

Integrated Waste Bank Application for Zero Waste Program

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Abstract

The Sorong Raya Waste Bank was established in 2014 and has collaborated with the government, the public community, and the private sector (as collectors) in the environmental conservation program. The waste bank accepts organic and inorganic types of waste by applying the 3R model (reduce, reuse, recycle). The expected outcome of implementing the waste bank program is providing added economic value to waste. This program also realizes the concept of implementing people's public economy straightforwardly. This research utilizes the Webqual 4.0 methodology to analyze the website quality instrument based on user satisfaction. The results of the analysis of the waste bank management information system website are the relationship between Usability Quality (UQ) and User Satisfaction, which has a sig value of $0.034 < 0.05$, which means that the two variables have a significant relationship. Next is the relationship between Information Quality (IQ) and User Satisfaction with a sig value of $0.836 > 0.05$ which is stated to have an insignificant relationship. Furthermore, Service Interaction Quality (SQ) with User Satisfaction value of sig $0.004 < 0.05$ means that it has a significant relationship. Meanwhile, Visual Quality (VQ) with User Satisfaction with a sig value of $0.150 > 0.05$ means that there is no significant relationship. For instruments that do not have a significant relationship with user satisfaction because the information displayed is not easy to understand, the layout for presenting information must also be appropriate so that it is manageable by users. The report font size must be adjusted on the website display so users can read the data efficiently, and the colors used must also correspond with the company logo.

Index Terms: zero waste, webqual, management information System, website quality, public service

I. Introduction

Indonesia produces 64 million tons of waste annually and is the world's second-largest plastic waste producer [1]. Plastic pollution is a much-needed problem that requires urgent action involving stakeholders at all levels [2]. Most of the waste ends up in landfill sites other than is recycled. The level of landfills has increased with the rapid population and economic growth around the world, especially in tourism cities [3]. This activity can cause water, soil, and air pollution and accelerate global warming [4]. The waste problem is not only the government's responsibility but also requires cooperation from all elements of society.

In early 2018 the Ministry of Environment and Forestry (KLHK) researched and evaluated the most polluted cities in Indonesia [5]. Several assessment indicators are cleanliness facilities establishment and waste processing procedures, which are relatively outdated. According to assessment results, Sorong City is one of the most polluted cities. This problem forms the basis for implementing a zero-waste program in Sorong City. The concept of zero waste management has emerged as an innovative way to solve the waste problem [6][7]. Zero Waste City (ZWC) is an urban development model to reduce production and

increase solid waste recycling, to reduce environmental impact [8][9]. The concept of zero waste has been embraced by policy makers because it stimulates sustainable production and consumption, optimal recycling, and resource recovery [10]. Based on the evaluation results, a Bank Sampah Sorong Raya (BSSR) program was established. So far, BSSR is a good program for the community, but the fact is that it has not been capable of solving the waste issue in Sorong City comprehensively. This occurrence occurs because of several concerns, i.e.:

1. BSSR uses conventional methods for operational and business activities, resulting in data disintegration and insufficient reporting.
2. Disbursement of customer funds is carried out every two months, which inconveniences customers.
3. Price changes of the waste from the processing plant can be done at any time. This change causes loss for the waste bank.
4. Difficulty in finding the garbage fleet exceeding the specified schedule.
5. Most people do not know the economic value of waste.
6. Lack of temporary disposal sites scattered around the residential neighborhood causes high piles of garbage in Sorong City.
7. Organic waste only ends in Tempat Pembuangan Akhir (TPA).

This study aims to

1. Increase performance effectiveness and business growth of waste banks.
2. Increase public awareness and revenue through the waste bank program.
3. Facilitate BSSR in providing full service to customers and the community.
4. Integrating administration of external and internal activities of the waste bank into one unified system.

Based on the problems and objectives described, the suggested innovations presented to the integrated waste management site, namely BSSR, are in the form of:

1. Transforming conventional systems into digital systems. The digital system in the internal BSSR is a Management Information System (MIS), which assembles and manages all data from various divisions and levels of the company to produce quality reports. Where this dramatically affects proper decision-making. This MIS will also accelerate data synchronization and minimize data manipulation and errors. Information systems have great potential to minimize waste [11].
2. The digital system for external BSSR can be used by the Bank Sampah Unit (BSU) as same as customers or the general public. This system will introduce new features, Payment Point Online Bank (PPOB), Education, and Ojek Sampah (OS). This application runs on android mobile, where users can see waste savings converted into Rupiah (Rp.) currency. Calculate savings through a waste calculator, and use PPOB services such as purchasing credit, data packages credit, electricity payments, Perusahaan Daerah Air Minum (PDAM), and Badan Penyelenggara Jaminan Sosial Kesehatan (BPJS). Ojek Sampah is a scheduled or one-time garbage pick-up service that makes it more manageable for people to find garbage pick-up services. The educational feature is helpful so that the community always follows the latest programs and information from BSSR. While investment in technology and solutions is critical, the components of waste management, valorization and treatment require concerted efforts to improve operational management of industrial waste through effective decision support towards a circular economy [12].

II. Materials and Methods

A. State of The Art

Klahang Sokaraja village has developed a management information system as a solution for waste banks in waste management. Based on Android Operating System (OS) helps manage waste-collected data, user data, and daily transactions, which collects and receives waste more quickly and accurately. Application users can also view information related to waste bank activities. In addition, we can see user receipts and payments briefly [13].

Jeruk Manis Waste Bank manages savings data with the BASAMPA Application. The concept of saving waste in the application is by converting waste into the form of a predetermined price. The BASAMPA application is a management information system that assists officers in managing savings and customer data quickly and makes it easier for customers to see each of their respective savings [14].

Paguyangan Village Hall developed a website based Sistem Informasi Bank Sampah (SIBS) to address problems in data management at the Waste Bank, such as recording savings transactions. The SIBS application was created to make it easier for officers and customers to get the service process at the Waste Bank. The results of testing the SIBS application with black box testing and Mean Opinion Score (MOS) explain that the management information system at the waste bank is running well according to the needs of officers and customers [15].

The website-based Garbage Bank E-Market Place information system can accommodate the transaction process between the Main Waste Bank and collectors. The waste bank information system expands the interaction between waste banks and collectors because the system can be accessed anywhere and anytime. An added benefit for collectors is that collectors can easily compare waste and the prices various waste banks offer [16].

The waste bank information system is designed by emphasizing the aspect of user convenience because an integrated application assists it. Another purpose of making a waste bank information system is to simplify operations, control efficiency, and minimize complaints about inconsistencies in the data reconciliation between customers and officers. The waste bank information system is expected to significantly improve the operational practices of the eHa Waste Bank in Batu City [17].

Management Information Systems (MIS) have been widely implemented in Waste Banks spread in various cities in Indonesia. An integrated management information system has been proven to help manage operational and business processes at the Waste Bank. MIS is beneficial because it speeds up and minimizes errors in data recording and can present higher-quality reports. They are providing faster service to the community.

Bank Sampah Sorong Raya (BSSR) has implemented an integrated information system between each division and level of the company. All data is centrally managed so that data is recorded neatly and in detail. The benefit of centralized data is quality reports, which are very influential on decision-making from stakeholders in maintaining the growth of BSSR. In addition to managing waste bank internal data, BSSR also prepares an external system for customers and the public.

The application for external waste banks is in the form of a mobile banking application where use is almost similar to mobile banking in a general banking application. Where in the application, the customer can see the balance using a waste calculator to make it easier for customers to calculate the waste savings that can be obtained. The PPOB (Payment Point Online Bank) feature is also available in the waste mobile banking application. Customers can make BPJS payments, purchase credit, data packages, and electricity and water supply payments with the available balance. The waste mobile banking application also has an educational feature so that the public can continue to update information regarding waste, its economic value, environmental hazard, and the long-term impact of the incorrect way of managing waste.

Integrating external and internal systems is advantageous because the number of BSSR customers has reached thousands. With centralized data, it is straightforward to carry out business processes, operations, and customer services. The community's economy in Sorong City, West Papua, can also be helped if they join the existing program in the BSSR. Sorong, as the entrance to the Papua and West Papua regions, will also become a pilot city because the people are aware of waste management in cooperation with the Sorong Raya Waste Bank.

B. Webqual

This study uses quantitative methods. The quantitative method is conducting surveys to obtain data from the past or present to test several hypotheses [18]. Primary data in this study was obtained by surveying by distributing questionnaires. The respondents are users of the management information system website for the internal Sorong Raya Waste Bank. This study measures the quality of BSSR's internal website from user perceptions. The measurement will use four instruments from the Webqual 4.0 method. Webqual is a method implemented for measuring the quality of a website based on the perception of end users [19]. The webqual method uses three variables to measure the quality of a website: usability, information, and service quality.

Table 1. *Research Instruments with Webqual*

Type	Category	Indicator
A	Usability Quality	1. The operating procedure is comfortable to understand for the user;
		2. Users are easy to interact with the website;
		3. User-friendly navigation operation;
		4. Ease of use of website operating by users;
		5. Website appearance is user-friendly and attractive;
		6. Design of the website already suitable for the type of website;
		7. The website represents competence;
		8. The website provides a positive experience for users.
B	Information Quality	9. The resulting information is accurate
		10. The resulting information can be trusted
		11. Provide timely information
		12. Provide relevant information
		13. Ease of information understanding
		14. The presented information is precise and detailed
		15. Precise information presentation layout
C	Service Interaction Quality	16. Excellent website reputation
		17. Secure user's sense in storing transaction data
		18. Website interaction feasibility in information distribution within divisions and groups.
D	Visual Quality	19. The website uses the appropriate font.
		20. The website uses attractive colors and styles according to the company's background.

Table 1 is the Webqual 4.0 instrument used in this study. Four instruments are used to measure the quality of BSSR's internal website. Instruments of perception of usability quality, information quality, service interaction quality, and visual quality. In total, there are four instruments which are then translated into 20 assessment indicators. The indicators

will be disseminated into a questionnaire to measure the quality of the BSSR internal management information system website

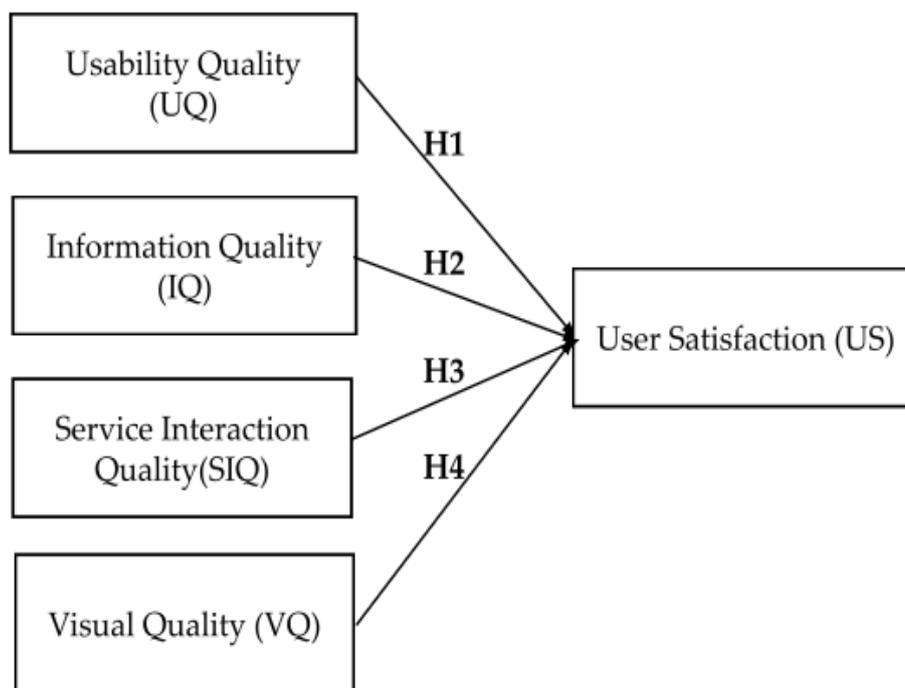


Figure 1. *Research framework*

Figure 1 is the researcher's framework for testing the hypothesis. There are four hypotheses to be tested, as follows:

- H1 is Usability Quality, which significantly influences User Satisfaction.
- H2 is Information Quality which has a significant influence significant to User Satisfaction.
- H3 is Service Interaction Quality) has an influence that is significant to User Satisfaction.
- H4 is Visual Quality which has a significant effect on User Satisfaction.

The research methodology will begin with formulating the problem by interviewing the resource person, the Bank Sampah Sorong Raya Chair (BSSR) foundation and the database section officer to obtain secondary data from the BSSR. Determination of variables by conducting a literature study to find supporting theories, research methods, and research variables used as the basis for making questionnaires. The questionnaires that have been made will be distributed to respondents, whose results will then be summarized and processed with SPSS software to test validity, reliability, and linear regression method. Based on the linear regression test results, an analysis of the relationship between variables will be carried out. Hypothesis testing is the final step to conclude and recommend research results.

III. Result

The population of this study is the internal employees of the Bank Sampah Sorong Raya (BSSR), totaling 25 people and retaining knowledge using the Waste Bank Management Information System. The respondent's characteristics in this study were 40% male and 60% female. Moreover, 80% are under 30 years old for the age parameter, while 20% are over 30 years old. Questionnaires are made using closed questions so that respondents can quickly answer them. The researcher makes the answer choices available on the questionnaire, and the data will be quickly analyzed statistically. Questions are made on a 5-point Likert scale. Scale 1 is "strongly disagree", scale 2 is "disagree", scale 3 is "undecided", scale 4 is "agree", scale 5 is "strongly agree".

3.1. Validity tests

Validity tests are widely used to measure or detect responses during testing [20]. The reliability of a product is also an aspect of validity [21]. The validity value is considered convergent by looking at the Average Variance Extracted (AVE) value of each construct above 0.5 so that it is considered that there is no convergent validity problem in the data being tested [22]. Questionnaire items can be valid if the "r" calculation value or Pearson Correlation is more significant than the "r table" [19]. The "r" value from the table with 25 respondents and a significant level of 0.0500 is 0.3961. The following is the data from the validity test results.

3.2. Reliability Tests

The reliability test was conducted to determine the measurement accuracy's validity [23] in the reliability test using the theoretical basis by comparing Cronbach's Alpha with a critical value of 0.6 [24]. Processing of waste to zero waste uses a scale and includes pre-testing and giving surveys and reducing the number of items by factoring. Tests will be conducted using IBM SPSS, where SPSS is used for confirmatory and expository factor analysis [25]. The following table 3 shows the data from the reliability test results.

Table 2. Validity Test Result

Number	Indicator	Pearson Correlation	r table value	Description
1	UQ1	0.4000	0.3961	Valid
2	UQ2	0.4210	0.3961	Valid
3	UQ3	0.7040	0.3961	Valid
4	UQ4	0.4430	0.3961	Valid
5	UQ5	0.6850	0.3961	Valid
6	UQ6	0.4390	0.3961	Valid
7	UQ7	0.6690	0.3961	Valid
8	UQ8	0.7060	0.3961	Valid
9	IQ9	0.4950	0.3961	Valid
10	IQ10	0.7890	0.3961	Valid
11	IQ11	0.6450	0.3961	Valid
12	IQ12	0.6500	0.3961	Valid
13	IQ13	0.7760	0.3961	Valid
14	IQ14	0.5330	0.3961	Valid
15	IQ15	0.5600	0.3961	Valid
16	SQ16	0.6240	0.3961	Valid
17	SQ17	0.8990	0.3961	Valid
18	SQ18	0.8000	0.3961	Valid
19	VQ19	0.8110	0.3961	Valid
20	VQ20	0.8850	0.3961	Valid

Based on table 2, after running validity testing with SPSS tools, the 20 question indicators were declared valid because the Pearson Correlation or r count values were all greater than the r table.

Table 3. Reliability Test Results

Number	Indicator	Cronbach's Alpha	Critical value	Description
1	UQ	0.6910	0.6000	Reliable
2	IQ	0.7610	0.6000	Reliable
3	SQ	0.6810	0.6000	Reliable
4	VQ	0.6060	0.6000	Reliable

Based on Table 3, the results of the reliability test state four indicators. Namely, Usability Quality (UQ), Information Quality (IQ), Service Interaction Quality (SQ), and Visual Quality (VQ) are declared reliable because they meet Cronbach's Alpha requirements more significant than the critical value.

3.3. Descriptive Analysis

Descriptive analysis is applied to analyze data by describing the collected data without intending to make conclusions that apply to the public or generalizations [26]. The standard deviation is the square root value of a variance used to assess the mean or expected. The standard deviation value is used to determine the data distribution in a sample and see how close the data is to the mean [27]. The following are the results of analyzing indicators or instruments on the waste bank management information system.

Table 4. *Descriptif Analysis Results*

Number	Indicator	Mean	Standard deviation
1	UQ	2.9620	0.7253
2	IQ	4.2584	0.4506
3	SQ	4.2396	0.6204
4	VQ	4.0600	0.6506

Based on table 4, the results of the descriptive analysis show four research indicators, namely Usability Quality (UQ), Information Quality (IQ), Service Interaction Quality (SQ), and Visual Quality (VQ). These variables analysis has an average value within the interval $2.8 \leq x \leq 4.3$ which indicates that the average respondent agrees with the statements contained in the IQ, SQ, and VQ variables. Meanwhile, the average UQ indicator of respondents disagrees results. The standard deviation of all variables has a value lower than the mean value.

3.4. Linear Regression Test Analysis

Linear regression analysis is a regression method that can be used as a statistical inference tool to determine the effect of an independent variable on the dependent variable [28]. The significance value of the T-test > 0.05 , meaning there is no influence between the independent variables on the dependent variable. If the significance value of the T-test < 0.05 , there is an influence between the independent variables on the dependent variable [29].

Table 5. *Linier Regression Test Results*

Number	Variables	Regression coefficient	T-count	T-table	Significancy
1	UQ	0.2900	2.9620	2.0796	0.0340
2	IQ	0.0510	4.2584	2.0796	0.8360
3	SQ	0.5290	4.2396	2.0796	0.0040
4	VQ	0.2520	4.0600	2.0796	0.1500

Table 5 shows the linear regression test results that the relationship between Usability Quality (UQ) and User Satisfaction has a T-count = 2.282 and sig 0.034 < 0.05 , which means that the two variables have a significant relationship. Next is the relationship between Information Quality (IQ) with User Satisfaction with a value of T-count = 0.209 and sig 0.836 > 0.05 , which is stated to have an insignificant relationship. Furthermore, Service Interaction Quality (SIQ) with User Satisfaction with a value of T-count = 3.249 and sig 0.004 < 0.05 , meaning that it has a significant relationship. While Visual Quality (VQ) with User Satisfaction with a value of T-count = 1.495 and sig 0.150 > 0.05 , there is no significant relationship.

IV. Discussion

Use In this study, in measuring the quality of the waste bank management information system based on user perception (user satisfaction), using the Webqual 4.0 method involving four instruments, namely Usability Quality (UQ), Information Quality (IQ), Service Interaction Quality (SQ) and Visual Quality (SQ). VQ). The following are the results of our research:

1. Usability Quality, Service Interaction Quality is significantly related to User Satisfaction with the website waste bank management information system. At the same time,

- Information Quality and Visual Quality do not significantly relate to user satisfaction.
2. Information quality and Visual Quality need to be a concern for management so that they become a top priority for improvement and improvement. Some things that need to be improved are that the information displayed must be easy to understand, and the format for presenting the information must also be correct so that it is easy for users to manage. On the website display, the font size on the report must be adjusted so that it is easy for users to read the data, and the colors used must also match the company logo.
 3. Overall, the waste bank management information system needs to be improved and further developed, especially the quality of Information Quality and Visual Quality services because of several things, namely the information displayed is not easily accessible and the format for presenting information is not in accordance with the wishes of the user. On the website, the font size on the report must be adjusted so that it is easy for users to read the data, as well as the colors used must also match the company logo.

Conclusion

This study found that several attributes require improvement related to website design, presentation of detailed and up-to-date information, and navigation on the website. Improving the presentation of information and the website's appearance can be the main focus of improvement because a good, attractive, and communicative display will undoubtedly make it easier for users. In addition to a good appearance, it must be supported by presenting detailed, informative, and up-to-date information.

The results of this study are expected to be used as material for evaluating the development of a waste bank management information system website to meet user expectations. There is a need for further research with different methods so that it can be seen which indicators are influential and not influential so that it can be explicitly known which indicators the main priority are to be followed up immediately in website development.

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