Implementation of EDS Monitoring System with Key Performance Indicators (KPI) Website

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Abstract— **The purpose of the study is providing a description and explanation of Key Performance Indicators (KPI) website for monitoring application. It starts from reading data according to sensor sections and next to show the results in the form of graphics. It can be accessed by the internet. Rapid technological developments are indirectly forcing research interests to adapt to respond to various things in analytics, including how the user can implement monitoring and evaluation strategies using technology such as KPI website. KPI website is an example of the implementation of a digital performance index monitoring which is done on Environmental Detector System (EDS) Application. The EDS can remotely detect and monitor the environmental parameters such as carbon dioxide (CO_2) levels, noise levels, light intensity, air temperature, relative humidity, and dust particle density in real-time via the internet. This study highlights the microthings as the KPI website in measuring the environmental parameters. Microthings can affect accurate of displaying data. The study was conducted with objective of providing an efficient perspective in measuring the performance of the EDS through a statistical analysis. Next, the result was analyzed of performance in speed and accuracy. Speed of page loading is fast because the information collected input in text format, specifically the capacity in bytes. Based on loading processing of visual graphics and analysis, the page weight is measured in kilobytes.**

Keywords— **KPI; performance analysis; speed; capacity, accuracy.**

I. INTRODUCTION

It is now inconceivable that a world could exist without the Internet. The Internet is facilitating connections between billions of people across the globe [1], [2]. It has the potential to become a cornerstone of the contemporary information society [3], [4]. Asia will have the most significant number of online users, exceeding 2.8 billion [5]. The ease of web-based internet access and mobile phones is growing rapidly [6]. Key Performance Indicators (KPI) are measures that evaluate how the data is executing its strategic vision [7], [8]. The term "strategic vision" refers to the way an interactive strategy is integrated into the overall plan. It is of paramount importance that the data used in the strategy aligns with the strategy's representation and the interpretation of its variations.

To ascertain the optimal and suboptimal performance of the system, it is essential to implement a performance measurement strategy [9]. The assessment of performance is a crucial undertaking, as the outcomes of such evaluations inform decision-making and influence managerial policies

[10]. The results of performance measurement also furnish information regarding the system's performance or achievements [11].

The KPI website application is done based on a mobile application [12], [13]. It can help the managerial level to monitor through applications from smartphones or laptops [14]. The purpose of this dashboard is to provide a complete picture, including graphics and description specifications based on KPI monitoring. It starts from the input of data according to each data section until the display of the results in the form of a chart, and it can be accessed from mobile platforms and a website [15].

Recent technological advancements have empowered users to monitor the Environment Detector System (EDS) Application comprehensively. This innovative application is designed to heighten awareness of pollution levels across the campus. Politeknik Negeri Medan, a distinguished professional institution, takes responsibility for addressing pressing environmental issues within its community. The primary goal of the EDS is to bolster initiatives that promote

sustainable development, foster continued research, enhance campus greening efforts, and create a positive social impact within society. By prioritizing these objectives, the EDS not only contributes to a healthier campus environment but also encourages collective responsibility among students and staff for the planet's future.

The EDS is capable of remotely detecting and monitoring environmental parameters, including carbon dioxide (CO_2) levels, noise levels, light strength, air temperature, relative humidity, and dust particle density in real-time via the Internet. The application's innovative feature is the incorporation of a KPI widget for users of laptops and smartphones. The utility of the dashboard extends beyond business activities; it can also be employed in monitoring

activities due to its intrinsic interactive, reliable, real-time, and analytical-scientific characteristics [16], [17], [18], [19].

II. MATERIALS AND METHODS

An EDS monitoring system is comprised of 5 (five) principal blocks, such as sensor blocks, IoT gateway blocks, connectivity blocks, cloud server blocks, and application blocks. An EDS diagram block was designed by the specifications outlined in Fig. 1. The novel aspect of the application block is the incorporation of a KPI (Key Performance Indicators) website for users of laptops and smartphones.
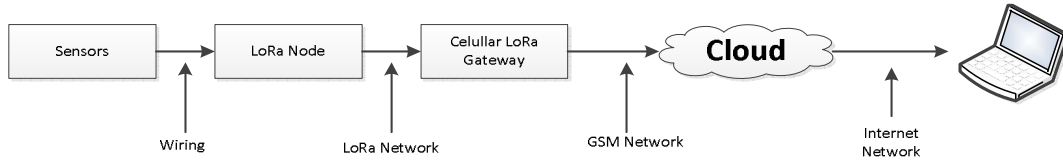

Fig. 1 EDS diagram block

The primary objective is to provide users with an exceptional digital experience as they navigate the vast internet landscape. Hence, it is essential to undertake a series of strategic modifications to the current system. Prioritizing responsiveness is crucial; websites must be designed to adapt seamlessly to various devices and screen sizes. Furthermore, adherence to established standards and best practices during the development process is imperative. By embracing these principles, we can ensure the delivery of a high-quality user experience that not only meets but exceeds expectations [20].

The website must be designed that prioritizes adaptability, ensuring seamless integration with the latest web innovations. This adaptability must extend to all contexts and devices, whether accessed via a smartphone, tablet, or desktop. A website that fails to meet these foundational criteria falls short of being classified as high quality and ultimately compromises the user experience, leaving visitors dissatisfied and disengaged. An optimal user experience hinges on the ability to provide a fluid and responsive interface that caters to the diverse needs of all users.

The efficiency of a website is crucial in ensuring an optimal user experience. Visitors to a website anticipate a swift loading time, intuitive navigation, and the prompt delivery of pertinent information [21]. Inadequate website performance can have a profound, detrimental impact on the user experience, the institution's reputation, and its ability to attract and retain users. For this reason, it is crucial to prioritize equipping individuals with the essential tools, along with cultivating the necessary skills and techniques to assess performance using key performance indicators (KPIs) effectively. By doing so, we can streamline the process of identifying areas that require enhancement in data analytics. This proactive approach aims to enhance speed and efficiency, ultimately resulting in a more refined and satisfying user experience.

A. User Application

User applications are classified into functions according to those in Table 1.

TABLE I
APPLICATION FUNCTIONS BASED ON USER

No.	User	Application Function,
1.	Admin	- User management - Indicator management - Role management - KPI data settings - KPI data management
2.	User manager	- View KPI data - Filter KPI data - Notification
3.	User application	- KPI data management - Filter and download data - Email notification

B. Research Stage

Use case diagrams are used to describe the relationship between actors and the features that exist in this application. The following is an application use case diagram of KPI as seen in Fig. 2.
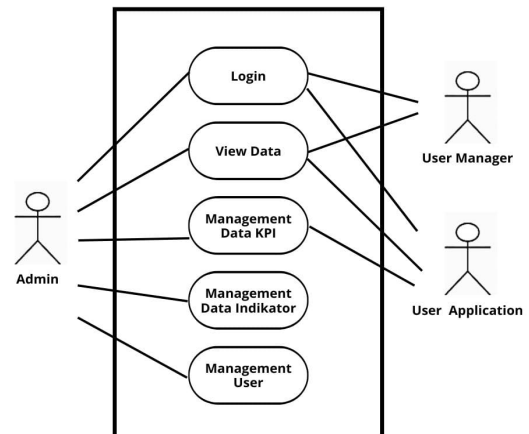

Fig. 2 Use Case Diagram of KPI website

In the diagram above, there are three actors, namely Admin, User Manager, and User Application. They have different access to each of the modules contained in this

application. The admin has access to all modules, while the User Manager has access only to the login and view data modules. User applications have access to login, view data, and manage KPI data modules. The workflow is described in Fig. 3.
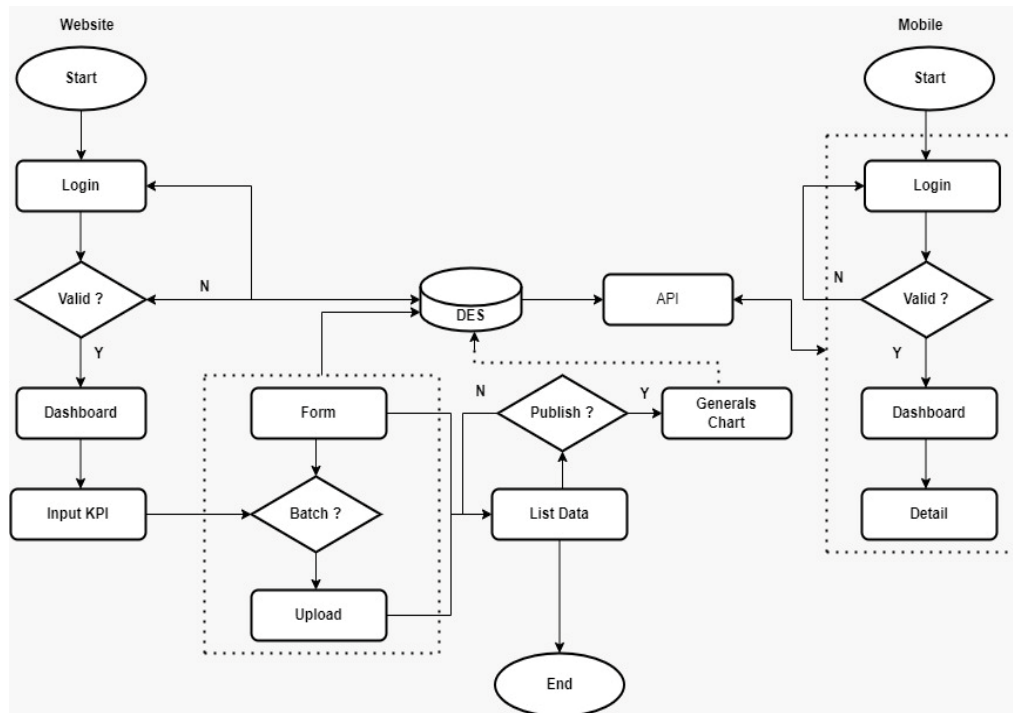

Fig. 3 Workflow of KPI.

Description of the website flow:
1. The user application logs into the KPI website by entering the requested username and password.
2. The system checks the database to ensure that the user logging in is a registered and valid user.
3. If an error occurs during user account verification, the system will redirect the user back to the login page.
4. If the account check is valid, the system will redirect to the KPI Dashboard page.
5. On this page, the user can access the KPI data entry menu.
6. Data input can be done by filling in a form or uploading an Excel file.
7. If the user chooses to complete the form, the system will display it for completion.
8. If the user chooses the file upload method. The system will display a page for uploading the file according to the defined template. After the input and upload process is completed, the system will redirect to the data list page.
9. This data list still has drafts and published data.
10. It is not possible to display data that is still in design form in graphical form.
11. In cases where the data has been published, a graphical representation can be generated and accessed via the mobile application used by the user manager.

Mobile flow description:
1. The manager logs into the application by entering their username and password.
2. The system checks the database via API to ensure that the user logging in is a registered and valid user.

3. If an error occurs during user account verification, the system will redirect the user back to the login page.
4. If the account check is valid, then the system will redirect to the KPI dashboard page.
5. On the dashboard page, users can monitor KPI data based on RKAP and weight.
6. Users can also view KPI data details.

Rules and validation:
1. The system will display an error if the user has not registered.
2. The system will display validation if the user has not logged in.
3. The system will display a validation message for the username and password if the user enters an incorrect username and password.
4. The user used is the user contained in the database.
5. The system will send an email notification to the application user if they have not filled in the KPI data.
6. If KPI data is already available, the system will send a notification to the mobile application.
7. The system will validate the KPI data against existing data in the database.
8. New KPI data must be entered first before it is used in data entry.
9. The system must set the graph data displayed through the menu setting, which is only accessible by the Admin.
10. The uploaded Excel file must match the template provided.

The quality of a website is of paramount importance, ensuring that users have a positive experience and can achieve their desired outcomes. Evaluating and rating a website can be a

challenging endeavor, primarily due to the inherent complexity of the task. This is because a plethora of services are associated with the website's homepage. The website in question outlines the primary activities and services provided by higher education institutions. The quality of a website can be assessed using a variety of evaluation models, tools, or techniques, depending on the specific parameters and objectives to be measured and evaluated. This is because a plethora of services are associated with the website's homepage. The website in question outlines the primary activities and services provided by higher education institutions. The quality of a website can be assessed using a variety of evaluation models, tools, or techniques, depending on the specific parameters and objectives to be measured and evaluated.

The determination of the level of quality represents the objective in any evaluation process and the foundation of any improvement process. It is imperative to comprehend the interrelationship between evaluation and quality. The method of assessment involves evaluating an entity's worth and assessing its ability to fulfill specific requirements. This entails analyzing the monetary cost of a product, service, or establishment.

The term " capacity" is used to describe, in essence, the term "capacity" refers to the set of intrinsic characteristics and properties that enable a given consumer's good or service to fulfill a specific set of needs. Given the importance of evaluating website quality, utilizing a structured and objective methodology is of paramount importance. A multitude of models have been developed, the goal is to provide precise criteria and metrics for measuring and scrutinizing numerous facets of applications or websites [22]. These models facilitate a comprehensive and systematic evaluation, thereby enabling the identification of areas for improvement and the implementation of effective strategies to improve the quality and efficiency of the site.

III. Results and Discussion

The following is a view of the KPI website page that has been evaluated online. Once the user has successfully logged in, the main page displayed to the user is the dashboard page, as shown in Fig. 4. The user can access various menus by selecting options from the left to the right-hand navigation section. Parameters were measured as shown in Fig.4. Parameters are CO_2 levels, noise levels, light intensity, air temperature, relative humidity, and dust particle densities.
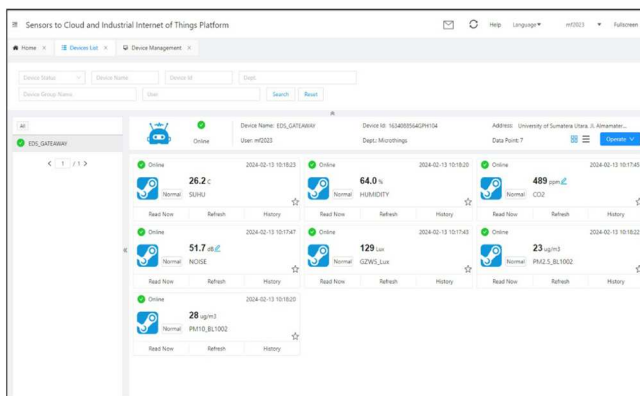

Fig. 4 Page shows the environmental parameters to be monitored.

This study utilizes the MicroThings platform software for operating web-based Android and iOS applications. This software is a KPI dashboard for laptops and smartphones. It can be used for monitoring daily activities that may contribute to environmental pollution because it is interactive, accurate, and analytical [23]. Monitoring activities can be conducted in real-time. Page interfaces used to monitor the air temperature and relative humidity are displayed in Figs. 5 and 6.

Fig. 5 Page shows the variation of the air temperature with date and time. Note: *suhu* refers to temperature.
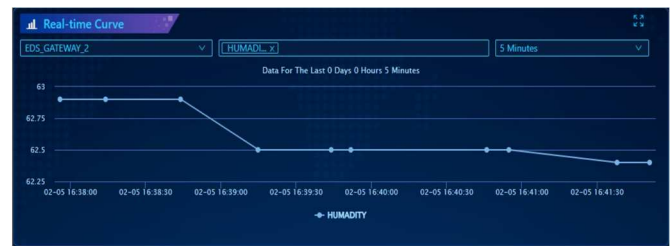

Fig. 6 Page shows the variation of the relative humidity to date and time.

The present study was conducted with the application of the evaluation above. This paper presents a statistical analysis that provides an efficient perspective for measuring the performance of the EDS. The following key facts should be considered:

A. Page Load Speed

Fig. 7 illustrates the speed of page loading, as measured by the parameters. The data used to create this illustration is based on information collected from the text, specifically the capacity in bytes. This data set allows for the observation of various metrics associated with the loading of web pages [24]. The metrics encompass both the visual loading process and page weight, which is quantified in kilobytes (kb).

B. Page Load Performance

The performance of the desktop dashboard is evaluated using the GTmetrix tool. Fig. 5 and 6 illustrate the dashboard's performance in terms of metrics such as air temperature and relative humidity. The parameters are Performance (%), Structure (%), and Full Load Time (%). The graph highlight is shown in Fig. 7, offering significant insights into the optimization and efficiency of websites.

Fig. 7 Graph highlights in terms of website performance – GTmetrix

Based on Figs. 5 and 6, the KPI website displays measurement data at intervals of 10-15 seconds. The data is displayed in graphical and numerical form. This will make it easier for users to analyze each environmental parameter that has been detected. To analyze the KPIs of a website running well, users must consider these things, namely:

1) Varied performance: The assessment of the KPI website reveals a notable degree of inconsistency across different metrics and tools. The efficiency of the sites in question varies to a significant extent concerning load time, page size, and accuracy [25].

2) Performance optimization challenges: As indicated by the analysis, the primary factors affecting KPI website performance are load time, page size, and accuracy. To ensure accurate measurement, improvements can be made in these areas [26], [27].

3) The importance of mobile performance: An analysis of both the desktop and mobile versions of the sites revealed that optimizing performance specifically for mobile devices is of paramount importance [28], [29]. Various evaluation of web performance includes the measurement of multiple metrics, such as load times and other performance indicators, demonstrated notable differences in the two versions, emphasizing the necessity of precise adjustments and optimization of websites to ensure an optimal mobile experience [30].

To achieve comprehensive website performance improvement, a multifaceted approach is essential. This entails the optimization and reduction of load time, the minimization of page size, and the consideration of other pertinent technical factors [31]. Despite these technical considerations, it is also imperative to prioritize usability, user experience, and accessibility, as these factors contribute to a holistic and satisfying user experience. To enhance the performance of KPI websites, it is vital to implement the techniques outlined in the subsequent study.

IV. CONCLUSION

The KPI website can functionally make it easier for users, especially those in top positions (decision-makers). It can be monitored directly through either a laptop or a mobile device for performance measurement purposes. The data displayed is already in the form of statistics and graphs, which tend to be easier to understand with detailed and accurate. By analyzing the metrics as mentioned above, we can provide valuable insight into several aspects, including evaluation of page loading time, page capacity, and other pertinent factors [32]. The data collected and analyzed yield findings regarding observed performance variations, optimization challenges, and mobile device performance. The measurement data displayed by the KPI website can serve as a reference and guide in deciding on mitigation actions when the situation and environmental conditions are in an extreme state.

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