Design of geographic information system for tracer study

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Abstract. Geographic information systems are a computer-based information system that uses spatial data and provides information about survey results, conducted by Tracer Study. The aim of this article is to design a geographic information system of tracer study in which it can present job vacancies' information needed by the alumni and data of alumni's feedback (such as job-searching, work environments, college contributions, and utilization of competence acquisition during lectures) needed by the universities. The methodology used in this article is an object-oriented methodology with Unified Software Development Process (USDP) approach as well as Unified Modelling Language (UML) modelling, in which this article is limited to the stage of the design model. The result of this research is a concept of geographic information system of tracer study that is needed to accommodate the needs of alumni's job-searching and to facilitate Tracer Study in universities.

1. Introduction
Geographic information systems (GIS) are a computer-based information system designed to work with data that have spatial information (spatial reference) [1] [2]. This system captures, checks, integrates, manipulates, analyzes, and displays data that spatially reflect the conditions of the earth. GIS is part of Information technology, information technology is a technology that has helped people performing their tasks quickly and appropriately [3] [4] [5] [6] [7] [8]. Tracer study is an illustration of the condition of works being undertaken by the alumni at the present (how the alumni get their job, the contribution of the lectures to the job, the image of the ideal job, the image of the work environments, and the condition of the alumni after graduation -whether they immediately get a job or vice versa, as well as the contribution of the college in some of the competencies taught in the lectures) [9] [10]. A college needs to have a Tracer Study application because it requires feedback from its alumni in order to improve education systems and management. These input, condition, and motivation determine a college to apply education systems and management with a pattern or a process of teaching and learning, research, practice, curriculum, workshops, laboratory, studio or research [11].

There are several research related to Geographic information systems and tracer study. The first one explained the concept of tracer study in the career center of Sekolah Tinggi Teknologi Garut [12] [13] [14]. The second one investigated tracer study in Universitas Negeri Semarang with digital maps application [15]. The third research described an Android-based SIG of Educational Attractions in DKI Jakarta [16]. The fourth one analyzed Geographic Mapping of Agricultural Land and Crops of Kudus Region [17]. The next one is about the development of a spatial decision support system for flood risk management in Brazil [18]. The last one described the condition of tracer study in Kalinga-Apayao [19]. The research explaind the concept of tracer study and geographic information systems in some areas. In
contrast, this article focuses on designing a concept of geographical information system of tracer study in Garut, especially in Sekolah Tinggi Teknologi Garut.

The aims of this article is to accommodate the needs of alumni’s employment, in which the alumni, who are working, are expected to help other alumni who have not get a job. As for the university, this application can accommodate the needs for tracer study.

2. Methodology
The methodology used in this study is USDP (Unified Software Development Process) which is one of system development methods or software that uses programming languages with object-oriented programming algorithm, that uses UML (Unified Modelling Language) as its main tool [20].

In the USDP method, there are several application-making processes with 5 phases: analysis model, design model, development model, implementation model, and testing (figure 1).

![Figure 1. The use case of driven software engineering model [20].](image)

With the following stages: First, the analytical model is to refine and specify the definitions of each use case. Second, Design model is a design that defines the static structure of the system such as subsystems, classes, and interfaces as well as their respective relationships within the framework of the system or software being developed. Third, The Deployment model is to define computer nodes physically and to map each component to each node of the existing computer. Fourth, The implementation model implies loading the components (representing codes in a particular programming language chosen) and mapping the classes to the components. Fifth, The test model is to describe cases and test procedures whose purpose is to verify the resulting software by seeing and verifying whether each use case has been implemented consistently with the main functionality involved.

3. Result and discussion
Based on literature studies and existing theories, WBS (work breakdown structure) is structured by following the steps in the USDP method as in figure 2.

![Figure 2. WBS (Work Breakdown Structure).](image)
3.1. Model analysis.
Model analysis is the first stage of building software in which all the needs of the users will be identified in order to describe it into the use case diagram. This is because the users are an actor who is directly involved with the application program. After conducting the analysis phase, it will be modelled with the identified actor so that it will support the running of the designed system.

Future system facilities are required for several facilities, such as; Search facility to find out the location of Alumni’s workplaces on maps connected with Google maps, Advanced search facility for finding tracer data, statistic facility for identifying the distribution stats of the tracer spots per region linked to Google maps, Admin page facility for processing data and updating information, Alumni page facility for inputting data tracer questionnaires, and Information page of job vacancy facility filled by alumni if there is a job vacancy available at their workplaces.

Actors who are involved in the future systems are Alumni (they will have to; Provide information of self-data to the system (Sign Up), Sign In, View and fill out the questionnaire according to the circumstances present, See the results of the questionnaires that have been filled, Update the questionnaire data if there is any changes in the data, and Fill in the job vacancy if it is available in the workplace) and Admin (which will be Managing sign in, Managing alumni data, Managing admin data and Managing job vacancy data ). Figure 3 is the design of use case diagram for application of tracer study.

![Use Case Diagram of Tracer Study Application](image)

**Figure 3.** The use case application of tracer study in STT-Garut.

3.2. Design model
After creating the use case diagram of the tracer study application, the next step is to create an activity diagram to clearly model a graphic of the steps or every process or activity that is engaged. Figure 4. Is an activity diagram of sign up in the tracer study application?
The class identification stage in a system or application that creates a class is based on the use case diagrams and activity diagrams that are implemented with the sequence diagram in the previous stage. The following classes which are included in the tracer study application are Users, University, Alumni, Tracer, and Tracer_detile. Relationships between classes can be seen in figure 5.

The final result of the implementation process of GIS RISTI as figure 6 and the layout concept in figure 7.
Figure 7. The layout concept of geographic information system of tracer study.

3.3. Discussion
The primary purpose of this study was made a design of geographic Information System for Tracer Study, earlier research made Geographical Information System Alumni Mapping [21].

4. Conclusion
The analysis and design of geographic information system of this tracer study resulted in the concept of geographic information system of tracer study that can accommodate the needs of the alumni and the university.

This concept will make the alumni get a job easier and will facilitate the university’s tracer study. Furthermore, this concept is also recommended for universities that do not have the concept of sig tracer study, especially universities that do not have tracer study

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