Development of Integrated Supply Chain Devices: Cloud-Based Learning and IoT Tracking System in Management Learning for Student Office Administration Education

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Abstract. The development of infrastructure and material management in industry has progressed rapidly, starting with digital infrastructure management. This research aims to develop learning media related to supply chain-integrated cloud-based learning IoT tracking systems. The research method used is the design thinking process, which consists of empathy, defining ideas, prototyping, testing, and finishing. The validation tests used are material expert validation tests, media expert validation tests, and IT platform expert validation tests. The research results obtained were that the material expert validation test obtained an average of 87.6%, the media validation test obtained an average of 90.6%, and the IT platform expert validation test obtained an average of 90.6%. From the test results obtained, the category is "very feasible" so that the integrated platform can be used in supply chain management..

Keywords: supply chain, IoT, tracking system, management learning, office administration education..

1 Introduction

Learning about supply chain and infrastructure is learning that discusses the evolution of existing infrastructure management within an organization [1]. This lesson will guide you through planning, managing, and evaluating the process of managing goods in an organization, commonly called the supply and delivery chain [2]. The development of material and infrastructure facility management in the industry has progressed rapidly, starting with the digital management of infrastructure facilities, the evolution of digital materials and goods management, and step-by-step supply chain management. Digital management can be simple or complex [3]. However, educational institutions needed help to keep up with these developments. In this case, for future labor suppliers, the existing learning is still more accessible for managing supply and does not follow the evolution of future industrial needs [4].

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Learning solutions already exist in developing learning media supplies in Indonesia [5], which developed website-based learning that contains an inventory system of goods. There is not much research in Indonesia on learning supplies and supply chains; other studies such as blockchain technology in supply chains [6], integrated supply chain learning [7], and several technology-based studies on supply chains have been carried out abroad with the latest technology [7].

systemsBased on these problems, the researchers initiated the "Development of Integrated Supply Chain Learning Based on Cloud Tracking System IoT in Supply Management Learning." This research aims to develop learning media related to supply chain integrated cloud-based learning IoT tracking system. This research has urgency in terms of the importance of proper management in supporting the company's main goals; the main goal supporting tools are clear and compelling management of supplies and inventory [8]. This research is essential to support the improvement of the quality of labor in the field of supplies to be able to compete directly in the industrial world in particular [9] and avoid things that hinder development in the industrial world because supplies are one part of the organization, which of course also has multiple effects that can affect other industries or organizations when their management is problematic and ineffective [9].

2 Literature review

Several studies have been conducted in management training delivery. thislevel study relates to the development of practical learning applications, Supply management at the student level, and applications developed containing supplier information, inventory information, rooms, offers, and returns. This research is ongoing and is being tested on a small scale and validated by experts [10]. Other Studies Research is being conductedflexibility. on supply and supply chain management whose subject is the effect of learning in supply chains on performance flexibility; The resultsThis of the research can enhance internal learning and increase knowledge of the three aspects of supply chain and other supply management [11]. Other research that has been doneindustry is about the Blockchain-Based Drug Supply Chain Management and Recommendation System and learning in the Smart Pharmaceutical Industry. Another successfully developed lesson was by [12] on an integrated conceptual model of supply chain learning. The authors developed a conceptual framework that brings together various constructs. Within this framework, the authors identify the drivers and sources of SCL at the intra- and inter-organizational levels. SCL consists of exploratory and exploitative learning capabilities, and the outcome of SCL is dynamic supply chain management capabilities and sustainable supply chain performance [13].

3 Methods

The design thinking process is used in developing this research [14]. The development of learning cloud-based CBC research is going well and can be used in design thinking for educators. This method is very suitable for use in the development of technology-based learning media, especially in education. This development method consists of five stages. The emphasize and define stage is the first phase of the needs analysis for supply management and supply chain training at the vocational level, and this step will also be applied mainly in office automation, research activities, seminar planning, the definition of objectives, and the technical implementation of activities. In the idea phase, researchers formulate research ideas and form design solutions clearly; at this stage, it is expected that at least a suitable product will be produced to be used as design validation material developed in terms of system design and user interface design, which experts in their fields validate. Validate ideas with minimum viable products to describe the course of ideas and future development to be developed at the next stage [15].

In the prototype stage, researchers work closely with cloud-based learning technology development engineers. It is expected to be able to produce initial and powerful cloud learning tools and continuous learning content, reference materials, and system manuals to obtain valid validation results at that time. The results of the development are expected to be validated thoroughly. At this stage, this prototype is made in the form of hardware and is also connected to the development of cloud-based learning. smallProduct tests are carried out in this phase on a small scale, field, and large scale in several schools. It is expected that later it can test the language skills of users through usability. Product testing, data collection from various test scales, and analysis results from the information to be used in the next step In the finishing stage, the researcher completes the evaluation, makes a final report, compiles the processing results, and analyzes data for indexed international journal publications and copyright preparation. Intellectually, researchers also evaluate developments at this stage until the end of the platform [16].

4 Results and discussions

4.1 Emphasize and Define

In the empathize and define stages, researchers make observations to understand the needs and problems experienced by users in depth and find new solutions. The main goal is to develop empathy for users and gain accurate insight into their needs. Observations were also made to design supply chain management materials. The researcher also analyzed existing products on the market and found problems that needed a solution, namely cloud tracking system-based learning. This solution can provide an understanding of adaptive and collaborative learning with technology. The following is software regarding supply chain management that has existed before:

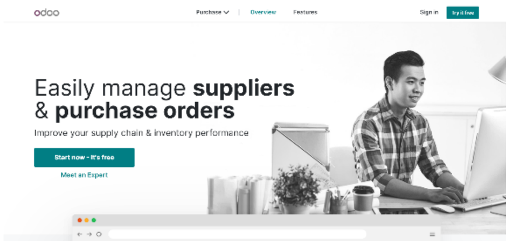

Fig. 1: Existing product analysis

4.2. Idea

Integrated Supply Chain Learning Software based on Cloud Tracking System IoT is a concept that combines Internet of Things (IoT) technology with a cloud system to monitor and track supply chain processes in an integrated manner. These devices use internet-connected sensors to collect real-time data on various aspects of the supply chain, such as inventory, production, shipping, and more. The data collected by these sensors is sent to a cloud platform that can be accessed online. The data is stored and analyzed on the cloud platform using machine learning technology. Machine learning enables these devices to learn basic patterns, trends, and insights in supply chains based on historical and real-time data.

4.3. Prototype

Material on the role of SCM in business success and measurement of SCM performance helps office administration education students know how to improve business efficiency and find out how SCM functions. The role of SCM in business success is to ensure an efficient, coordinated, and integrated flow from raw materials to finished products and the delivery of products or services that meet customer expectations. This material is arranged systematically to facilitate the understanding of office administration education students.

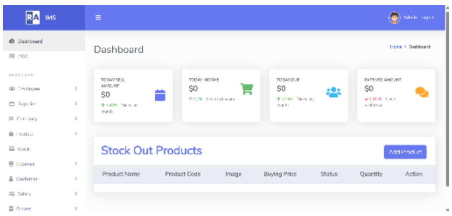

Fig. 2. Dashboard display of the integrated supply chain learning device platform based on the IoT cloud tracking system.

This platform is integrated with supply chain learning based on an IoT cloud tracking system with various useful features. The dashboard display containing a performance summary and other data analysis is visually attractive, intuitive, and easy to understand so that office administration education students can monitor SCM performance, identify problems, and make the right decisions to increase efficiency.

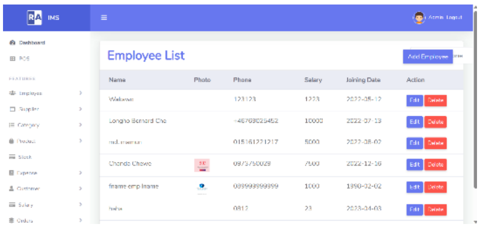

Fig. 3. View of the employee list on the cloud tracking system and IoT-based supply chain learning device.

This feature briefly describes the list of employees of the companies involved in the supply chain. This feature also includes a list of employee salaries and joining dates to monitor employees in the supply chain system. In addition, this feature makes it easy to add employee data if needed. This feature helps monitor employees and maintain the accuracy of employee data in the SCM system.

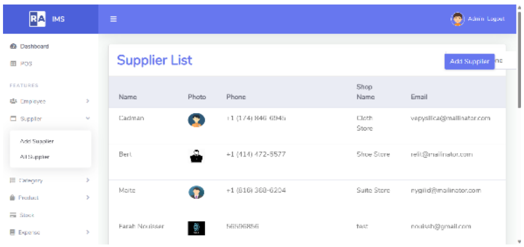

Fig. 4. Display of supplier list on supply chain learning-based cloud tracking system IoT device

The Supplier List feature aims to present information about suppliers involved in the supply chain. This feature contains information from phone numbers, store names, and emails to make purchasing supplies, raw materials, and finished goods easier. This feature makes it easier for management to store important supplier data and be able to contact the supplier when needed.

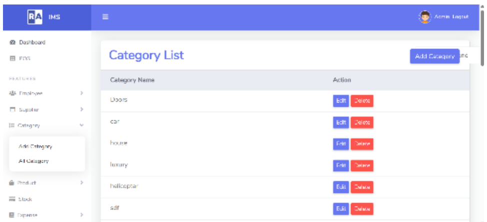

Fig. 5. Category list display on the cloud tracking system of the IoT-based supply chain learning device

The category list feature categorizes products or services within the company, which helps organize and understand the complexity of products or services in SCM. This feature is also helpful in performing analysis and monitoring within each category, thereby encouraging decision-making based on detailed data.

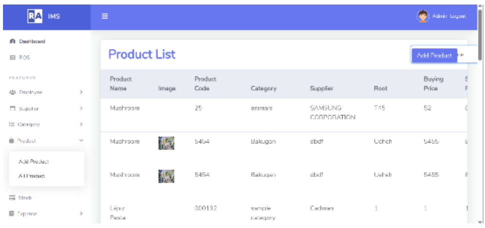

Fig. 6. Product list display on supply chain learning-based cloud tracking system IoT devices

This feature contains a complete list of products, from product names, images, product codes, categories, and suppliers to selling and buying prices. This feature makes it easy for product management by managing product price and inventory information. Furthermore, this feature makes it easier to perform quality control and analyze product performance, which in turn makes it easier to identify pertinent data that can be used to make decisions. Examples of this data include product popularity and inventory availability analysis.

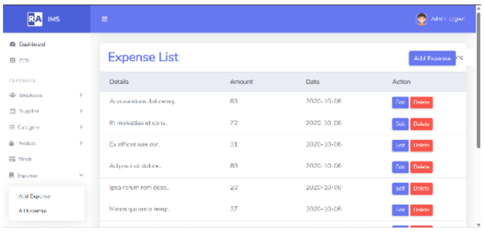

Fig. 7. Expense list display on the cloud tracking system IoT-based supply chain learning device

To manage and track expenses and expenses in SCM, the expense list feature is essential. This feature consists of expenses, amounts, and expenses made. This feature is helpful for detailed cost monitoring, expense analysis, to budget management. With this feature, companies can better manage expenses by identifying opportunities for cost savings, increasing operational efficiency, and ensuring the budget follows the predetermined budget plans.

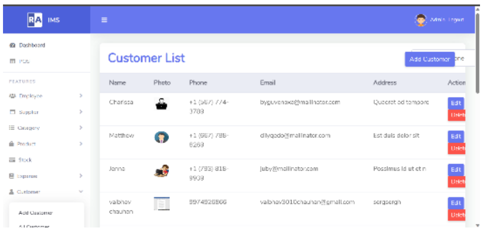

Fig. 8. Customer list display on supply chain learning-based cloud tracking system IoT devices.

This feature has various benefits, especially in managing customer data. This feature can assist in monitoring customer data and analysis for better customer service. This feature can facilitate companies to manage communication with customers because customer contacts can be contacted. In addition, it is also easier for companies to provide notifications about changes or promotions in the supply chain.

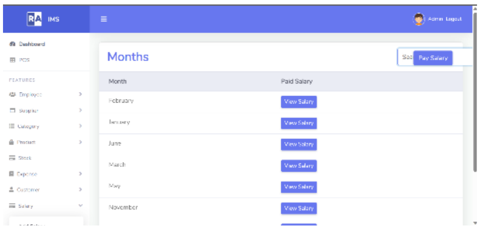

Fig. 9. Salary display on cloud tracking system IoT-based supply chain learning devices.

This feature helps monitor employee payroll more efficiently. This feature can also be used as a data source in preparing financial reports regarding salaries issued in a supply chain. This feature ensures that employee payroll is carried out within a predetermined time. This feature also has a search feature to find the required month's data.

4.4. Test

In compiling the Integrated Supply Chain Learning Tool based on the Cloud Tracking System IoT learning, the experts carry out a material validation test so that suggestions and input are obtained on the material to be delivered to students. The suggestions and input obtained will be used as learning and applied to the Integrated Supply Chain Learning Device based on the IoT Cloud Tracking System to improve it.

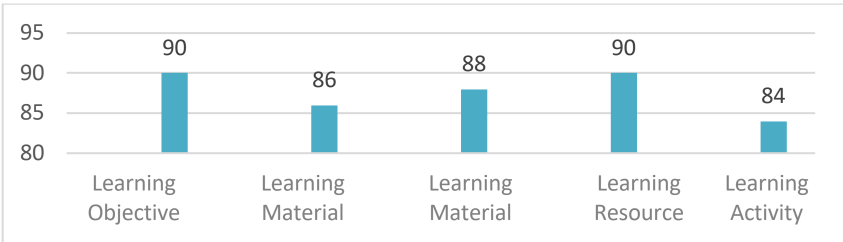

Fig. 10. Material validation test for supply chain learning devices based on the IoT cloud tracking system.

Based on Graph 1. the material expert validation test obtained a mean result of 87.6% with a maximum score of 100%. The mean, with an average percentage of 87.6%, is in the "very decent" category.

This test aims to provide an assessment of the media that has been developed to obtain input for better development from learning media experts. In conducting learning media validation tests, assessment instruments are used to improve things that still need to be improved based on expert suggestions and input. The following is the media validation test data in Graph 2.

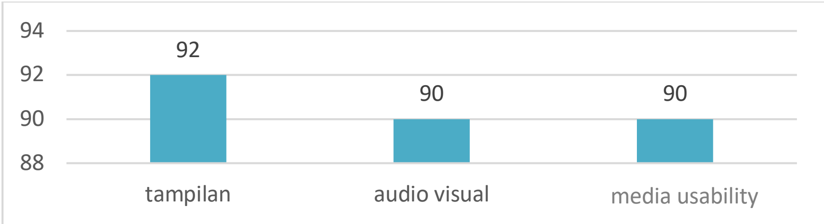

Fig. 11. Media validation test for supply chain learning devices based on the IoT cloud tracking system.

In Graph 2. the average assessment media expert validation test results obtained a score of 90.6% with a maximum score of 100%. The average value can be categorized as "very decent".

Learning Platform Validation Test

The learning platform expert test is carried out to provide an assessment of the feasibility of the learning platform that has been developed. The expert referred to in this test is an IT expert. The assessment instrument was carried out in this test to find suggestions and input and then make improvements to improve the learning media platform. The following is the data validation test for the Learning platform in Graph 3.

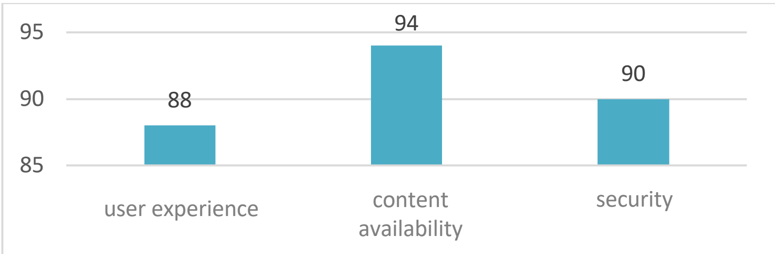

Fig. 12. IT platform validation test for supply chain learning devices based on the IoT cloud tracking system.

Based on Table 3, the platform validation test assessment obtained an average score of 90.6% and a maximum score of 100%. The average value obtained can be categorized as "very decent."

4.5. Finishing

Based on the product validation stages, the IoT-integrated supply chain learning platform must be evaluated for future development. At the evaluation stage, data is collected for suggestions and input from students during the process of using the Chem Squad account. Based on validator input and suggestions, namely adding more diverse material content, and providing a lot of learning content in video form because it is more interesting. Comments and opinions of validators as a whole are interesting and can learn IoT-based supply chains more easily. This research shows that IoT-based supply chain learning media is very suitable for use. Responses and input will be used as a basis for product improvements for further research.

5 Conclusions

Developing an Integrated Supply Chain Learning device based on the IoT Cloud Tracking System has various features: stock lists, supplier lists, category lists, employee lists, and orders. The user-friendly interface makes this tool easy to use for learning supply management. In addition, this tool starts from essential technical management and supply chain based on critical thinking. The validation tests used are material expert validation tests, media expert validation tests, and IT platform expert validation tests. The research results obtained were that the material expert validation test obtained an average of 87.6%, the media validation test obtained an average of 90.6%, and the IT platform expert validation test obtained an average of 90.6%. From the test results obtained, the category is "very feasible" so that the integrated platform can be used in supply chain management.

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