

Data Visualization Analysis in the Management Information System for Submitting Credit Scores for Education Personnel



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ABSTRACT: Education staff have an important role in facilitating the implementation of the tridharma of higher education and are an indicator of educational administration success. This study looks at how data visualization was implemented in the Management Information System for Submitting Credit Scores for Education Personnel. The research is primarily concerned with the Functional Position of Intermediate Expert Computer Staff. The study's goal is to create web-based data visualization tools to enable submitting and assessing credit scores for Intermediate Computer Experts easier, thereby meeting the requirement for efficiency and accuracy in the promotion and position process. This study employs a research and development (R&D) methodology with an iterative prototype approach. The initial step involves a needs analysis, including an in-depth understanding of the Associate Computer Expert promotion process and the associated administrative requirements. Next, a web-based data visualization prototype was designed, which included an intuitive user interface, database integration, and a credit number calculation algorithm. The prototype was then implemented and tested on a limited basis in the IPDN environment. The proposed system is designed to provide easy access, facilitate data verification, and enable computerized sorting and calculation of credit numbers. The main contribution of this research lies in developing information technology solutions that can increase the transparency and effectiveness of administrative processes in the IPDN environment. It is hoped that the output of this research can provide conceptual and practical contributions to managing the credit figures for educational staff and provide a basis for developing similar systems in other educational institutions.

KEYWORDS: Management Information Systems, Data Visualization, Credit Scores, Intermediate Expert Computer Institutions, Promotion.

INTRODUCTION

In implementing the tridharma of higher education, the vital role of educational staff in supporting the educational administration process cannot be ignored (Djokopranoto, 2019). In carrying out their duties, educational staff involve various professions, including educational unit managers, inspectors, supervisors, researchers, and others (Madjid, 2018). Increasing academic qualifications and competency certificates according to fields is a benchmark for the success of educational administration activities (Hadi, 2017).

The promotion process, especially in the Functional Position of Associate Computer Expert, is the primary focus in ensuring educational staff receive recognition for their performance (Law Number 5 of 2014). Challenges arise in applying for and assessing credit scores for Intermediate Computer Experts.

This research aims to identify, analyze, and design effective and efficient web-based data visualizations to facilitate applying for and assessing credit scores. In this context, the findings from Hill and Smith's (2020) research regarding using web-based tools to improve educational administration become relevant. They highlight the importance of utilizing web-based technology to increase efficiency and effectiveness in educational administration.

Additionally, in the context of digital solutions for educational governance, Kumar and Brown's (2018) research provides insights through case studies of university administration. Their research results contribute to understanding how digital solutions can be implemented to improve educational governance efficiently.

Other research that supports the relevance of this research is the work of Wang and Chen (2019), which highlights the importance of technology in creating transparent and efficient educational administration processes. This research provides a valuable perspective on how technology can be used to improve the effectiveness of academic governance.

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Information system development is becoming increasingly important in supporting the effectiveness and efficiency of business processes. In this context, prototyping is one of the approaches used to design responsive information systems and user needs (Sommerville, 2011). Prototyping allows early identification of needs, minimizes design errors, and increases user participation (Pressman, 2014). This method aims to accelerate information system development and ensure design quality from the early design stages (Dennis et al., 2015).

This research contributes by providing tools that enable a more transparent and measurable picture of the performance of intermediate computer experts (Suhartono & Rahmatillah, 2023). The suggested data visualization can be a helpful tool for Associate Computer Experts and the assessment team by helping them comprehend the calculation method, credit score evaluation, and document verification (Widyastuti & Purwanto, 2023). The successful implementation of this data visualization is expected to provide significant benefits in facilitating the management and documentation of office activities, improving the efficiency of the educational administration process, and expediting decision-making regarding promotions and positions (Setiawan & Sukoco, 2023).

This research is vital because it can increase the educational administration process's transparency, accuracy, and efficiency. By combining information technology and personnel management principles, it is hoped that this research can positively contribute to improving the quality of educational services at IPDN and can be adopted by similar institutions in the tertiary environment. Therefore, this research is considered relevant and provides a real solution to the educational administration challenges faced by IPDN.

RESEARCH METHODS

This research used prototyping to develop Data Visualization for the Management Information System for Submitting Credit Scores for Education Personnel at IPDN. This method was chosen for various reasons that are relevant to the aim of designing an effective and efficient information system. First, the prototyping method was selected to accelerate information system development. By building an initial model of the system, researchers can get early feedback and respond to changes quickly from the early stages of design. Second, the prototyping method was chosen to minimize errors in information system design. By allowing users to view and test initial models of the system, potential errors can be identified and corrected before full development occurs. Third, the prototyping method increases user participation in information system design. By involving users in initial model testing, researchers can ensure that the system being developed better meets user needs and expectations. Fourth, the prototyping method was chosen because it allows easier changes and modifications to be made to the information system. Prototypes can be quickly adjusted to reflect changing needs or new requirements as development progresses. Therefore, users and developers can collaborate in the design process and ensure the resulting system can provide effective solutions.

The flow diagram in Figure 1 below is a concept map illustrating the steps in the prototyping method used. These steps include requirements identification, prototype design, prototype testing, and iteration until the information system reaches the expected quality level.

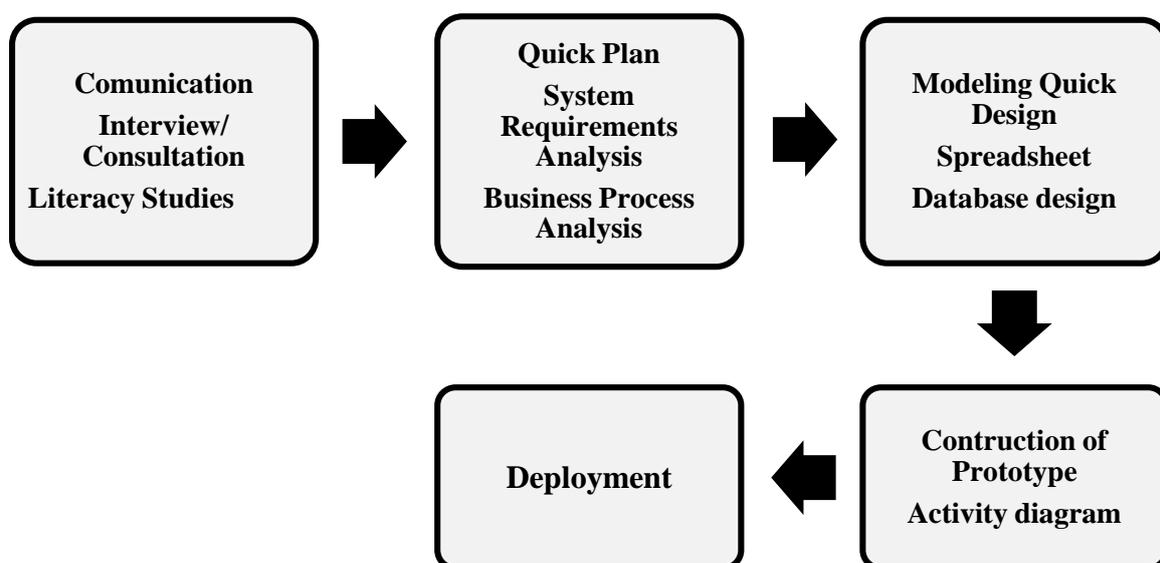


Figure 1. Concept Map That Illustrates The Steps In The Prototyping Method Used

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The Concept Map shows the prototyping method used in this research to develop Data Visualization for the Management Information System for Submitting Credit Scores for Education Personnel at IPDN.

Prototyping was used as the major approach in this study for building Data Visualization for the Management Information System for Submitting Credit Scores for Education Personnel at IPDN. These judgments are based on literature-proven ideas such as accelerating development, reducing design flaws, enhancing user interaction, and facilitating easier adjustments (Sommerville, 2011; Pressman, 2014; Dennis et al., 2015). The phases of prototyping are further outlined in the flow diagram in Figure 1 Concept Map, which embodies these principles (Gottesdiener & Gorman, 2012).

RESULT AND DISCUSSION

In this section, we will look at the research findings and describe the development of an information system for providing credit figures for Associate Expert Computer Institutions. Effective stakeholder communication, rapid planning, prototype creation, and rigorous implementation are among the system development processes. As a first phase, extensive consultation with relevant parties such as the Ministry of Home Affairs' Data and Data Center and the Central Statistics Agency (BPS) was conducted. This seeks to provide a comprehensive understanding of the requirements and procedure of applying for credit numbers. The following phase is rapid planning, which compares the current and prospective business processes to identify essential modifications and additions. Prototype development is the primary basis for developing this system. The prototyping method creates a temporary system model that allows design evaluation and improvement before full implementation. Data visualization is the main focus in developing the prototype to provide a better and more efficient understanding of credit numbers and the application process.

The results of this development process are depicted in effectively structured data visualizations, as shown in the results overview. The system implementation and deployment phase demands a deep understanding of user needs and business processes. Therefore, user training and system maintenance are of primary concern to maintain system performance and sustainability.

Analysis of results and discussion includes contributions to related literature, combining the principles of effective communication, rapid planning, prototype building, and information systems implementation. Overall, this research is expected to provide in-depth views and practical solutions in applying for Associate Computer Expert credit figures, bringing significant benefits to the effectiveness and efficiency of the process.

A. Communication

The first aspect of the prototyping concept map is effective communication between stakeholders in information system development. Good communication will ensure that all parties involved understand the needs and requirements of the information system.

In this research, consultation communication was carried out via online media from the Ministry of Home Affairs' Data and Data Center and from the Central Statistics Agency (BPS), which is a member of the BPS assessment team to obtain information on the application of credit figures for Intermediate Expert Computer Institutions.

Discussions with Intermediate Computer Experts were conducted to obtain constructive input to support this research. The interview/consultation instruments used are as follows:

1. Files required for applying for a computer credit number
2. What is the process for applying for a computer credit number?
3. How to apply for credit scores for Intermediate Expert Computer Staff
4. What files are needed to apply for an Associate Expert Computer Officer

B. Quick Plan Design

The second aspect is quick planning (quick plan design), namely making an initial plan that generally describes how the information system will work and interact with users and other systems. Quick Plan about business process planning and the need for creating data visualization. The results of this temporary Plan were obtained from preparing an instrument for assessing the credit scores of Intermediate Expert Computer Institutions, which was compared with the activity items of BPS Regulation 2/2021 and with the activities of job duties at the Ministry of Home Affairs Work Unit.

1. Business Process Analysis
Current Business Process.

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This stage explains the business process that is currently occurring in the assessment of the instrument for submitting credit numbers for Intermediate Expert Computer Officer from those who offer the assessment to BPS with the business process as Figure 2 follows:

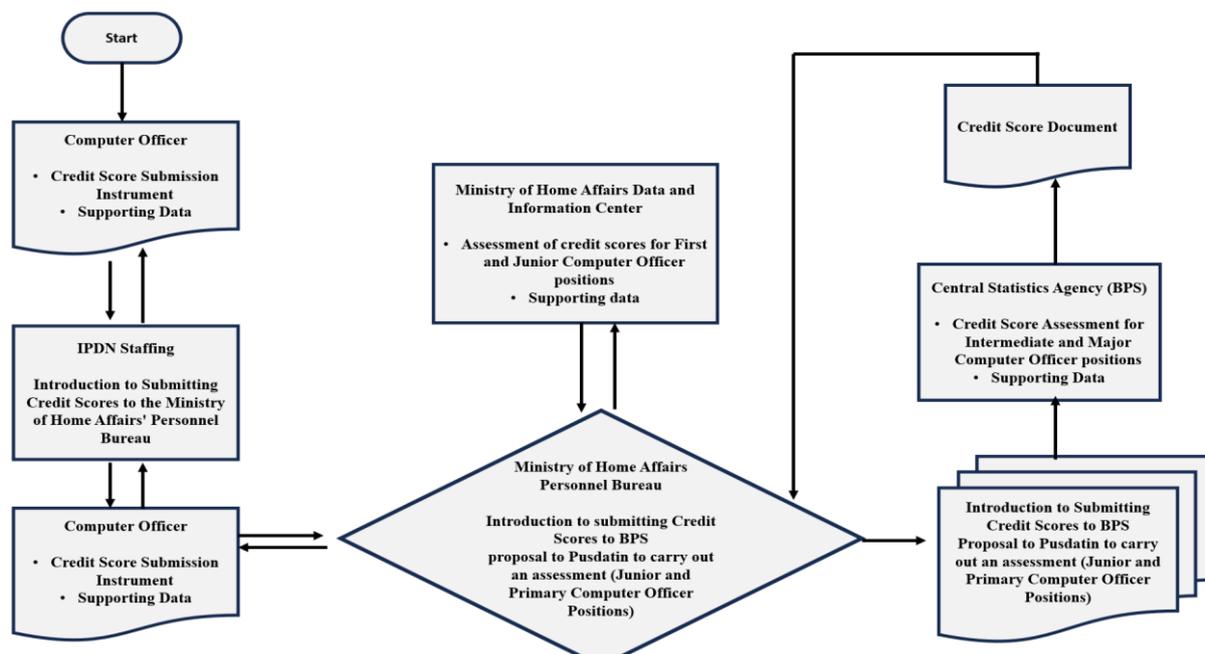


Figure 2. Process For Submitting A Credit Score (PAK) For The Position Of Computer Officer

Business Process Proposal

The proposed business process for detecting credit number applications is explained at this stage. The business proposal process can be seen in Figure 3. In this proposal process, several changes and additional features occurred. BPS receives data visualization sent by Intermediate Computer Experts from the system to be created. The results of this data visualization will make it easier to carry out calculation operations to determine an AK calculation. To increase the ease of BPS performance, researchers added visual data on credit score values filtered as desired by using a visualization of activity item mapping data based on BPS Regulation 2/2021. Next, BPS will contact the Intermediate Computer Expert Institution for further action.

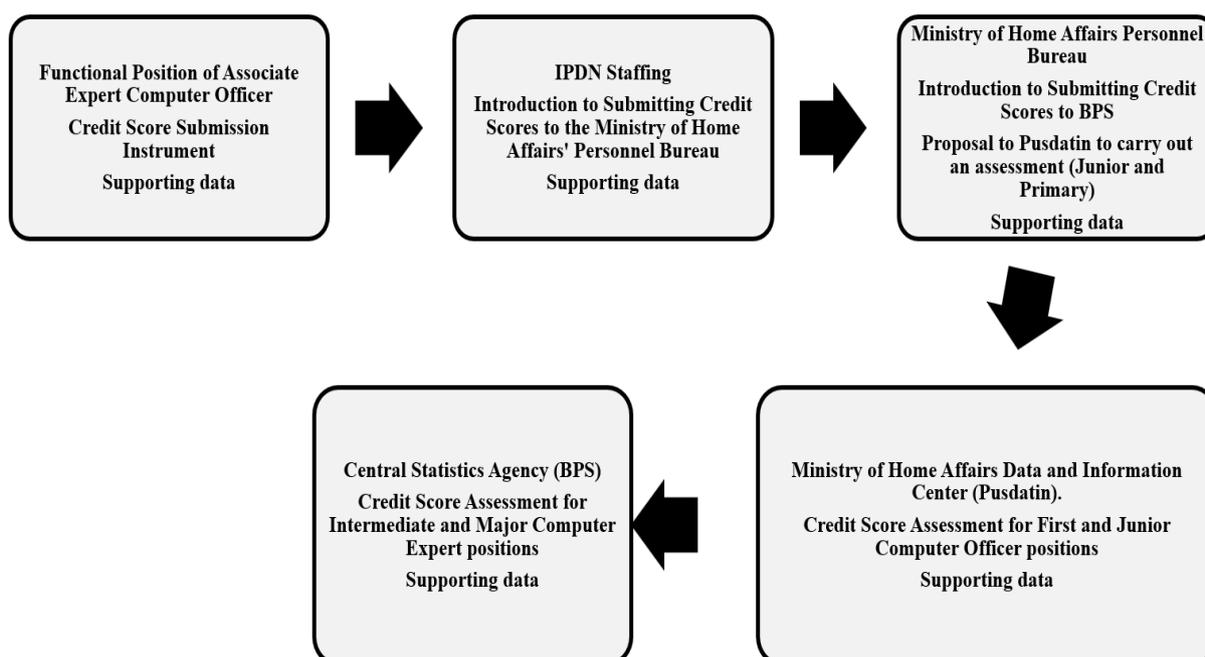


Figure 3. Process for Submitting the Proposed Associate Computer Expert PAK

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Comparison of Current and Proposed Business Processes

Even though the current and proposed business processes are the same, there are differences. One of them is that in existing business processes, there are still processes that involve manual processes, so activities tend to take longer and are less thorough, especially when checking credit numbers. Therefore, the business proposal process is more helpful for BPS to see the data directly in a visualization display. So, BPS's performance in assessing the credit numbers of Intermediate Expert Computer Institutions is more effective, and credit number applicants can be more effective in presenting their credit number data.

2. System Requirements Analysis

In data visualization, researchers conduct a needs analysis first to determine what the system will need. Needs analysis is obtained from literacy and interviews/consultations with Pusdatin and BPS. The following are the results of the system requirements analysis from the last iteration.

Input Requirements Analysis

Input requirements analysis is used to find out what data will be used by the system so that this system can carry out the data visualization process. The data used is as follows:

1. Daily report data
2. Daily report date data
3. Monthly data daily report
4. Daily report year data
5. Detailed data on job duties activities
6. BPS Activity Data
7. BPS Activity Type Data
8. BPS Activity Item Data
9. BPS Activity Sub-item Data
10. Activity value data
11. Section performance group data
12. Data on Physical Evidence of Activities
13. Physical Evidence Attachment Data
14. Daily report data link
15. Data Links to Annual Reports and other Physical Evidence

Process Requirements Analysis

After obtaining the necessary data, the next step is to analyze the process requirements that will be used to visualize the data. The process used is as follows:

1. Manage daily report name data into a table
2. Manage daily report name data links for visualization of physical evidence
3. Manage year filters
4. Manage monthly filters
5. Manage the job duties activity filter
6. Manage BPS Activity filters
7. Manage BPS Activity Type filters
8. Manage BPS Activity Item filters
9. Manage BPS Activity Sub-item filters
10. Manage Activity Attachment filters
11. Manage job duties activities into graphic filters
12. Organize Activity sections into tables
13. Manage condition indicators for the amount of value per activity

Analysis of Output Requirements

The next step is the output obtained from the process requirements analysis, a system that can display data visualization on hardware. The information shown is:

1. Information on mapping job duties activities
2. Information filter activities
3. Graphic filter information
4. Information table for section activities
5. Information on activity value indicators
6. Regulatory information regarding computer institutions
7. Information on computer institution activity items

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Analysis of Interface Requirements (Interface)

Interface requirements are essential to determine the correct interface for the user. These interfaces are:

1. Employee Job Goals Interface. This interface will later be used for data visualization based on job duties and activities. This interface contains seven output requirements analysis information, namely information on circle graphs of institutional/department activities, bar graph information on activities compared to Job Duties activities, information on indicators for the number of activities, information on indicators for the number of activities for Job Duties, information on indicators for the total number of activities, information on tables containing Position Duties activities, institution/department activities, activity details, activity date and month. Also provided is a link to physical evidence of activities.
2. Physical Evidence Interface. This interface will later be used for data visualization based on job duties and activities. This interface contains seven output requirements analysis information, namely information on circle graphs mapping institutional/department activities, information on bar graphs attached to Job Duties activities, information on indicators for the number of activities, information on indicators for the number of activities for Job Duties, information on indicators for the total number of activities, table information containing activity description and attached files, month of activity, physical evidence in the form, and Year of activity.
3. Employee Work Goal Achievement Interface. This interface will later be used for data visualization based on job duties and activities. This interface contains seven output needs analysis information, namely information on the mapping of job duties activities, information on bar graphs of activities compared to Job Duties activities, information on circle graphs of Job Duties activities per Year, Information on indicators for the number of activities, information on indicators for the number of activities of Job Task Activities, information on indicators for the total number of activities, information on tables containing Job Task Activities, Year, Output Target, Quality target, Time target, Output Realization, Quality Realization, Time Realization, Type 1, Achievement value.
4. Interface of Position Regulations for computer institutions. This interface will later be used to visualize regulatory data regarding computer institutions and the Year they were issued.
5. BPS Regulation 2/2021 Activity Item Interface. This interface will later be used to visualize data from the Central Statistics Agency (BPS) regulation Number 2 of 2021 concerning Technical Instructions for the Assessment of Computer institution credit figures, which are grouped by activity, type of activity, activity item, and activity sub-item, information on indicators for the number of activities, type of activity, activity items and activity sub-items, table information containing activities, graphs, and number of activity items and activity sub-items.
6. Interface for Adjusting Employee Work Targets with Central Statistics Agency Regulation Number 2 of 2021. Filter This interface is an interface used to display more detailed information from filtered job duties activities along with Year and month. These activities can be assessed and given credit numbers (BPS), Activity Type (BPS), Activity Items (BPS), and Activity Subitems (BPS) will be determined. This interface contains information on output requirements, namely graph filter information, where the specified graphs are bar graphs of the percentage of activities and job assignment activities, circle graphs of the percentage of section activities, indicators of the value of each activity as well as indicators of the total number of activities and the value of the Credit Score (AK).

C. Construction of Prototype

The third aspect is prototype development, creating a temporary information system that functions as a model or initial example. This prototype will evaluate and improve the system design before it is fully implemented. The next step is to create a temporary information system that is used as a model with the following output:

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Figure 4. Proposed Visualization Of Data For The Intermediate Expert Computer Pranata PAK Application

D. Deployment

Fourth is implementing and disseminating information systems designed and tested through prototypes. This stage involves installation, user training, and system maintenance. In this implementation, visualization and system testing is carried out after the system is complete. Implementation at the deployment stage of the Data Visualization Management Information System for Submitting Credit Scores for Education Personnel at IPDN involves several scenarios, which are detailed as follows:

1. **Employee Job Goal Scenario:** In the first stage, this scenario highlights the data visualization's first view, including an interactive table graph based on the Job Task Activities of the Associate Computer Expert Position. Data taken from the Ministry of Home Affairs' Sikerja application for 2020-2023 allows users to sort data based on the type of activity, activity section, month, Year, and overall data table. However, obstacles at this stage include the incompatibility of job duties with BPS Regulation 2/2021 and the lack of credit value (Brown & Wilson, 2016).
2. **Physical Evidence Scenario:** This interface will be used to visualize data depending on work assignments and activities (Harsa, 2023). This interface contains information on seven output requirements analysis outputs, namely information on circle graphs mapping institutional/departmental activities (Rahmahwati, 2023), information on bar graphs attached to Job Duties activities (Santoso, 2023), information on indicators for the number of activities (Agustina, 2023), information on indicators for the number of activities for Job Duties (Wulandari, 2023), and information on indicators for the total number of activities (Permata, 2023).
3. **Employee Work Target Achievement Scenario:** The third data visualization displays an assessment of employee performance targets using data from the Ministry of Home Affairs' Sikerja application for 2020-2023. Although featuring interactive menus similar to the previous scenario, this stage allows additional input and improvements.
4. **Computer Officer Position Regulation Scenario:** This scenario highlights the regulations governing the computer officer position. Hyperlinks of the rule type allow users to access further information, and data can be exported to various file types. Identifying inputs and special attention at this stage can improve the system's quality.
5. **Activity Item Scenario BPS Regulation Number 2 of 2021:** Sorting activity items by BPS Regulation 2/2021 is the focus of this scenario. Interactive data allows users to explore details of computer system activity items by sorting by activity type, activity item, and activity subitem. This stage provides space for input that can improve the accuracy and relevance of the information.
6. **Scenario for Calculating Credit Scores for Intermediate Expert Computer Institutions with BPS Regulation 2/2021:** At this stage, the scenario displays the calculation of credit numbers by considering activity items, types of activities, and sorting based on time. The interactivity of bar graphs enriches the user experience in exploring data. Identification of input at this stage can increase calculations' accuracy and information's usefulness.
7. **Scenario for Calculating Credit Numbers using SKP for Intermediate Expert Computer Staff by Menpan-RB Regulation 6/2022:** The final scenario shows the calculation of credit figures using SKP according to Menpan-RB Regulation 6/2022. Data from

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the Ministry of Home Affairs' Sikerja is integrated into sorting based on activities that can be assessed. Identification of inputs at this stage can ensure compliance of calculations with the latest regulations.

This scenario analysis is based on the concept of Rapid Application Development (RAD), a concept described by Brown and Wilson (2016), which emphasizes the importance of flexibility and responsiveness in information system development. The iterative and flexible methodology promoted by RAD allows for quick adjustments and alterations during the system development process. The difficulties discovered in each scenario serve as focal points for prospective upgrades to increase the system's effectiveness and efficiency. Investigating these issues yields valuable information for guiding future system development efforts.

The analysis proceeds in stages, beginning with effective stakeholder communication, then moving on to quick planning (Quick Plan Design), business process visualization, prototype development, and finally, system implementation and deployment. Each stage is thoroughly investigated, relying on a solid research approach consistent with the fundamental concepts recommended by specialists in information systems development. This complete method clarifies how these concepts interact, resulting in a unified framework for successful system development.

CONCLUSIONS AND RECOMMENDATIONS

This research highlights the importance of prototyping in developing Data Visualization for the Management Information System for Submitting Credit Scores for Education Personnel at IPDN. This method has proven effective in accelerating information system development, minimizing design errors, and increasing user participation. The research results show that prototyping allows rapid adaptation to changing needs, ensures continuity of user interaction, and provides solutions that meet expectations.

Based on research findings, information system development in similar institutions should consider the prototyping method as the primary approach. Special attention is needed at the requirements identification and prototype testing stages to ensure optimal results. Active user involvement during the development process should also be increased. Additionally, future research could explore integrating new technologies that can enrich system functionality and support the efficiency of management processes.

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