(RESEARCH ARTICLE)

Development of Digi-Ecosmart, a smart digital economy ecosystem based on immersive technology case study at PT Nuswantoro Informasi Teknologi Indonesia

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Abstract

Sidoarjo Regency is a Delta Plain with an altitude between 0 to 25 m, a height of 0-the 3m with an area of 19,006 Ha, covering 29.99%, is a pond area located in the eastern part of the Central Region which has fresh water with an altitude of 3-10 meters above sea level is a residential area, trade, and government. Covering 40.81%. The western region with an altitude of 10-25 meters above sea level is agricultural.

This paper is a brief report on application development funded by the Matching Fund of the Ministry of Culture, Research, and Technology at PSDKU Sidoarjo Information Technology. As a study program that stands in the Sidoarjo district with all of the above characteristics.

The Matching Fund Program is a program funded by the Ministry of Education and Culture, and the Ministry of Research and Technology to strengthen cooperation between universities and the industrial world to jointly form the "Ekosistem Merdeka Belajar – Kampus Merdeka". In this project, we make application software based on immersive technology. At the end of the program, a better and more sustainable working relationship will be established between universities and the industrial world, which is expected to contribute to solving real problems in the field or carrying out national strategic actions

The method used on this project is prototyping, which is a system development method in which prototypes are built, tested, and then reworked as necessary until acceptable results are achieved from which a complete system or product can be developed.

Keywords: Matching Fund; Prototyping; Immersive Technology; Virtual Tour

1. Introduction

Sidoarjo Regency is located in the Province of East Java, led by H. Ahmad Muhdlor, S.IP, established on January 31, 1859. The area of Sidoarjo is 719.63 km^2 (4). The geographical location of Sidoarjo Regency is shown in Figure 1. The economic and business characteristics of Sidoarjo are as follows: Fisheries, industry, and services are the main economic sectors of Sidoarjo. The Madura Strait to the east is a fishery-producing area, including fish, shrimp,p, and crab. The regency logo shows that shrimp and milkfish are the city's main fishery commodities. Sidoarjo is also known as "Petis City". The industrial sector in Sidoarjo is growing quite rapidly because of its location close to the business center of East Java (Surabaya), close to the Port of Tanjung Per,ak and Juanda Airport. (5)

Sidoarjo Regency is a Delta Plain with an altitude between 0 to 25 m, a height of 0-3m with an area of 19,006 Ha, covering 29.99%, is a pond area located in the eastern part of the Central Region which has fresh water with an altitude of 3-10

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meters above sea level is a residential area, tra,de and government. Covering 40.81%. The western region with an altitude of 10-25 meters above sea level agricultural area. (1),(2)

PSDKU Sidoarjo is a New Study Program that was officially established by Decree 4494/PL17/KP/SK/2021 concerning Study Programs Outside the Main Campus of Informatics Engineering Kab. Sidoarjo was founded in 2021. This study program has enormous potential, both in terms of its territory, the potential of its people, the potential of MSMEs, and the potential of its human resources. Through the Vocational Matching Fund 2022 program, it is hoped that it will be able to accelerate the study program progress by creating the Digi-Ecosmart application engineering in collaboration with DUDI Partners, namely PT. Nuswantoro Information Technology, implementing PBL-based learning activities for students in the TIF PSDKU Sidoarjo Study Program so that they are more focused on providing the intended competencies. As well as in the future, it can create a Center of Technology Excellence which is realized by the formation of TEFA in PSDKU Informatics Engineering Sidoarjo Regency.

In the 2022 Matching Fund activity, the author raised the theme of immersive technology to be implemented in Sidoarjo, because based on data obtained from the official website of the Sidoarjo Regency Government above, the potential of this district is very suitable and suitable for applying immersive technology. Immersive technology is a term that describes any technology that connects the physical and digital worlds. This includes technologies such as augmented reality, virtual reality, and mixed realityThesee, technologies provide a natural and intuitive interaction between the user, 3D animation, and the environment. (6) In the business sector, this technology is very interesting to develop, especially during the Covid-19 pandemic, because it alCovid-19iness activities to be carried out without direct contact between sellers and buyers. (7)

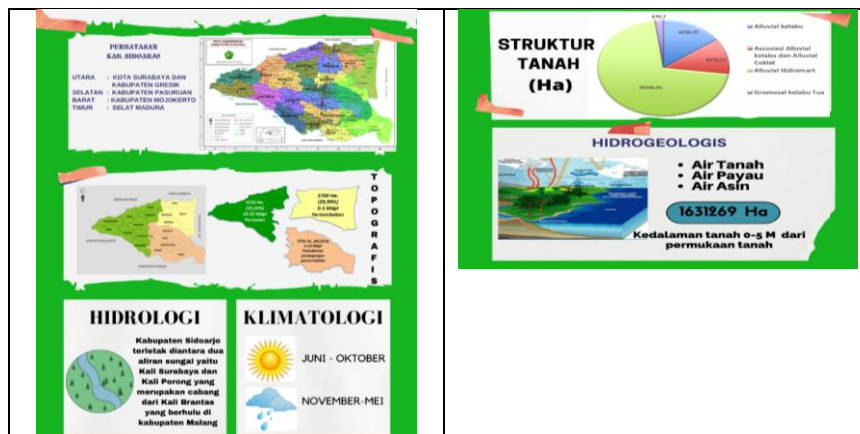**Figure 1** Sidoarjo Geographics

2. Literature Review

Immersive technology has started to attract the attention of researchers, as evidenced by the many research journal papers that examine this immersive technology. Among these studies are in the field of education and training (8), the field of construction, tourism, and the use of games in the field of education (9–11)

In this paper, the author will describe a project for making immersive technology-based applications for East Java MSMEs, using grants from the KEMENBUDRISTEK INDONESIA Matching Fund. The object of this research was carried out on a Virtual Tour located in the English Village of Pare, Kediri.

3. Material and methods

3.1. Time

This research was conducted at CAMPUS 4 TIF PSDKU Sidoarjo, starting April 2022 – December 2022

3.2. Materials and Tools

The tools used in making the Digi-ecosmart application is

- PC Computer
- Oculus quest 2

Software

- unity
- JetBrains Rider Editor 2.07
- openXR Plugin 1.02
- Universal Rp 10.3.2
- universal UI 1.0.0
- XR interaction Toolkit 1.0.1
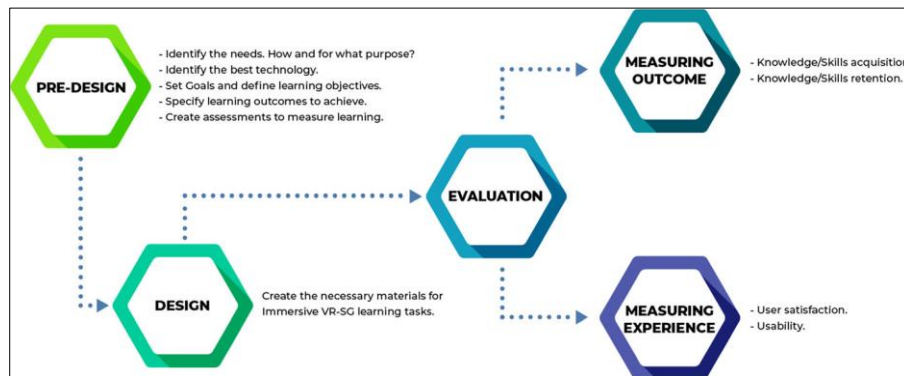- XR Plugin Management

3.3. Methods

Figure 2 Flowchart for the design and Implementation of immersive Digi-Ecosmart(12)

3.4. Predesign

Identify the needs. How and for what purpose

At this stage, the user needs are identified, what the application is built for, and the goals and benefits of the system being built are determined. This is important so that the system built is right on target, and able to provide clear benefits for users

3.4.1. Identify the best technologies

At this stage, the technology used is identified. For the development of the Digi-Ecosmart application, virtual tour technology is used in immersive technology

3.4.2. Set Goals and define learning objectives

At this stage, the determination of the goals and objectives of the system is carried out

3.5. Evaluation

At this stage, all acquired abilities are evaluated. If an immersive application system is built for learning media, then evaluation is useful to get an assessment of the user's abilities

3.5.1. Measuring Experience

User satisfaction

At this stage, the level of customer satisfaction is measured. Many methods are used to measure satisfaction, but this paper does not explain the measurement of customer satisfaction because the application being built is still in the form of a prototype

3.5.2. usability

At this stage, the ability of the application system is measured according to the objectives that have been set

3.5.3. Specify learning outcomes to archive

Specifies the results of the application system that is built. At this stage, the impact of the benefits of the system being built is determined, as the impact on the surrounding environment, especially for stakeholders related to the application system being developed.

3.5.4. Create assessments to measure learning

At this stage, testing is carried out to measure the system being built, including the extent to which user satisfaction with the development of this application.

3.6. Design

At this stage, the materials needed to work on the Digi-ecosmart application are designed, and create the necessary materials for immersive Digi-Ecosmart,

In making the application design the Prototyping method was used to develop the application, the development steps using the prototyping method are shown in figure 2.

The software development method used on this project is prototyping, which is a systems development method in which prototypes are built, tested, and then reworked as necessary until acceptable results are achieved from which a complete system or product can be developed. This model works best in scenarios where not all project requirements are known in detail in advance. It's an iterative, trial-and-error process that happens between the developer and the user. (13)

As explained above, the method used in this research is Prototyping. The system development stage includes system requirements analysis, system design, evaluation of system design, system coding, and testing of the alpha version of the system with system developers. The method used in making this system is a prototype. The flow of the prototype method is shown in Figure 2.
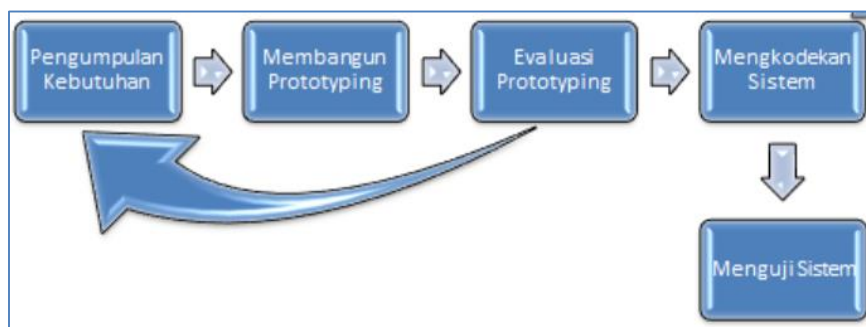

Figure 3 Prototyping Methods

The choice of this prototype method is because in the process of designing a complex Digi Ecosmart system an evaluation stage is needed so that at the coding stage the system becomes easier (14).

3.6.1. Requirements Gathering

The needs-gathering stage is carried out by observation, interview, and documentation techniques. Observations and interviews were carried out by the Jember State Polytechnic team with PT. NIT is a partner in Matching Fund Grants. This requirement gathering is carried out to obtain information about the actual state of the object to be visualized in the Digi-Ecosmart Virtual Tour application. This activity was carried out in the English Village of Pare Kediri.

3.6.2. Building Prototyping

The prototyping building stage is carried out using an image processing application.

3.6.3. Prototyping Evaluation

The prototyping evaluation stage is carried out to test the results of the prototype that has been developed. This is to ascertain whether there is still a need for changes to the initial design before the system coding stage is carried out.

3.6.4. Encoding System

The coding stage of the Digi-Ecosmart application was built using Unity Pro Builder. The coding of this system was carried out according to what had been designed during the prototyping development stage.

3.6.5. Testing the System

The system testing phase was carried out on English Village MSME users, and PT.NIT
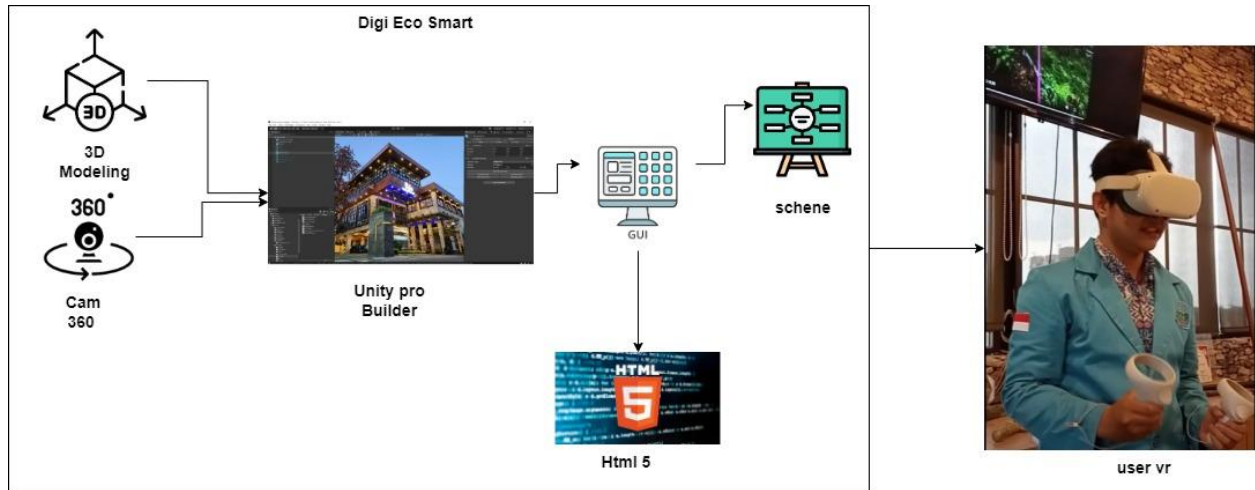

Figure 4 System Design of Digi-Ecosmart

Evaluation

At this stage, it is divided into 2 activities, namely measuring outcome, and measuring experience

- Measuring Outcomes
- Knowledge/skill acquisition
- knowledge/skilletention

At this stage, all acquired abilities are evaluated. If an immersive application system is built for learning media, then evaluation is useful to get an assessment of the user's abilities

- Measuring Experience
- User satisfaction

At this stage t, the level of customer satisfaction is measured. Many methods are used to measure satisfaction, but this paper does not explain the measurement of customer satisfaction because the application being built is still in the form of a prototype

3.6.6. usability

At this stage, the ability of the application system is measured according to the objectives that have been set

4. Result and Discussion

At the implementation stage, according to the flow of application development using the Prototyping method in the method section above, this application development activity is carried out with the Predesign, Design activity stage which includes making a prototype according to Figure 5 followed by an evaluation.
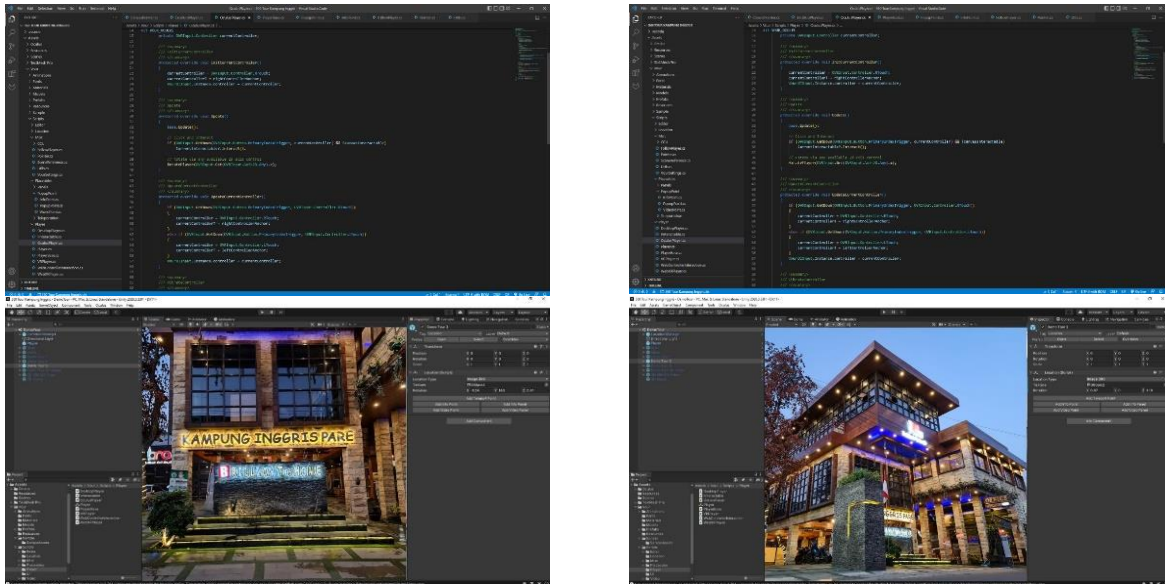
Figure 5 Sourcecode Digi-Ecosmart

Figure 5 above shows the Digi-Ecosmart source which was built using the Unity application

Figure 6 Implementation and Testing Digi-Ecosmart

Figure 6 shows the implementation and testing of the Digi-Ecosmart application, which was carried out at the Computer Laboratory of Campus 4, Jember State Polytechnic.

5. Conclusion

After carrying out this research activity it can be concluded that:

- Applications based on immersive technology are very useful for Sidoarjo SMEs

Suggestions

After carrying out this research, the authors suggest the following:

- Testing and developing this immersive technology application system for other objects, not only in the field of education but also in the field of business economics, and the fields of defense, law, and construction
- Applications based on immersive technology should be applied to industries that have high risks, high costs, and large investments.

Compliance with ethical standards

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