

# IMPLEMENTATION OF EDUCATION 4.0 THROUGH DIGITAL-BASED SCHOOL ADOPTIVE ASSESSMENT APPLICATIONS

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## Abstract

Educational institutions are open systems that are required to adapt to the development of science, technology, art, social, economic and industrial developments. An industry that underwent a revolution until the birth of the Industrial Revolution 4.0 which was marked by IoT (Internet of Things), big data, and artificial intelligence. School Adoptive Assessment as a series of ability testing activities and processes carried out in schools to acquire, assimilate, transform and utilize knowledge to produce dynamic school capacity. This study aims to develop a digital application based on an android-based model for assessing school absorptive capacity in implementing education 4.0. The result of this research is the creation of an Android Application for the School Absorptive Capacity Assessment Model in the Application of Education 4.0. This study uses research and development methods. The implication is that the entire community in the school environment will directly and transparently receive and obtain results in order to improve the quality of human resources.

**Keywords:** Adoptive Assessment, Implementation of Education 4.0, School-Based.

## 1.0 INTRODUCTION

The rapid development of information technology demands changes in educational institutions and demands digital-based learning and educational management of educational institutions that are always creative and innovative. Teaching staff are required to be able to adapt to these technological advances. Android smartphone-based learning is a variation of learning models in the world of education that are in accordance with the needs of today's students, because the content of Android smartphone applications can be adapted to the subjects being studied. The Industrial Revolution 4.0 requires educational institutions such as schools to make adjustments. The form of adjustment in learning is using e-learning, Pentahelix ecosystem of education and blended learning as the implementation of education 4.0. Because Android-based mobile learning in learning strategy courses is a product that has been developed. (Ningsih & Adesti, 2019). Education plays an important role in developing human resources to be capable of making changes and generating ideas in learning. (Novaliendry, Darmi, Hendriyani, Nor, & Azman, 2020)

The problem is that teaching staff need to master knowledge and skills in utilizing digital media, such as communication tools, internet networks and so on, think critically with scientific communication and innovate. There has been remarkable and mind-blowing improvement in innovations by man. This includes a rapid improvement in information and communication technology (ICT); which provides unique and inventive opportunity for improvements and changes in teaching and learning. (Mfreke Umoh & Basseyy, 2020)

Why is that a problem because of limited human resources, especially teaching staffs who are over fifty years old. Human Resources (HR) is the most important asset for an educational institution. Competent human resources are able to utilize the resources of the institution or institution. To see the competence of human resources in an institution, mapping analysis is needed (Dr. Asnaini, Fatimah Yunus, & Miko Polindi, 2020) optimal competence in order to achieve the vision and mission that has been formulated.

What problems will be solved by teaching staff must utilize the learning process in digital form because in this 21st century, teaching staff are only facilitators who provide teaching materials. With the development of science and technology that continues to grow, teaching staff are required to be innovative and creative in learning activities, as well as utilize existing technology to advance these learning activities. The determinants of 21st-century skills and 21st-century digital skills. The following skills are investigated: technical, information, communication, collaboration, critical thinking, creativity, and problem-solving skills. (van Laar, van Deursen, van Dijk, & de Haan, 2020) One of the main lessons from history is that new technology results in new ways of working, in order for the benefits of the technology to be fully exploited. This lesson applies as much to teaching in higher education as it does elsewhere, although it is taking some time for this lesson to be fully appreciated. Thus we have had technology added to classroom teaching without changing the fundamental methods of teaching, such as PowerPoint slides to support lectures, and this has merely added costs without noticeable benefits in terms of learning. (Bullen, 2015)

Why is it important to discuss because the teaching staff is the core force in the teaching and learning process in producing quality students (Malik, 2018). In this case, educators have a very important role in guiding, directing, and educating students in the learning process, therefore a competency standard for teaching staff is needed in the implementation of digital-based 4.0 education. The converging impact of globalization, ICT and knowledge explosion has led to phenomenal changes in the modern society, which have challenged every aspect of our modern lifestyle, especially in the world of education.

How to solve problems, every teaching staff must have the competence to innovate and understand the development of information technology highlight the problems related to the development of professionals involved in the field of educational technology, defining a series of new professional roles, skills and competencies acquired to respond to the job market demand in this field. A referential model for the staff involved in the development of networked based courses or activities is also defined in the course of this paper in order to cover all the necessities of a networked-based course development. (Pettenati, Giuli, & Abou Khaled, 2001) The reason for this research is because 21st century learning is a learning transition where the curriculum developed leads schools to change their learning approach from teacher centred menjadi student centered. Related to this, this study is aimed to investigate the learning needs analysis on learning that will be used as an input to syllabus and material planning, to lesson planning and classroom instruction practice so that objectives and programs offered to learning. (Emaliana, 2017) This is in accordance with future demands where students must have the skills to think and learn. The 21st Century Skills that must be possessed by teaching staff is:

patience and persistence, understanding science and technology developments, creative thinking, and virtual world management. Technology has made profound changes in twenty-first century business and everyday life, but most educational systems operate much as they did at the beginning of the twentieth century. While contemporary business and social practices engage people in collaborative efforts to solve complex problems and create and share new ideas, traditional instructional and assessment practices require students to work individually as they recall facts or perform simple procedures in response to pre-formulated problems within the narrow boundaries of school subjects, and often they do so without the aid of books, computers, social networks, or other resources. School work is shared with and judged by only the teacher and there is little feedback to the student or opportunity for revision. (Emaliana, 2017). Teaching staff must have the skills of patience and persistence in dealing with the various traits and personalities of students.

Research contributes to filling the gap by producing a smartphone-based Adoptive Assessment application to measure the ability of teaching staff and can be followed up immediately by looking at various things that need to be improved... Mobile devices such as laptops, personal digital assistants, and mobile phones have become a learning tool with great potential in both classrooms and outdoor learning.(Sung, Chang, & Liu, 2016).

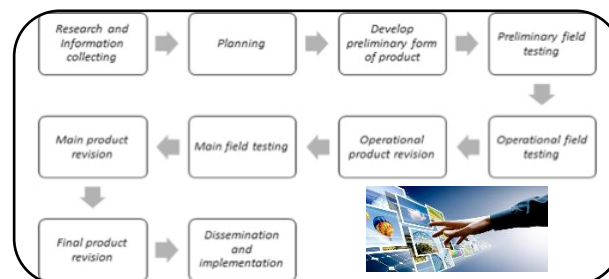
Methods to be used This study uses research and development methods with a sequence of stages, namely: (1) analyzing the assessment model to be developed (Maba & Bagus Nyoman Mantra, 2017); (2) developing the initial model (Hartono & Tedja, 2019); (3) validation and revision (Brauns & Abels, 2021); (4) small-scale field trials and model revision (Aryanti, 2018); dan (5) large-scale field trials and revision of the final model (Iyakrus, Sugihartono, Hartati, Usra, & Arizky, 2021). State of the art Based on the analysis of Scopus indexed journals from 2016-2021, it is known that there are at least 200 journal articles that discuss absorptive capacity in the context of business organizations or public organizations outside of school. While the journal with the theme of absorptive capacity in the context of new schools contained 4 articles, but the four articles did not discuss the absorptive capacity of schools in the implementation of Education 4.0. So that this article is novel, and has a significant contribution to the field of education management science. School Digitization is a new breakthrough in the world of education by utilizing the development of information technology in various aspects of teaching. School digitization can facilitate the teaching and learning process because students can access all teaching materials or exam materials in a system that is connected to the internet. To contribute to educational research and practice by understanding digitalization and digital transformation through educational theory. The approach to the research problem was first to theoretically define digitalization and digital transformation in schools in terms of human learning and development. This perspective suggested that digitalization may be a requirement for digital transformation but not an enabler.(Siljebo, 2020) The proposed innovation is to increase digital literacy skills through the use of smartphone-based Adoptive Assessment applications to produce teaching staff resources (Bidin & Ziden, 2013) intelligent people will be able to think critically in solving problems (Piotrowski, 2013) as well as creative and innovative at work (King & Anderson, 1990). So that an important skill that must be mastered by future teachers in facing 21st century

education is the digitalization of learning. The research objective specifically is to develop a Digital-Based School Adoptive Assessment application so that it can be implemented in educational institutions in Indonesia. (Manuel et al., 2021). The development of information technology today is unavoidable, including in the world of education. Education and information technology should be in line in order to create quality education.

## 2.0 RESEARCH METHODOLOGY

The research method used in this research is research and development, which is a process used to develop and validate products used in education and learning. The use of this method is because it is able to address real and urgent needs (real needs in the here-and-now) through developing solutions to a problem while generating knowledge that can be used in the future, being able to produce a product/model that has a high validation value. (Thacker et al., 2004), because through a series of field trials and validated by experts, it encourages a continuous process of product/model innovation so that it is hoped that models/products that are always up to date with current demands will be found and are a liaison between theoretical and field research. Model development steps:

**Figure 1: Digital-based Model Development Steps**



(1) Conduct preliminary research by utilizing all literature related to the theme;

This first step includes needs analysis, literature study, literature study, small-scale research and required reporting standards. To conduct a needs analysis, there are several criteria related to the urgency of product development and product development itself, as well as the availability of competent human resources and sufficient time to develop. The literature study was carried out for a temporary introduction to the product to be developed, and this was done to collect research findings. And other information pertinent to the planned product development. While small-scale research needs to be done so that researchers know a few things about the product to be developed.

(2) Planning in the preparation of the application by utilizing the information obtained in previous research so as to add insight into the update.

Develop a research plan, including the capabilities needed in conducting research, the formulation of the objectives to be achieved with the research, design or research steps, the possibility of testing in a limited scope.

**Figure 2: Application planning process (Ayu, 2022)**

(3) Developing the initial model is a process of translating concepts from the plans that have been built, this step is an effort to produce an overview of the Adoptive Assessment application.

This step is a limited product test, namely conducting an initial field test of the product design, which is limited in nature, both the substance of the design and the parties involved. Initial field tests were carried out repeatedly in order to obtain a feasible design, both in substance and methodology. For example, this test was conducted in 1 to 3 schools, using 6 to 12 test subjects (vocational teachers). During the trial, observations, interviews and questionnaires were distributed. Collecting data with questionnaires and observations which are then analyzed.

(4) Conducting initial field trials (test by experts);

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(5) Make a revision based on the results of the initial field trial (expert test);

This step is an improvement of the model or design based on a limited field test. Improvements to the initial product will be carried out after limited field trials have been carried out. At this initial product refinement stage, more is done with a qualitative approach. The evaluation carried out is more on the evaluation of the process, so that the improvements made are internal improvements.

(6) Conducting limited field trials;

This step is a more product test, including product design effectiveness testing, design effectiveness testing (generally using a repetition model experiment technique). The result of this test is that an effective design is obtained, both in terms of substance and methodology. This sample test, for example, was conducted in 5 to 15 schools with 30 to 100 subjects. Collecting data on the impact before and after product implementation using a special class, namely quantitative data on the appearance of the test subject (vocational teacher) before and after using the tested model. The results of data collection were evaluated and if possible compared with the comparison group.

(7) revise the model of the limited field trial results;

This step is a product improvement based on the results of the field test based on the input and the results of the main field test. So this improvement is the second improvement after conducting a wider field test than the first field test. The improvement of the product from the results of this wider field test will further strengthen the product being developed, because the previous field trial stage was carried out with a control group. The designs used are pretest and post-test. In addition to internal improvements. This product improvement is based on the evaluation of the results so that the approach used is a quantitative approach.

(8) conduct large trials;

This step should be carried out on a large scale, including testing the effectiveness and adaptability of the product design, and testing the effectiveness and adaptability of the design involving potential users of the product. The results of the field test are in the form of a design model that is ready to be applied, both in terms of substance and methodology. For example, this test is conducted in 10 to 30 schools with 40 to 200 subjects. Tests were carried out through questionnaires, interviews, and observations and the results were analyzed.

(9) Final model revision; and

This step is a refinement of the product being developed. Improvement of the final product is deemed necessary for more accurate products developed. At this stage, a product has been obtained whose effectiveness level can be accounted for. The final product refinement results have a reliable "generalization" value. Improvements are based on input or the results of a feasibility test on a wide scale.

(10) Disseminate the model.

Dissemination and implementation, namely reporting products on professional forums in journals and implementing products in educational practice. Publishing products for commercial distribution or free for use by the public. Product distribution must be done after going through quality control. In addition, monitoring of the use of products by the public must be carried out to obtain input in the framework of controlling product quality.

The research procedures to be carried out are:

- (1) Analyze the model to be developed;
- (2) Developing the initial model;
- (3) Validation and revision;
- (4) Small-scale field trials and model revisions; and
- (5) Large-scale field trials and revision of the final model.

Data collection techniques in this study used literature studies, interviews, and questionnaires. Data processing uses quantitative and qualitative data analysis. Quantitative data analysis includes analysis of descriptive data (frequency, mean, median, mode, percentage, standard

deviation) and analysis of test instruments (validity and reliability of assessment instruments), collecting, display, reduction, and conclusion.

The research subjects of this research are:

- (1) IT expert in education management;
- (2) State vocational high school teachers in East Jakarta; and
- (3) State vocational high school teachers in DKI Jakarta.

### **3.0 RESULTS AND DISCUSSION**

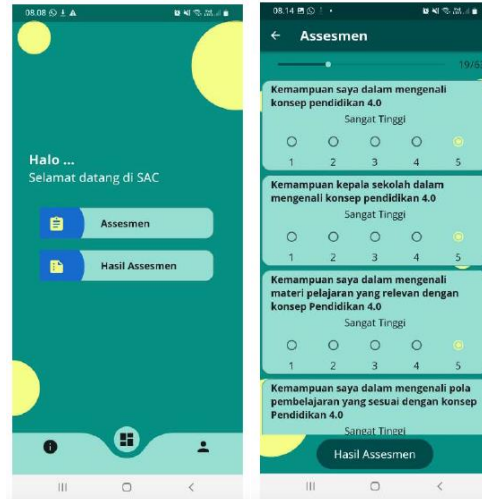
The application of the Android Application for the Absorptive Capacity Assessment Model for Schools in the Implementation of Digital-Free Education that has been obtained is:

1. A study of the application concept to be developed for the Android Application of the School Absorptive Capacity Assessment Model in the Application of Education 4.0.

In the in-depth study there is a need to provide an understanding of the concept and application of School Adoptive Assessment in conducting competency tests. The existing learning techniques and methods have shifted from the traditional pattern that is teacher center to technology-based learning that places vocational students as the main learning. The era of mobile learning based on the use of the internet as a learning tool has given teachers a greater role as facilitators and motivators of learning. Teachers at the vocational level must be able to create and develop mobile learning content because at this time such media are in demand and widely used by students in their daily lives. Teachers can develop mobile learning devices by following drill and practice models, simulation models, tutorial models, and games models. Software tools that can be used to create mobile learning-based learning such as Web Exe, Adobe Air, Adobe Flash, app inventor, Mit App inventor, RPG Maker, and Appsgeyser (Aripin, 2018). Along with the results of the application concept study of the needs of SMK in conducting an Android-based assessment.

2. A study of the features, navigation and technical provisions of the Android Application of the School Absorptive Capacity Assessment Model in the Application of Education 4.0

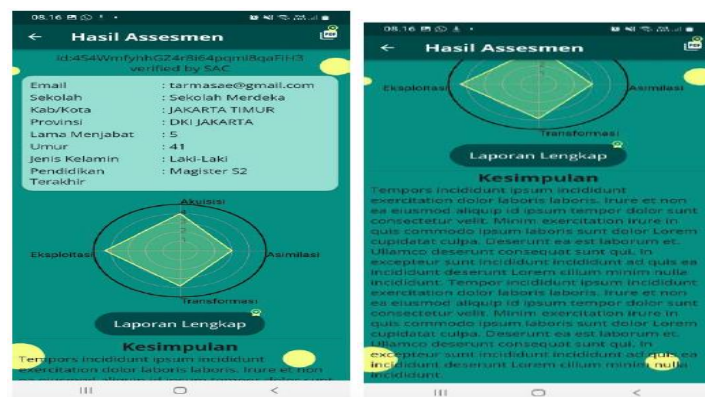
Figure 3: Android Application Features Absorptive Capacity Assessment Model



Currently, one of the most popular applications in communication technology is Android. Since Android is the most commonly used application by people compared to iOS, many people are trying to learn to modify and develop through this application. The above feature will appear after the user has finished the data input process, the user can directly fill out the assessment instrument to measure the condition of his school in terms of school absorptive capacity. The number of assessment items is 63 items with a Likert scale. This assessment instrument has passed the test phase in previous studies. The existing application features are considered important by the user and are used as a basis for making decisions in the assessment. The features of this application can be in the form of physical characteristics, functional properties, form of questions and how to answer them, font size, ease of accessing questions, colors, or other components owned by this application.

3. The creation of an Android Application for the Absorptive Capacity Assessment Model for Schools in the Application of Education 4.0 in the demo version.

Figure 4. Information on Assessment Results





Absortive Capacity Assessment Application is an Android-based application that functions to: manage device resources, such as memory and disk space. Execute applications and software. Displays the user interface. Absortive Capacity Assessment Application is an application created to conduct an assessment of vocational teaching staff. Existing applications have been conceptually tested to be applied to educational institutions, besides that this application also directly displays results in real time and provides an explanation of the results obtained as well as conclusions. So that users can find out their abilities to further improve competence in the teaching and learning process.

#### 4.0 CONCLUSION

The implementation of education 4.0 in 21st century learning requires an Adoptive Assessment of digital-based schools to determine the quality of teaching staff.

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