Smart education: educational service system for equal quality education

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Abstract. The problem of unequal quality of high school education in West Java with the viewpoint of Senior High School (SMA) due to the assessment of the quality of education in Indonesia is still focused on Students, Teachers, Principals, and Parents separately. Supposedly the assessors of high school quality are assessed based on an education service system (ESS). Research studies related to high school as an educational service are well suited to a service science approach, and the term educational service system. The ESS study discusses educational sector issues in the perspective of a service system consisting of components, functions, interfaces, component linkages, inputs, processes, and outputs. The purpose of this research is to create educational service system model to improve the quality of high school education services in West Java. Creation of ESS Model with service engineering method with stages: service innovation, service engineering, and service measurement. Output of Educational Service model System in the form of learning management system (LMS) based on Moodle. The prototype measurement result ESS model shows the efficiency of high school education service system. The research output is expected to solve the problem of equalization of high school education quality in West Java.

1. Introduction
The equal distribution of the quality of high school education in West Java has major problems, including: 1. uneven education infrastructure, 2. improving the quality of teachers, 3. distributing teachers to remote areas, and 4. administrative costs for underprivileged students. The fourth problem causes the low quality of high school education in West Java based on the data of Angka Kebutuhan Guru (AKG) 2015/2016, the province of West Java lacks the needs of teachers by showing the AKG of -102,149 (teacher shortage number of 102,149 people) and Non-Permanent Teachers 89,026 (Kompas Nov. 21, 2016). The problem of inequality in the quality of high school education in West Java is due to a separate assessment of the quality of education in students, teachers, principals, and parents. based on the 8 National Education Standards, the Educational Service System is expected to improve the quality of education, and education equity.

Smart Education is an Educational Service System with the use of Digital Technology to improve the quality of educational services, with the hope of improving the quality of education [1]. Smart Education is a term agreed upon by many researchers as an educational service system in the digital environment [1-6]. The results of the literacy study show that the Smart Education Model and Framework still have not carried out the process of validation, implementation, and measurement of the quality of the education service system model. There is the potential for high school research as an
education service system that is studied in the Service System science called the Educational Service System.

The Smart Education model consists of 3 (three) dimensions, namely; organization, technology, and learning science. Discussion of the smart education model point of view as a service system consisting of components, functions, interfaces, component relationships, inputs, processes, and outputs. The purpose of this study was to create an Educational Service System model to improve the quality of high school education services in West Java. Modelling Educational Service System refers to the smart education reference model. The output of research is the design and architecture of educational service systems based on the smart education model. The output of the research is expected to solve the problem of quality distribution of high school education in West Java.

1.1. Smart Education as Education Technology
SMART Education is an education system designed to strengthen the ability of students to deal with 21st century problems, by offering educational system innovation solutions including education, method and evaluation environment [1-6]. SMART meaning to show, self-control (learning behaviour), motivation (interest), adaptive (talent and ability), various learning resources, and utilization of an IT-based learning environment [5,7,8]. Smart Education is an IT-based education service innovation, characterized by the use of various digital media [8,9]. The development of IT utilization for education is illustrated in Figure 1 below. The researchers agreed the development of IT-based education service innovations starting in 1996 with the use of Desktop PC for education, in 2003 e-Learning was characterized by internet usage, in 2005 m-learning was marked by notebooks and PDAs, in 2010 u-learning was marked with Smartphones and in 2012 Smart Education was marked by the use of various digital media [10].

![Figure 1. Development of Smart Education.](image-url)

1.2. Smart Education and 21st Century Skill
The need to master 21st century skills, has led many countries around the world to carry out educational reforms in their countries [11]. The form of education reform is an education project that focuses on smart education. Smart education projects have been carried out globally starting in Malaysia 1997, Singapore 2006, Finland 2011, Australia 2012, South Korea 2012, United Arab Emirates (UAE) 2012, and New York 2014 [12,13]. SMART Education is an education system designed to strengthen 21st century skills, by offering innovative educational systems based on intelligent education, methods and evaluation [12,13]. SMART stands for (Self Directed, Motivated, Adaptive, Resource free, Technology embedded) has meaning, self-control (learning behaviour), motivation (interest), adaptive (talent and ability), a variety of learning resources, and utilization of an IT-based learning environment, represented in figure 2 [7].

![Figure 2.](image-url)
Smart education as an education service system consists of 3 (three) dimensions namely; 1. Organization, 2. Information and Communication Technology (ICT), and 3. Outcome / Outcomes of education [1]. Organizational Dimensions emphasize flexibility, a combination of forms of education and teaching, individualises and customises. The dimensions of ICT are intelligent education environments for the needs of integrity, interactivity, social interaction tools, and mobility. Outcome / Outcome of education is the achievement of student goals towards 21st century skills. The stages of Smart Education development consist of 5 topics, namely: 1. Development of digital books and their applications, 2. Online classes and testing, 3. Making learning environments for the security of learning content, 4. Building teaching competencies, and 5. Making IT-based education systems [10,11]

1.3. Smart Education Component
Smart education as an education service system in Figure 3, consists of 3 (three) dimensions, namely; 1. Organizational Aspects, 2. Information and Communication Technology (ICT), and 3. Outcome / Outcomes of education [11]. Organizational Dimensions emphasize flexibility, a combination of forms of education and teaching, individualization and customization. The ICT is the use of technology in Smart Education for the needs of integrity, interactivity, social interaction tools, and mobility. Outcome / Outcome of education is the achievement of students’ goals on 21st century cognitive skills, special knowledge, literacy learning, and life skills intelligence.

Outcomes / outcomes for each dimension of Smart Education are: 1. Organizations are Smart Education development strategies, 2. ICTs are Smart environments, Smart educational technologies, and Smart educational materials, 3. Education outcomes are Training of new generation of students, connected communities, and fast knowledge delivery to students.

Figure 2. Smart Education Functionality [7].

Figure 3. Smart Education Dimensions [11].
2. Methods
The methodology that we use in this research is Framework Service Engineering Based on SOA Methodology [7].

![Research Framework](image)

**Figure 4.** Research Framework [7].

Service engineering simple approach composed by three steps which are (1) identification, (2) design that consists of service process design and SOA design, and (3) prototyping that consists of develop and deploy.

3. Results and Discussion
The educational service system (ESS) model is a web-based application that supports the automation of business processes in school activities. With MoNE standards and has been adapted to the Ministry of National Education’s competency-based curriculum, it supports immersion classes, calculates & automatically evaluates and school administration reports are carried out by simply pressing buttons on the computer screen.

3.1. Functionality Design of ESS
The functionality design of ESS includes services in high schools in West Java. The examples of services in a University are illustrated below.
Detailed description of the design of ESS functionality for high schools in West Java as follows:

a. New student Admission
   The module that supports the new student admission process, starting from the registration of prospective students to the list of students received and distributed in the class, the PSB module

b. Student
   - Student Data
   - Class Management
   - Student Mutation
   - Class Attendance
   - Counselling guidance
   - Intra / Extra School Activities
   - Competition
   - Scholarship
   - School Fee Payment
   - Alumni
   - Control & Configuration

c. Academic
   - Academic Calendar
   - Curriculum
   - Teaching Schedule
   - Teaching and Learning Activities / Academic Activities
   - Finalization of Teaching and Learning Activities
   - Student Academic & Non Academic Achievement
   - Specialization / Majors in Study Programs
   - Control & Configuration

d. Online Library
   - Online catalogue
   - Booking
   - Loans & Returns
   - Sanctions & Fines
   - Membership
   - Inventory

e. Other Application Modules
   - Accreditation
   - Finance & Payroll
   - Asset Management
   - Employment
   - Internal Portal

Figure 5. Functional design of ESS
3.2. ESS Architecture

The ESS architecture for Smart Education is illustrated in the picture below.

![Smart Education Architecture](image)

**Figure 6.** Smart Education Architecture.

The computing service system for Smart Education, carried out an approach to the service computing system (Service Computing System) in the science of Computing Services. Service computing is a scientific discipline that bridges the gap between IT (software service) and organizational business services [14], for this study business services are learning services on Smart Education. The implementation of the computing service system for Smart Education is carried out based on the service computing system model divided into 4 (four) main parts, namely:

1. Learning service model for Smart Education;
2. Application of service technology (web services, service-oriented architecture) for Smart Education,
3. IT Architecture for Smart Education, and
4. Analysis methods and optimization of service computing systems for Smart Education.

The part of the learning service model for Smart Education is to realize a model of learning services for the achievement of 21st century skills, especially the two main skills of ATC21s, namely problem-solving collaborative skills, and learning through a digital network. The challenge in this section is how to model services, learning resources, and assessments to initiate problem-solving collaborative skills, and learning through a digital network. The implementation of service technology for Smart Education is the selection of service technology for Smart Education service models. The challenge in this section is how to choose the right and best service technology for the implementation of the service models to be built. The part of IT architecture for Smart Education, is how to create an IT architecture to support the model of Smart Education services. The challenge in this section is how to design architecture openly to better support improving the integration of interfaces, smart devices and diverse learning resources [13]. It can be concluded that the service computing system for Smart Education is an integrated IT-based learning service system to produce learning services for users / students, in order to achieve 21st century skills. This system is an IT system that uses information, computing and service technology, as well as other IT resources to create IT services for users / students.
4. Conclusion

This paper conducts research studies of service computing systems, service computing technology, and the role of service computing and the need for service technology in Smart Education to achieve 21st century proficiency. The need for education service systems from several countries aimed at achieving 21st Century Skill (21st Century Skill) which has been conveyed in this paper, is an important foundation for innovating / engineering computational systems for Smart Education services. The Smart Education model consists of 3 (three) dimensions, namely; organization, technology, and learning science. Discussion of the smart education model point of view as a service system consisting of components, functions, interfaces, component relationships, inputs, processes, and outputs. Modelling Educational Service System refers to the smart education reference model. The output of research is the design and architecture of educational service systems based on the smart education model. The output of the research is expected to solve the problem of quality distribution of high school education in West Java.

Based on the results of research related to educational service systems, there are still problems remaining in this study. This research is still in the model level, to prove the model still has to be proven in the form of products and tested for implementation. In general, the Smart Education architecture is in accordance with the Service Oriented Architecture (SOA) architecture. Technology needs must be in accordance with the Smart Education service computing system model, which is technology that supports the SOA concept.

5. References

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