from East Java.

The survey was then distributed to the target population of Senior High School/Islamic Senior High School/Vocational High School students in the East Java region via WhatsApp. This distribution method was chosen for its convenience and efficiency in collecting data. The data collection process spanned approximately one month, from March 20 to April 29, 2023, allowing participants ample time to respond and ensuring enough responses for analysis. In total, 506 participants participated in the study.

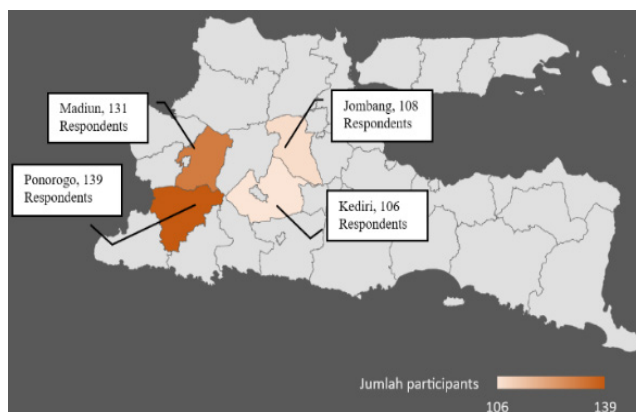


Figure 4. Mapping of spreading the participants

It is important to note that during the data collection process, discrepancies and incomplete data were identified from a substantial amount of data. Consequently, 6 participants each from the regencies of Jombang, Kediri, Madiun, and Ponorogo were excluded from the analysis due to these issues. As a result, the total number of participants used for data analysis was reduced to 484. The distribution of participants across different East Java regions is visually presented in Fig. 4, highlighting that most participants are from Ponorogo Regency (139), while Kediri Regency has relatively fewer participants (106).

To assess the acquired data, a Likert scale was employed to gauge participants' agreement or disagreement with each statement (Table 9). Subsequently, the data will be systematically organized in a spreadsheet and analyzed using statistical software (IBM SPSS version 26). This software was chosen for its capability to conduct descriptive statistics analysis, including frequencies and percentages, as recommended by [22]. These statistical measures offer an overview of the distribution of responses, providing insights into participants' perspectives on the factors under consideration [44].

In addition to the descriptive statistics, an additional step will be taken to ensure the validity and reliability of the data used in the study analysis. This involves verifying that each question in the questionnaire was appropriately administered and has been correctly conducted. Furthermore, a thorough examination will be conducted to ensure the quality of information provided by the Brainly application.

Furthermore, the validity and mediation analysis assesses the relationships between variables through the use of a Pearson correlation coefficient (r). The outcomes of this analysis will be scrutinized using a table of critical values for the Pearson product-moment correlation coefficient ($r > 0.128$, $p < 0.05$), which is considered both valid and significant [45].

Table 4. Validity test

Dimension	Pearson Correlation Coefficient (r)	p-value
TD	0.928	0.645
CT	0.971	0.645
FD	0.936	0.221

Table 4 presents the results of the research validity using bivariate correlation analysis for each dimension. The column labeled "Pearson Correlation Coefficient (r)" displays the outcomes of the analysis conducted on each dimension. These values are evaluated against the set criterion of "r" > 0.128. Consequently, all measurements have an analysis value of "r" greater than 0.128, indicating a significant positive relationship between items in each dimension. Moreover, a high "r" value signifies a strong and consistent dimensional assessment, thereby reinforcing the validity of the research conclusions. In summary, the validity study affirms the positive and reflective aspects and the reliability of the data obtained in measuring the quality of information on the Brainly application.

5.2. Measuring the Information Quality

To assess participants' understanding of the quality of the information in the Brainly application, particularly among students in the East Java region, the percentage level of understanding (PLU) will be employed [46]. This method offers a direct measure of participants' comprehension and provides a succinct summary of the level of achievement, making it easily interpretable for students and other stakeholders. The calculation of "PLU" can be performed using Equation 1 [46]:

$$PLU = \frac{Total\ Score}{Maximum\ Score} \times 100\% = \frac{F}{N} \times 100\% \tag{1}$$

The variable F corresponds to the frequency of participants, representing the number of participants falling into a specific category or response option. Meanwhile, N denotes the total number of participants included in the study.

To offer a comprehensive understanding of the criteria utilized in this analysis, Table 5 delineates the criteria and their corresponding interpretations. These criteria, rooted in the work of [46], furnish researchers with a framework to evaluate participants' overall understanding and proficiency in the topic or concept under investigation. By comparing the calculated percentage level of understanding (PLU) with these criteria, researchers can assess the extent of comprehension demonstrated by the participants.

This process aids in establishing benchmarks for interpreting the results and contributes to a comprehensive understanding of participants' comprehension of the research topic.

Table 5. Criteria of percentage level of understanding (PLU)

PLU	Category
≤ 20%	Very Low
21% ≤ x ≤ 40%	Low
41% ≤ x ≤ 60%	Moderate
61% ≤ x ≤ 80%	Good
≥ 81%	Very good

Out of 484 participants, the frequency (F) value is 355.8. The resulting percentages of TD_1 are presented below:

$$PLU = \frac{F}{N} \times 100\%$$

$$PLU = \frac{355.8}{484} \times 100\%$$

$$PLU = 74\%$$

Consequently, for TD 1, has a percentage level of 74%, signifying a good level of understanding. This indicates a high level of satisfaction and knowledge among participants regarding the quality of timely delivery of information provided by Brainly.

6. Results

The findings demonstrate that a strong level of information quality on the Brainly application has a substantial impact on user happiness, emphasizing the significance of precise, pertinent, and lucid material. Moreover, there are significant disparities in user satisfaction among various locations, indicating that geographical characteristics may impact how users perceive and appreciate the quality of content on the site.

6.1. The Effect of Information Quality on the Brainly Application

According to Table 6, a comprehensive assessment of user satisfaction with the transmission of quality information by the Brainly application is provided, classifying it into three dimensions: technical (TD), content (CT), and functional (FD). Within these dimensions, satisfaction percentages range from 76% to 78%, all falling into the "Good" category. As per the results of this research, users perceive the Brainly program as quite effective in providing accurate and dependable information.

The "Good" label underscores the positive user experience, highlighting the application's success in meeting users' expectations for high-quality content. Continuous monitoring and feedback collection remain crucial for the ongoing development and enhancement of the Brainly application to sustain and enhance user satisfaction. Further details for each dimension can be found in Fig. 5 to Fig.10.

Table 6. The satisfaction of the Brainly application in delivering quality information

Dimension	PLU	Category
TD	76%	Good
CT	76%	Good
FD	78%	Good

Referring to Fig. 5 and Fig. 6, the research instruments employed to assess the time dimension are analyzed. Fig. 5 presents the variables considered in the analysis, along with the frequency of responses for each category and the corresponding PLU values.

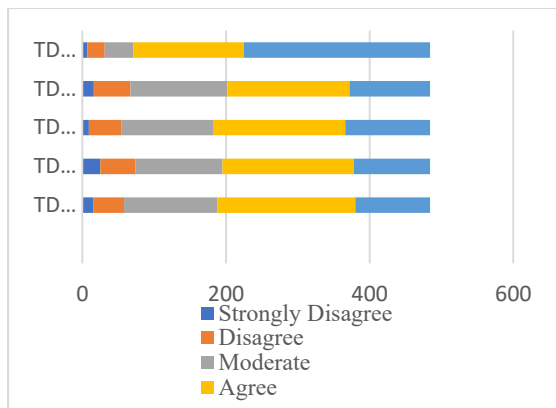


Figure 5. Likert scale analysis of TD

Upon analyzing the time dimension, it becomes apparent that most participants agreed with the statements across all five instruments. Specifically, TD_1, TD_2, TD_3, and TD_4 received the highest frequency of responses in the "agree" category, indicating a generally positive perception of the time dimension. Notably, TD_5 stood out with a significantly higher number of responses in the "strongly agree" category, with 259 participants, underscoring an especially positive perception of the time dimension.

The PLU values, ranging from 72% to 86% as depicted in Fig. 6, suggest a good to very good rating for the time dimension. This indicates a high level of satisfaction and understanding among participants regarding the quality of information provided within the time dimension. Notably, TD_5 stands out with the highest PLU value of 86%, representing an exceptionally high level of satisfaction and appreciation for the timely and relevant information offered.

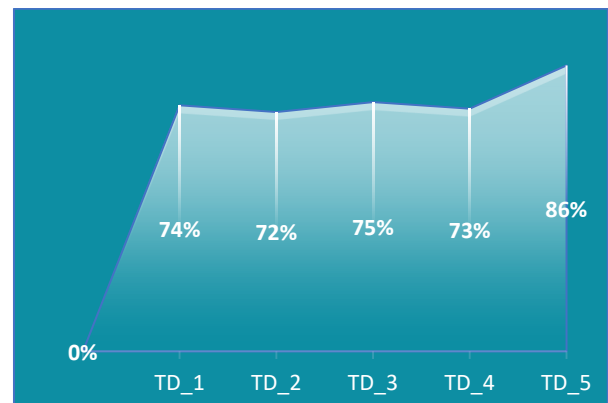


Figure 6. The effectiveness of the Brainly application in delivering quality information based on the TD

In contrast, TD_2 has the lowest PLU value of 72%, placing it in the "good" category. This suggests a slightly lower level of satisfaction compared to the other instruments in the time dimension analysis. However, overall, the findings underscore the effectiveness of the time dimension in delivering quality information and contributing to the overall excellence of the research instruments.

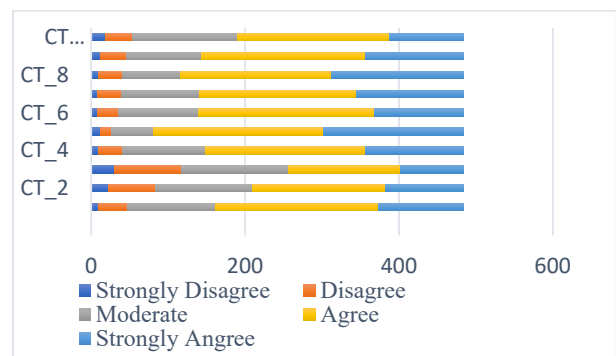


Figure 7. Likert scale analysis of CT

Similarly, Fig. 7 illustrates the outcomes of the content analysis conducted on variables CT_2 to CT_10. This analysis offers insights into participants' perceptions of the content dimension of the Brainly application. Each row in the figure represents a different instrument used to assess the content dimension, displaying the frequencies of responses for each category (strongly disagree, disagree, moderate, agree, strongly agree), along with statistical measures such as P values.

Upon analyzing the content dimension, it becomes apparent that participants generally expressed agreement or positive perceptions across all instruments. The majority of responses fell within the "agree" category, indicating that participants found the content provided by the Brainly application to be satisfactory. However, among the instruments, CT_5 stood out with a higher number of responses in the "strongly agree" category compared to others.

This suggests that participants particularly appreciated the content offered by this specific instrument, finding it highly valuable and relevant.

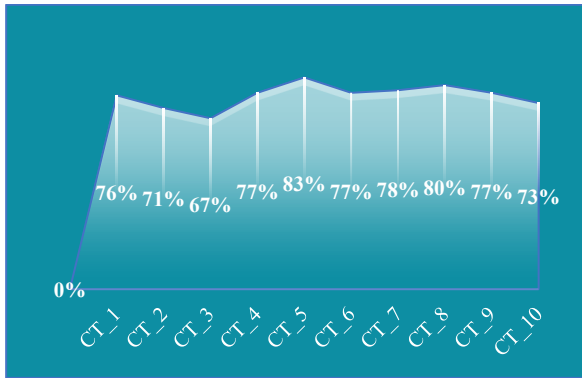


Figure 8. The content qualities in Brainly application based on the CT

Based on the analysis presented in Fig. 8, which displays the total PLU for each instrument in the content dimension (CT), it can be concluded that the overall rating for the content dimension is good. The values range from 67% to 83%, indicating a favorable perception among participants. This suggests that the content provided by the Brainly application is of high quality and relevant by the users. All instruments within the content dimension are classified as good. This classification reinforces the positive evaluation of the content dimension, implying that participants generally find the content presented in the Brainly application satisfactory, meeting their expectations and needs. These values suggest that the participants perceive the content as valuable, informative, and engaging.

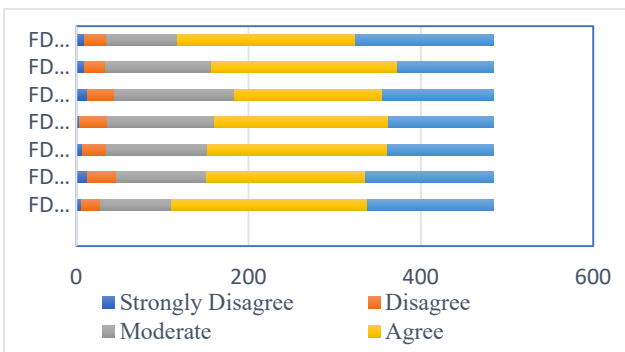


Figure 9. Likert scale analysis of FD

The form dimension is examined in Fig. 9 using the instruments FD_1 through FD_7. The form dimension describes the attributes and user interface of the Brainly application. Each row in the figure represents a distinct instrument, with the frequencies of responses for each category (strongly disagree, disagree, moderate, agree, strongly agree) and category categorization displayed.

In terms of the form dimension, most participants expressed agreement or positive perceptions across all instruments. The most frequent responses fell within the "agree" and "strongly agree" categories, indicating that participants found the characteristics and user interface of the Brainly application to be satisfactory. This suggests that users generally appreciate the design and usability of the application, finding it easy to navigate and visually appealing.

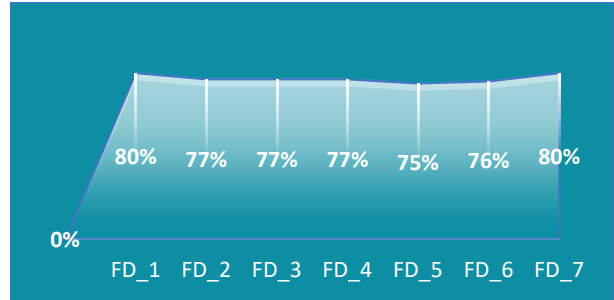


Figure 10. The qualities of the characteristics and user interface in brain application based on the FD

Based on the findings presented in Fig. 10, all instruments within the form dimension of the Brainly application are classified as "Good" based on their total PLU values, which range from 77% to 80%. This indicates a positive perception of the form dimension by the participants. The classification of all instruments in the form dimension as "Good" further emphasizes the positive evaluation of the characteristics and user interface. This consistency in the classification implies that users consistently perceive the form dimension as satisfactory across the different instruments. Meanwhile, it suggests that the characteristics and user interface of the application are well-received and considered effective in meeting users' expectations and needs.

The high PLU values in the form dimension imply that participants perceive the Brainly application's design and user interface favorably. This suggests that the application's layout, visual elements, and overall user experience are well-designed and user-friendly. The positive perception of the form dimension highlights the importance of an intuitive and visually appealing interface in enhancing the overall user experience for users of the Brainly application.

These findings underscore the significance of investing in a well-designed and user-friendly interface in application development. A positive user experience in terms of the form dimension can contribute to increased user satisfaction, engagement, and overall usage of the Brainly application. It is important to note that these findings have certain limitations.

The evaluation of the form dimension is based on self-reported data from the participants, which may be subject to individual biases and personal preferences. Additionally, the study does not provide a comparison with other similar applications or benchmarks, limiting the ability to determine the uniqueness or superiority of the Brainly application's form dimension.

6.2. User Satisfaction with Information Quality on Brainly Region Variations

Table 7 provides a comprehensive analysis of user satisfaction with the Brainly application, specifically examining the delivery of quality information across diverse regions and dimensions. Notably, in regions such as Kediri and Madiun, information quality consistently surpasses 80% across all dimensions (time dimension, content trustworthiness, and form dimension), yielding impressive average satisfaction scores of 80% and 81%, respectively. This signifies a robust and positive perception of the Brainly application's performance.

Conversely, in minority regions such as Jombang and Ponorogo, information quality scores, while still above average, exhibit comparatively lower average satisfaction scores of 69% and 75%, suggesting a somewhat subdued response to the information quality provided by the Brainly application. Despite these regional variations, all areas are rated as 'good,' underscoring the application's overall proficiency in delivering quality information.

Table 7. The satisfaction of the Brainly application among PLU dimensions in delivering quality information for each region.

Regions	TD	CT	FD	Average
Jombang	68%	69%	71%	69%
Kediri	79%	79%	82%	80%
Madiun	81%	81%	81%	81%
Ponorogo	74%	74%	76%	75%

This data underscores the application's strengths in predominant regions while highlighting potential areas for enhancement in minority regions, thereby ensuring a consistently improved user experience across diverse demographic segments.

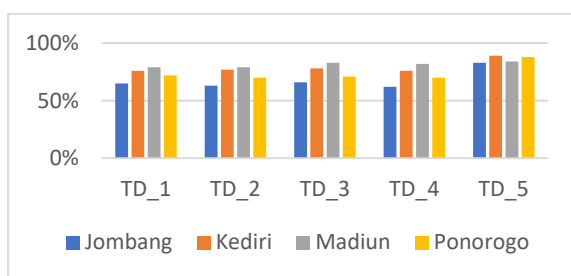


Figure 11. The satisfaction of the brainly application effectiveness in delivering quality information

Fig. 11 explains the time dimension variable of quality information based on attributes: timeliness, currency, and frequency. In the assessment of the timeliness attribute (TD_1 and TD_2), students in Madiun exhibit a notable level of understanding, recording a satisfaction rate of 79%, surpassing their counterparts in other regions. Conversely, Jombang manifests a comparatively diminished satisfaction level, ranging between 63-65%, indicative of nuanced perceptions regarding the application's punctuality.

Further scrutiny of the currency attribute (TD_3) reveals a consistent outperformance by Madiun's students, registering an impressive 83% satisfaction level, particularly surpassing Jombang and Ponorogo. Moreover, the analysis of the frequency attribute (TD_4 and TD_5) highlights Madiun's prominence, underscoring their higher satisfaction levels in comparison to other regions. It is noteworthy that the majority of regions exhibit commendable levels of understanding, exceeding 81% satisfaction.

Overall, the time dimension variable result reveals that most students from the Madiun region have higher satisfaction and a very good level of understanding, especially for the currency and frequency attributes. While using the Brainly application in other regions such as Jombang, Kediri, and Ponorogo, the majority have a good percentage level of understanding.

Table 8 provides a detailed analysis of the outcomes derived from an extensive examination of the content dimension variable, categorizing qualities into accuracy, relevance, completeness, and conciseness. Notably, students in Madiun expressed heightened satisfaction with the information correctness of the Brainly application, specifically excelling in the accuracy attributes (CT 1, CT 2, and CT 3), which investigate the precision of information on Brainly. In contrast, Jombang recorded comparatively lower satisfaction in the knowledge correctness domain, resulting in a moderate understanding level of 54%, notably lower than other regions.

Table 8. The satisfaction of content qualities on Brainly applications

Dimension	Jombang	Kediri	Madiun	Ponorogo
CT_1	67%	80%	81%	73%
CT_2	61%	76%	79%	67%
CT_3	54%	71%	80%	61%
CT_4	71%	80%	82%	75%
CT_5	80%	85%	81%	84%
CT_6	70%	81%	80%	77%
CT_7	71%	81%	81%	77%
CT_8	76%	83%	82%	80%
CT_9	68%	80%	81%	78%
CT_10	68%	73%	80%	71%

Shifting focus to the relevance characteristic (CT 4, CT 5, and CT 6), which assesses the pertinence of knowledge sought by students, both Kediri and Madiun students reported elevated satisfaction. However, Kediri's students demonstrated a very good level of understanding at 85%, distinguishing it as a region with high satisfaction in the completeness qualities (CT 6 and CT 7), which interrogate the thoroughness of information, registering an understanding level of 81%. Conversely, Madiun exhibited superior satisfaction and understanding compared to Jombang when evaluating the conciseness of the content in Brainly through CT 8, CT 9, and CT 10 surveys.

In summary, the results derived from the content dimension variables reveal that the majority of students from Kediri exhibit heightened satisfaction while utilizing the Brainly application, surpassing their counterparts in other regions.

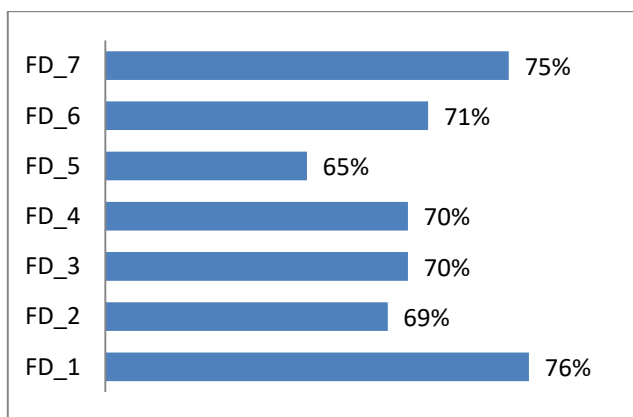


Figure 12. The satisfaction of the characteristics and user interface of Brainly application qualities

In assessing user satisfaction, five distinct form-related criteria were considered, including clarity, information, order, presentation, and media (Fig. 12). Upon reviewing the clarity attribute, Kediri exhibited higher satisfaction compared to other regions. Specifically, the clarity characteristic questioned the user-friendliness and potential for confusion in FD 1 and FD 2. Notably, Jombang students expressed lower satisfaction with the clarity of the Brainly application compared to their counterparts. Conversely, Kediri and Madiun demonstrated a very good level of understanding, ranging from 81-83%, indicating a high level of satisfaction and comprehension.

Analysis of the applications assessing information detail and comprehensiveness in FD 3 and FD 4 yielded mixed results. Jombang lagged with a satisfaction and understanding level of around 70%, while Kediri and Madiun surpassed 81%. Similarly, the assessment of the arrangement of information in FD_5 and FD_6 indicated higher satisfaction levels for Kediri and Madiun students compared to Jombang.

When examining the understanding level between Madiun and Kediri, Kediri emerged with a very good level of understanding. Furthermore, the evaluation of the presentation attribute in FD_7, probing the presentation of information in the Brainly application, revealed that Kediri students exhibited higher satisfaction and understanding levels compared to their counterparts.

In summary, the variables derived from the dimensions suggest that most students from the Kediri and Madiun regions found greater satisfaction when using the Brainly program compared to others, particularly Jombang.

The analysis depicted in Fig. 13 indicates that most students from Ponorogo and Madiun consistently report higher overall satisfaction scores than those from Kediri and Jombang. However, when considering the mean results dominated by Kediri and Madiun, it is evident that Madiun consistently holds the highest results overall, while Jombang consistently records the lowest. This suggests that, for the Jombang region, students' satisfaction with the Brainly application consistently remains at the lowest level, indicating that the application may not meet their needs and requirements, leading to a lack of sustained interest in its long-term usage.

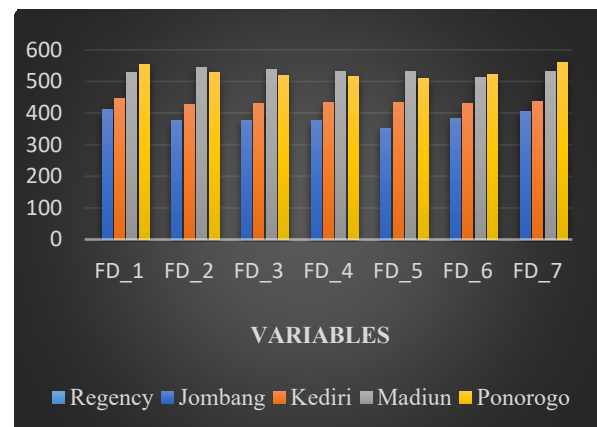


Figure 13. Total values based on the FD

On the other hand, students in Kediri and Madiun consistently express high levels of satisfaction when using the Brainly application. This implies that the Brainly application provides them with a comfortable and reliable tool for obtaining information, fostering a positive perception that encourages long-term usage.

7. Discussion

In this study, the QIS model was employed to assess the impact of information quality in the Brainly application, an e-learning platform, on user satisfaction among 484 high school students across four regions.

The quantitative analysis revealed that user satisfaction serves as a significant predictor of information quality in the Brainly application, suggesting its utility in evaluating information quality variance.

The study identified that a majority of students expressed satisfaction with the information quality for their learning process, considering four dimensions of implication. Notably, students emphasized the importance of accurate and reliable information in enhancing their understanding of content and overall academic performance [47]. This underscores the influence of e-learning systems on the learning process, particularly through the perceived usefulness of information quality.

Addressing the second research question on students' satisfaction regarding information quality in Brainly, the findings indicated a high level of satisfaction, particularly with the reliability and accuracy of the provided information. This positive experience was linked to improved comprehension and decision-making skills among students. While previous research often focused on evaluating e-learning technology without delving into user satisfaction based on information quality, this study emphasizes the significance of considering both aspects. It highlights that evaluating user satisfaction is crucial in understanding the quality of e-learning beyond technological assessments.

However, the study also suggests that the Brainly application needs improvement in information quality to ensure a positive impact on learning behavior and encourage long-term usage. High-quality information is seen as a key factor influencing positive learning outcomes. These findings underscore the importance of prioritizing information quality by educators and instructional designers when developing e-learning applications.

In conclusion, the research findings underscore the significant impact of information quality on students' learning experiences in online courses. High-quality information distribution is linked to improved comprehension, critical thinking, and decision-making abilities, ultimately enhancing learning outcomes. To ensure effective and successful online learning experiences, prioritizing information quality should be a central focus in the planning and delivery of online education.

8. Conclusion

This study focused on evaluating the time and form dimensions of the Brainly application. The examination of the time dimension revealed that most participants agreed with the statements, signifying that the application consistently delivers timely and relevant information.

Notably, TD_5 received a notably high number of responses in the "strongly agree" category, emphasizing the favourable perception of the time dimension. Concerning the form dimension, the study found that participants generally expressed agreement and positive perceptions regarding the attributes and user interface of the Brainly application. The predominant responses fell within the "agree" and "strongly agree" categories, indicating satisfaction with the design and usability of the application. The information quality values for all instruments in the form dimension further corroborate the positive perception of the application's form.

This study provides valuable insights into users' perceptions of the Brainly application, specifically regarding the time and form dimensions. The results underscore the application's effectiveness in delivering timely information and its positive impact on user satisfaction with its form. These findings contribute to a deeper understanding of users' experiences and offer guidance for potential enhancements to enrich the overall user experience of the Brainly application.

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Appendix

Table 9. Questionnaire of the quality of the information in the Brainly application

No.	Codes	Questioner
1	TD 1	The information available on the Brainly Application is timely in delivering information to users
2	TD 2	The information displayed on the Brainly App is always available to the user
3	TD 3	The information displayed on the Brainly Application has an updated level of information
4	TD 4	The information displayed on the Brainly application has a regular content update rate
5	TD 5	The Brainly application can be used by users at any time
6	CT 1	The information displayed on the Brainly application has clarity
7	CT 2	The Brainly application has a level of responsibility for the information displayed
8	CT 3	The Brainly application has a small error probability
9	CT 4	The information displayed on the Brainly application is by the user's needs
10	CT 5	The information displayed on the Brainly application has benefits for users
11	CT 6	Information on the Brainly application has a lot of content with answers to specific topics
12	CT 7	The Brainly application always provides complete information for users
13	CT 8	The Brainly application always makes it easy for users to find complete information
14	CT 9	The information displayed on the Brainly application is always packaged in a concise manner
15	CT_10	The information displayed on the Brainly application always uses language that is easy for users to understand
16	FD 1	The Brainly application is a user-friendly application
17	FD 2	The information displayed on the Brainly application does not confuse users
18	FD_3	The information in the Brainly application tends to be comprehensive (according to the order needed)
19	FD 4	The Brainly application provides comprehensive information to meet user needs
20	FD 5	The Brainly application always provides a systematic presentation of information
21	FD 6	The Brainly application always provides appropriate information content with a clear structure
22	FD_7	The information displayed on the Brainly application is delivered with interesting information content

Table 10. The satisfaction of the Brainly application effectiveness in delivering quality information for each region.

Region		TD_1	TD_2	TD_3	TD_4	TD_5
Jombang	Mean	3.27	3.13	3.30	3.10	4.17
	r	0.56	0.69	0.65	0.7	0.46
	p	0.07	0.01	0.11	0.0	0.0
	PLU	65%	63%	66%	62%	83%
Kediri	Mean	3.80	3.86	3.92	3.79	4.46
	r	0.71	0.73	0.74	0.79	0.67
	p	0.13	0.32	0.5	0.07	0.0
	PLU	76%	77%	78%	76%	89%
Madiun	Mean	3.97	3.95	4.14	4.11	4.19
	r	0.86	0.87	0.79	0.83	0.8
	p	0.46	0.39	0.42	0.58	0.18
	PLU	79%	79%	83%	82%	84%
Ponorogo	Mean	3.62	3.48	3.56	3.50	4.42
	r	0.77	0.63	0.71	0.75	0.55
	p	0.17	0.01	0.07	0.01	0.00
	PLU	72%	70%	71%	70%	88%

Table 11. The satisfaction of brainly application content qualities for each region

Dimension	Jombang				Kediri				Madiun				Ponorogo			
	Mean	r	p	PLU	Mean	r	p	PLU	Mean	r	p	PLU	Mean	r	p	PLU
CT_1	3.37	0.77	0.43	67%	3.98	0.75	0.86	80%	4.07	0.82	0.18	81%	3.66	0.8	0.36	73%
CT_2	3.07	0.71	0.0	61%	3.78	0.68	0.07	76%	3.97	0.77	0.46	79%	3.37	0.76	0.0	67%
CT_3	2.68	0.43	0.0	54%	3.56	0.57	0.0	71%	4.00	0.81	0.66	80%	3.06	0.47	0.0	61%
CT_4	3.53	0.71	0.51	71%	4.02	0.78	0.87	80%	4.10	0.8	0.67	82%	3.75	0.78	0.99	75%
CT_5	4.00	0.71	0.0	80%	4.25	0.78	0.02	85%	4.06	0.82	0.93	81%	4.20	0.74	0.0	84%
CT_6	3.48	0.69	0.88	70%	4.07	0.82	0.15	81%	4.01	0.8	0.7	80%	3.86	0.73	0.18	77%
CT_7	3.57	0.74	0.23	71%	4.07	0.76	0.59	81%	4.07	0.83	0.88	81%	3.86	0.68	0.21	77%
CT_8	3.81	0.7	0.0	76%	4.16	0.82	0.15	83%	4.08	0.89	0.78	82%	4.00	0.69	0.21	80%
CT_9	3.40	0.69	0.59	68%	4.00	0.75	0.99	80%	4.04	0.84	0.91	81%	3.90	0.69	0.09	78%
CT_10	3.40	0.46	0.63	68%	3.64	0.57	0.0	73%	4.02	0.84	0.8	80%	3.53	0.3	0.02	71%

Table 12. The satisfaction of brainly application qualities of the characteristics and user interface for each region.

Region		FD 1	FD 2	FD 3	FD 4	FD 5	FD 6	FD 7
Jombang	Mean	3.80	3.47	3.50	3.48	3.26	3.54	3.75
	r	0.71	0.62	0.7	0.71	0.7	0.72	0.64
	p	0.0	0.9	0.66	0.81	0.07	0.5	0.01
	PLU	76%	69%	70%	70%	65%	71%	75%
Kediri	Mean	4.20	4.04	4.07	4.08	4.08	4.07	4.13
	r	0.69	0.77	0.75	0.82	0.8	0.78	0.6
	p	0.07	0.75	0.53	0.45	0.49	0.53	0.22
	PLU	84%	81%	81%	82%	82%	81%	83%
Madiun	Mean	4.03	4.15	4.10	4.05	4.05	3.91	4.06
	r	0.78	0.82	0.87	0.82	0.86	0.84	0.87
	p	0.85	0.41	0.67	0.98	0.96	0.22	0.93
	PLU	81%	83%	82%	81%	81%	78%	81%
Ponorogo	Mean	3.99	3.79	3.73	3.71	3.66	3.76	4.02
	r	0.57	0.64	0.77	0.79	0.76	0.77	0.69
	p	0.0	0.64	0.89	0.69	0.34	0.86	0.0
	PLU	80%	76%	75%	74%	73%	75%	80%