Designing indonesian teacher engagement index (itei) applications based on android

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Abstract. Teachers who have a good level of engagement will be able to produce students who engage and excel. Level of national teachers' engagement needs to be a reference to the level of educational success and equity of national education. The spread of geographically inaccessible Indonesian teachers is a barrier to these measurements. ITEI Android application developed by analysing the geographical problem, so that each teacher can participate wherever they are. The ITEI app is designed by implementing Android on the client side and load balancer on the server side. Android ITEI will feature a number of questions questionnaire to teachers. Meanwhile, the load balancer will distribute the answers to each server for processing. Load Balancer ensures fast data processing and minimize server failure. The results of the processing on the server will be sent back to Android in the form of profiling themselves ITEI teachers. While the data obtained and stored in the server can be used to measure the level of national teachers' engagement. The result of this research is the design of ITEI application ready to be implemented in order to support the data collection process of national teachers engagement level.

1. Introduction

Teacher development efforts in Indonesia has strived so well by the Indonesian government through the Ministry of Education and Culture of the Republic of Indonesia. The basis for developing such coaching efforts is preceded by performance measurement and teacher competency testing each year. But if we look at the implementation of the measurement, there is a suspicion that the measurement of performance only contain questions that measure a norm that should be done by teachers, but do not measure the performance of each teacher what should be done (process) through established standards [1]. The same is true in terms of taking an approach in measuring teacher competence. In examining the competencies that are routinely performed by the government, it is suspected that testing of teacher competence is limited to test his mastery of learning theory, how to become a teacher, how to run the profession as an educator, how to teach, and others.

Teacher competence testing is not measured up to measure the capacity aspect of the taught science field and its qualifications as a teacher and educator [2]. The meaning, the two facts of the measurement approach (teacher performance and competence) are not designed to have a profile that impacts the
actual size of a professional teacher, a self-developed teacher that can impact learning. Indeed the results of the measurement of the performance and competence of teachers throughout Indonesia has been implemented is the basis for the Ministry of Education and Culture of the Republic of Indonesia to provide educator profession allowance to the teachers. But the facts on the ground show that the two measurements seem to be an additional burden on teachers, resulting in not increasing capacity, but decreasing the capacity of teachers. Measuring the profile of Indonesian teachers through performance and competence instruments is a good concept and step, but if the concept is top down, it will be a heavy burden for all actors both government and teachers themselves. For that ITEI a new solution that is the concept of measurement that is not just measuring the performance and competence by way of self-assessment through the Android based Apps.

The Indonesian Teacher Engagement Index (ITEI) is an instrument that provides a new alternative to a measurement approach of teachers as adults are to build self-measurement through self-evaluation as a form of humanizing an adult human. Basically, an adult who works as a teacher-educator, in himself, wherever the teacher is, what his or her existence is, is the form of the totality of the profession as an educator. The condition of the adult teacher is, in fact, able to build his own positive psychological condition (healthy), able to give the meaning of education that always have success and positive, have high performance, able to develop basic competence as the main requirement of a teacher, able to show Character of nationality based on Pancasila values and shows itself as a teacher who is not only a leader in the school and local duties but himself as a teacher throughout Indonesia (nationalism leadership engagement). [4] - [10]. [2] The ITEI-based App approach is what will enable teachers to introspect their professions, which ultimately improve what teachers have to do for the improvement of their profession, performance, competence, As well as its leadership that reflects Indonesian teachers (not teachers who are limited only in the duties of devotion in their respective schools).

Because the nature of ITEI is to evaluate oneself as one form of introspection of the teacher's self-achievement, the necessary tools are privately owned by the teacher inherent in his gadget. This form of self-introspection not only shows the score or its value but ITEI Apps is developed up to the suggestion of intervention through artificial intelligence that serves to help teachers in developing themselves according to priority. Thus, with ITEI apps this is not just performance and competence but includes building the character of teachers as educators in total (engagement).

ITEI Apps is a representation of the rapid growth of information technology that influences the way humans collect, process and share their information as teachers/educators to the wider community. This growth is supported by the implementation of the Internet in almost all teacher activities throughout Indonesia. This includes supporting mobility with available online bookings such as Uber, and Grab or as an information technology [11] which uses information technology to facilitate the search for boarding. If it refers to the statistics that can be derived from [12] Internet user activity is dominated by the workers/entrepreneurs as much as 82.2 million (62%) of the total 132.7 million Internet users in Indonesia by 2016. Internet is accessed bigger in smartphone than others. Total internet smartphone is 89.6 million (67.8%). Referring to data shown on [13] since 2011 smartphone with Android operating system is the most widely sold operating system in the market [14].

Information technology is also used in the field of education, which in this study focuses on the use of information technology for the profiling of Indonesian teachers to see the teacher's engagement level as it is based on research [15], [16] the engage teacher proved able to produce students who are engaged and have achievement Which is good [15], [17], [18]. This study was designed using information technology in collecting data from each teacher from all over Indonesia, doing data processing in accordance with ITEI benchmarks, and distributing and displaying the results to the teacher. Processed data is also used by related parties as a measure of teacher engagement based on school, city, to the provincial level. However, this study will only focus on the design of Android ITEI applications to be built.

The process of measuring the engagement of Indonesian teachers is still done manually and cannot reach all Indonesian teachers. If you want to make teacher engagement measurements, it is usually only done if there are national high-level teachers or special teacher meetings. This process takes a long time, this is because the task is still done by filling out the questionnaire on the paper which for processing and processing the data takes a long time, the two geographical Indonesia wide so that required cost and proper scheduling when will do data collecting, third Data validation is still manual by checking data
one by one. That's why an application is needed that can accommodate the teacher's engagement measurement needs by solving the problem.

The Ministry of Education and Culture of the Republic of Indonesia noted that there are 2,926,565 teachers spread across 216,666 schools across Indonesia [19]. It takes a long time to collect data and profiling throughout the teacher. With the Android-based ITEI application will facilitate in collecting data from all teachers and with high server capacity will perform the process well and correctly.

The ITEI application was developed based on six main dimensions of ITEI, namely the positive psychology dimension, the positive education dimension, the dimension of good performance, the teacher competence dimension, the dimension of national character, the dimension of nationalism leadership engagement. Each ITEI dimension has an indicator and each indicator has an item. This item will be presented in the form of an assessment quiz to the teachers, where teachers will provide answers following the Likert scale (1-4-) for each question.

![Figure 1. (a) ITEI Architecture; (b) Android ITEI Application Work Flow](image)

Teachers can access the questionnaire material through Android smartphones, the process on ITEI described as in Figure 4 before filling out the questionnaire needs to be authenticated first. This authentication is used as the identity of each teacher. Teachers are required to log in using google account which by default is used on Android smartphone, Figure 2a. After login, the teachers are then asked to fill in self-data in the form of school origin, school location, educational status and employment status, Figure 2b. The application will not solicit or record Master Master's data as well as Teacher Name, this is done to ensure the confidentiality of teacher's data and comfort when filling out the questionnaire. After the data has been submitted successfully, it will display questionnaire questions consisting of fifty-four total questions, Figure 2c. The answer to the questionnaire will be processed following weighted index weighting rules. Weights based on the weighted index are selected because each dimension has a different level of importance [20].

Using Internet data and teacher questionnaire answers will be sent to the server as shown in Figure 1a. On the server side is implemented load balancer to ensure the traffic input from all Android ITEI smartphones can be processed correctly and data processing time is fast. A load balancer is a tool that acts as a reverse proxy, to efficiently distribute all the incoming network traffic to a number of backend servers where each backend server is a cloning of a server application. Cloning this server usually called an instant server [21] - [24]. Access and manipulation of the same database in an effort to ensure the data accessed on Android ITEI is on the backend server and is real-time data Figure 1a.

Teacher self-data, answers questionnaire, and the results of data processing will be stored on the database. The Database used is a relational database that is MySQL. Selection of this database because Android ITEI applications require data storage in a structured table. Each data has a special identity
where the value should not be the same as other data, this identity is called the primary key. Similar data will be grouped in the same table. When one table requires another table for the two tables it will communicate using a foreign key in the destination table [25].

![Figure 2. Android ITEI Application: (a) Login Page; (b) Entry Personal Data; (c) Filling Questionnaire; (d) Personal Profiling](image)

The results of data processing performed on the server then sent back to the Android smartphone each teacher. The app on Android will generate a self-profiling graph of self-profiling, Figure 2d. Each point represents the six dimensions of ITEI, and the results obtained will be displayed in the average value of each rib. In addition to display profiling, ITEI calculations are also displayed conclusions that can be drawn from the results of these calculations.

2. Research Methods

The current research focuses only on designing ITEI application architecture including server design, database, and Android ITEI application display. This research follows the method of waterfall development. The waterfall is a sequential application development model [26], [27]. The stages consist of requirements definition, system and software design, implementation and unit testing, integration and system testing, and operation and maintenance [26]. The waterfall motive ensures the need for software to be developed is well defined, clear and each sequence is sequentially done. This method is quite easy to implement and well documented [27] - [30]. The designs were based on study literature from various sources using the same techniques as this study. From the five stages in a waterfall, research on this paper only until there is a second stage, system and software design.

Requirements definition is done in two stages, the first stage by first validating questionnaire question as many as 165 questions with answer choice 1 - 4. Of the 165 questions validated to the experts in the field of education and outstanding teachers, then generated twenty-eight questions the final questionnaire, which are grouped into indicators and dimensions. At this stage also determined the weighted index of each dimension and indicator, which will determine how data processing and teacher profiling conclusion. The second stage is the collection of needs related to the application. Based on data recapitulation on [19] required client server applications that can manage all data and display profiling results without the risk of server down. At this stage, it is also concluded that the teacher can only perform a one-time profiling, using a certain identity, not including Master's Number or Master's Name. By using this identity the teacher can re-login and see the profiling results in the future.

System and software design is the design stage of ITEI system architecture and software as a whole. The architecture of the ITEI system follows Figure 2a, where after the teacher completes the questionnaire the data is not directly sent to the server, but must first through the load balancer. The load balancer will divide equally all incoming traffic to each server and each server will access the same database. The next design is database design. This database has eighteen tables that relate to each other using a certain key. ITEI software in the form of Android ITEI application interface design in accordance
with the collection needs to be done in the previous stage, designed as in Figure 3. With the application steps as in Figure 2 that has been described in the previous chapter.

3. Discussion

The ITEI Android app was developed to facilitate the measurement of Indonesian teachers' engagement. Questionnaires will be grouped into six dimension groups. Teachers are asked to answer each question by choosing between 1-4. After the teacher answers twenty-eight questions, all data and answers will be sent to the server. On the server will be done processing answers by grouping answers based on dimensions.

The ITEI server application will calculate the average value generated in each dimension. Then the average value will be multiplied by the weight of each dimension in Table 1. The final value obtained in each dimension will be stored in the database. The ITEI server application sends two analytical values to the ITEI Android app; First the end result of each dimension will be used as the value to be displayed on the self-profiling chart as shown in Figure 3d, the two results of the analysis of the narrative obtained by mapping the final value of the dimension where if the calculation value is approaching four then the teacher's engagement level on the dimension the more positive.

| Table 1. Weighted Dimensions of ITEI |
|-------------------------------------|
| Dimension | A   | B   | C   | D   | E   | F   |
| Weight    | 0.108 | 0.343 | 0.199 | 0.17 | 0.087 | 0.092 |

Implementing load balancers on the server side ensures the server process will not be hampered despite large data processing since load balancer will share the incoming traffic to each server equally. And when it was discovered that there was a full load of data processing on each server, the load balancer would automatically create a new server instantiation to handle the processing of new data. Thus the entire input data can be processed properly.

4. Conclusions

The ITEI Android app will facilitate the process of collecting Indonesian teachers' engagement data without geographical limitations because the Android ITEI app can be accessed anywhere and data processing can be done as long as the smartphone has an Internet connection [31]. Data processing on the server will be easier and faster with the load balancer. With the help of this tool will minimize the occurrence of server processing failure. The results of data collected from all Indonesian teachers can be used by stakeholders as a consideration for the development of Indonesian teachers. However, for the next development, it should be noted also to reach teachers who do not use Android smartphones. In addition, stress testing is required to prove load balancer resistance in processing multiple data simultaneously, to ensure that the server is eligible for national use.

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