

Needs Analysis of Simulation-Based Construction Services-Tendering Skill Model

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ABSTRACT

Joining the E-Tendering process for construction services requires technical skill (hard skills) and the ability to operate software (soft skills), especially during E-Tendering. However, Diploma 3 of Civil Engineering Study Program students do not acquire these skills in practice, while the world of work requires them to master these skills. For this reason, a simulation-based construction service E-tendering training model was developed. The needs analysis in this development's initial steps was carried out on 30 students and 8 Business and industrial world (DUDI) who became contract award through E-Tendering within the project's scope at Universitas Negeri Padang. The data analysis technique used a percentage formula, and the data is taken through a questionnaire instrument. The results of the analysis state that of the 15 sub-competencies to carry out E-tendering for construction services, none of the students' mastery, on average the student's ability is in the low category of 63, while the results of the analysis on the perception of the need to take part in the training area at an average score of 93 with the very needy category. The needs analysis results on the four aspects of ability expected by DUDI obtained an average score of 98 in the very high category. Thus, simulation-based E-tendering training for construction services is feasible.

Keywords: Model, Skill, E-Tendering, Construction Services, Simulation-Based.

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INTRODUCTION

By the Industrial Revolution 4.0, the competition for jobs is getting tighter. College graduates have to compete with advanced technology-based machines and foreign workers who have skills and competencies. (Feladi, et al, 2020; Verawardina, et al, 2020; Hendriyani, et al, 2020, Bandri et al, 2020). Of course, it is a separate issue that must be studied seriously and deeply in terms of available employment and graduates required professional skills. So that the right formula is found to increase competitiveness and skill following the needs of the business and industrial world (DUDI), it is a big task for higher education as an institution that produces superior human resources to make a contribution at maximum level as the efforts to increase human resource capacity.

The results of Tracer of Universitas Negeri Padang (UNP) in 2019 at the Diploma 3 of Civil Engineering Study Program show that more than 65% of graduates work in the construction services business sector. Based on the Tracer Study results above, it can be concluded that the majority of business sectors in the construction and development services sector dominate the work sector of Civil Engineering graduates from universities. Job opportunities in construction services are wide-open opportunities for students who graduate in Civil Engineering. They can work in the construction of construction services and infrastructure development.

To work in the world of construction services, college graduates have to compete in getting the project. The mechanism for obtaining construction projects, construction service projects, and consulting services, consisting of planning and supervision with specific technical criteria and values, must go through a Tender mechanism. The Presidential Decree (Perpres) explains that Tender is a selection method to contract other goods/construction/services (Perpres 16/2018).

At the same time, the construction work itself is a whole or part of activities that include constructing, demolition, and reconstructing a building (LKPP, 2019).

The implementation of this manual Tender on its way opens the potential for problematic cases to arise in the process procurement. The cases analyzed are categorized as indications of the tender conspiracy that contradicts the Presidential Decree 80 of 2003. Given that tendered procurement can create potential state losses, it is certainly necessary to find a better solution in the tender process for government projects. Considering that procuring goods/services must be under the Presidential Decree principles, it is more efficient, effective, open and competitive, transparent, and fair, and non-discriminatory. It is aimed to obtain goods/services that are efficient at cost and of quality to quality, Tender which from the beginning was manual (Presidential Decree No. 80 of 2003 was transformed into Electronic Procurement of Goods / Services *E-Procurement*) in the form of electronic tenders (*E-Tendering*) accommodated by Presidential Decree Number 16 of 2018 and its derivative regulations.

Since 2012, UNP has implemented *E-Tendering*, supported by infrastructure and human resources as an organizer. The results of questionnaires and limited interviews with all contractors who were the contract awards of the *E-Tendering* in 2019 at Universitas Negeri Padang provide input that DUDI requires human resources who have the right professional skill, *hard skills*, and *soft skills* in the *E-Tendering* process (Results of questionnaire and contractor, supplier, and limited consultant interviews, November 2019). *E-Tendering* process skill is needed in the world of work for them as contractors or staff in charge and responsible in the *E-Tendering* process to get a construction service project.

The current condition of students and graduates of civil engineering, especially at Universitas Negeri Padang, is

not yet equipped with the latest knowledge and understanding of the tender process for construction services. Then they are also not equipped with the latest knowledge about construction service tenders, skill in making and compiling tender documents, operating the application system *E-Tendering*, and knowing strategies in awarding construction service tenders. In the Diploma 3 of the Civil Engineering Study Program curriculum, the construction service tenders' material is part of the Construction Project Management course. However, for the practice and application of *E-Tendering*, construction services are the application of four courses. These courses consist of building construction courses applied to skills in reading *shop drawings* of construction service tender documents, Quantity surveying courses applied in making Project Budget Plans tendered, Project Management courses are applied in the knowledge of construction service tender stages. Furthermore, project managerial personnel and construction K3 courses are applied to make the RKK for tendered projects.

A survey conducted on a sample of students of the Diploma 3 of Civil Engineering Study Program study program at the Universitas Negeri Padang shows that approximately 64.71% of them only know the term construction service tender. More than 98.9% of them have never known and understood the process of implementing construction service tenders electronically (*E-Tendering*). Then more than 98.9% indicated that they did not know how to make tender documents and knowledge of strategies in winning construction service tenders, and 99.9% had never used the application *E-Tendering*.

Based on the explanation above, this article discusses the analysis of the Simulation-Based E-Tendering Skill Model's needs to improve students' professional skills. In this case, Diploma 3 of Civil Engineering Study Program students in the field of *E-Tendering of construction services*. With this, it is expected to increase graduates' competitiveness in competing and meeting the business and industrial world (DUDI) in the future. Then by providing knowledge and skills can increase the entrepreneurial spirit in the field of construction services.

LITERATURE REVIEW

Project Management

According to Mary Parker Follet (1868-1933), management is "the art of getting things done through people." The point is that management is the art of getting things done through other people to achieve individual goals. This definition implies that they carry out management practices, or only a manager, as befits an artist, must make all the efforts necessary to achieve organizational goals by managing other people and considering these efforts as a work that must be completed (Sulastrri, 2014).

According to James AF Stoner (1935), management is "the process of planning, leading and controlling organization members' effort and using all other organizational resources to achieve stated organizational goals." The point is that management is the process of planning, organization, leadership, and supervision of organizational members' efforts and using all other organizational resources to achieve the stated organizational goals (Sulastrri, 2014). According to Luther Halsey Gulick (1892-1993), management is a field of science that systematically tries to understand why and how people work together (Sulastrri, 2014).

Construction Projects

Construction Projects (Gould, 2002) can be defined as activities that aim to build a building that requires resources, costs, labor, materials, and equipment. Larson (2000, 4) states that the project's main objective is to satisfy customer needs. As well as resemblance, a project's characteristics help distinguish the project from others in the organization. The main characteristics of the project are as follows: (a) Goal setting, (b) A defined life span from start to finish, (c) Involving multiple departments and professionals, (d) Doing something that has never been done before, (e) Time, costs, and specific needs.

According to Schalbe (2006), each project is limited by scope, time (*time*), and cost (*cost*). These constraints are often used in project management as the three main constraints. For the project to be successful, the project manager must consider the following. *First*, the work scope that will be done as part of the project and what products and services or results the customers (sponsor) want to produce in a project. *Second*, the time needed to complete a project. *Third*, the costs required to complete a project.

E-Tendering for Construction Services

Construction tenders are activities carried out to find competent contractors to obtain the best construction or consult services in carrying out construction project construction. A construction service tender is selecting to obtain a construction service provider (Presidential Decree No. 16 of 2018). The regulations regarding construction tenders have undergone several long changes. It is adjusted to the needs and advances in technology today. The construction service tender regulations accommodate various problems related to the tender process itself and guidelines for resolving tender problems.

Presidential Decree No. 16 of 2018 concerning government procurement of goods and services, tenders are part of a method of selecting goods and services procurement that aims to (a) Produce the right goods/services for every money spent, measured in terms of quality, quantity, time, costs, location and providers, (b) Increasing the use of domestic products, (c) Increasing the participation of micro, small and medium enterprises, (d) Increasing the role of national business actors, (e) Supporting research and utilization of goods/research services, (f) Increasing the participation of creative industries, (g) Encouraging economic equity, (h) Encouraging sustainable procurement.

In the construction tender process, which is part of selecting the procurement of goods/services, fundamental principles serve as references in the implementation process. These principles are applied to encourage good procurement of goods/services and reduce budget leakage (*clean governance*). The principles of the procurement of goods/services are (a) Efficient, (b) Effective, (c) Open and competitive, (d) Transparent, (e) Fair or non-discriminatory, (f) Accountable.

Construction work is the whole or part of activities that include the construction, operation, maintenance, demolition, and reconstruction of a building (LKPP, 2018). According to the Government Goods / Services Procurement Policy Agency Regulation number 9 of 2018 in article 3, the implementation of procurement of goods/services through providers has been carried out through the Electronic Procurement System (SPSE) application a support system. In electronic tendering (*E-Tendering*), especially in *construction services E-tendering*, there are several components involved in it that are

interrelated with one another both from the human side (*man*) and from the system (*hardware, software*) side.

Skills Model

Increasing students' professional skills is the key to winning the competition and competition at work. Skills and skills based on the business and the industrial world's needs (DUDI) provide provision and confidence for college graduates. This skill enhancement can be done in various forms, such as education, learning, workshops, public lecture seminars, field lectures, and training. One model of increasing the professional skills of students in training is research. Snelbecker (1974: 32) states: "A model is a concretization of a theory which is meant to be analogous to or representative of the processes and variables involved in the theory." Meanwhile, Joh JOI Ihalaw (2004: 123) states that the model is essentially the same as theory, namely a system of propositions or an integrated series of propositions.

In line with the views of Joh JOI (2004: 123) and Snelbecker (1974: 32), the model in this study is essentially a theoretical concretization used to describe the processes and variables contained in the theory of training *E-Tendering* simulation-based construction services. for Diploma 3 of Civil Engineering Study Program students, namely: 1) components of the concept (*construct*) of training for *E-Tendering* simulation-based construction services, in the form of a definition in the form of scientific language that describes the theory of training and simulation; 2) procedures, namely the steps that must be taken towards the stated objectives; and 3) objectives, in the form of mastery of skill *E-Tendering* construction service.

This *E-Tendering* construction services training is a deliberate effort to improve students' professional skills, namely mastery of knowledge, skills, and attitudes in *E-Tendering* construction services. The training for students aims to make students: (1) know *E-Tendering* construction services, (2) can improve their skill and professional skills in *E-Tendering* for Construction services in the form of technical skill in making construction service tender documents (*hard skills*) and skill in using software applications *E-Tendering*(*soft skill*); (3) equip students to have professional skills in jobs that are in line with DUDI's needs, because students often do not master the professional skills required by DUDI; (4) help solve problems faced by students in the learning process so that the training program should be based on student needs.

Simulation Method

One of the efforts to improve the students' professional skills is using-based training simulation. Research that supports this simulation method is the research conducted by Teach in Moratis and Jeroen (2006), which states that simulation can increase the skills or skill needed by a person to make systematic decisions for measuring goals and predicting an uncertain environment. This simulation technique is effective in increasing the technical competence needed in the job. According to Zoloxochitl and Berges (2005), the simulation model can improve the skills and knowledge needed by companies and organizations, so that the model to be developed has the potential to increase competence effectively and efficiently.

The Development Model of Simulation-based Construction Services E-Tendering Skills

The simulation-based construction service *E-Tendering* skill development model is a model designed to improve the professional skills of Diploma 3 of Civil Engineering

Study Program students in the form of technical skill in making construction service tender documents (*hard skills*) and skill in operating the construction services *E-Tendering* software (*soft skills*), as well as fostering the spirit and motivation to become entrepreneurs in the field of contractors.

The development of this skill model begins with a needs *analysis of the* construction services *E-Tendering* skill model, which in this case is carried out through a questionnaire to the business and industrial world (DUDI) that need this skill and then followed by a questionnaire to students of the Diploma 3 of Civil Engineering Study Program. This model will produce material books, manuals, user manuals, instructor manuals, and model books. Later on, this product will be validated through FGDs, after the implemented skill model of *E-Tendering* construction services through *E-Tendering* training for Diploma 3 of Civil Engineering Study Program students. In this skill model, the training will be based on Kirkpatrick's evaluation model with a "four-level evaluation model," namely *reaction, learning, behavior change, and evaluation*.

DEVELOPMENT METHODS

Development model

This research included Research and Development or Educational Design Research. According to Plomp (2013: 11), Educational Design Research is a research design appropriate for developing research-based solutions to complex problems in educational practice or developing or validating theories about learning processes, learning environments, and the like. According to Sugiyono (2015: 30), research and development can be interpreted as a scientific way to research, design, produce, and test the validity of the produced products. Research and development are often called a "bridge" between basic *research and applied research*.

Richey & Klein, 2007 state that *design and Development Research* is "the systematic study of design, development and evaluation processes to establish an empirical basis for creating instructional and non-instructional products and tools and new or enhanced models that govern their development." Design and development research is a systematic study of how to design a product, develop/produce the design, and evaluate the product's performance, to obtain empirical data that can be used as a basis for making products, tools, and models that can be used—used in learning or non-learning.

Based on the understanding that has been stated above, it can be concluded that the research and development method is a method used to produce a new model, new pattern, or new product and test its effectiveness through systematic steps, in the form of development design and evaluation of the resulting product. Based on this conclusion, "Research and Development" is suitable for developing a skill Model of *Simulation-based Construction Services E-Tendering* that is valid, practical, and effective. It can improve skills professionally for hard skills and soft skills Diploma 3 of the Civil Engineering Study Program Students.

Development procedure

It followed the ADDIE model's systematic development steps or stands for Analysis, Design, Development, Implementation, and *Evaluation* (Dick, Carey & Carey, 2001: 4). From the research development procedure and *development* above, it can be described the flow of research and development of the Skill model

systematically as shown in *Simulation-based Construction Services E-Tendering Figure*

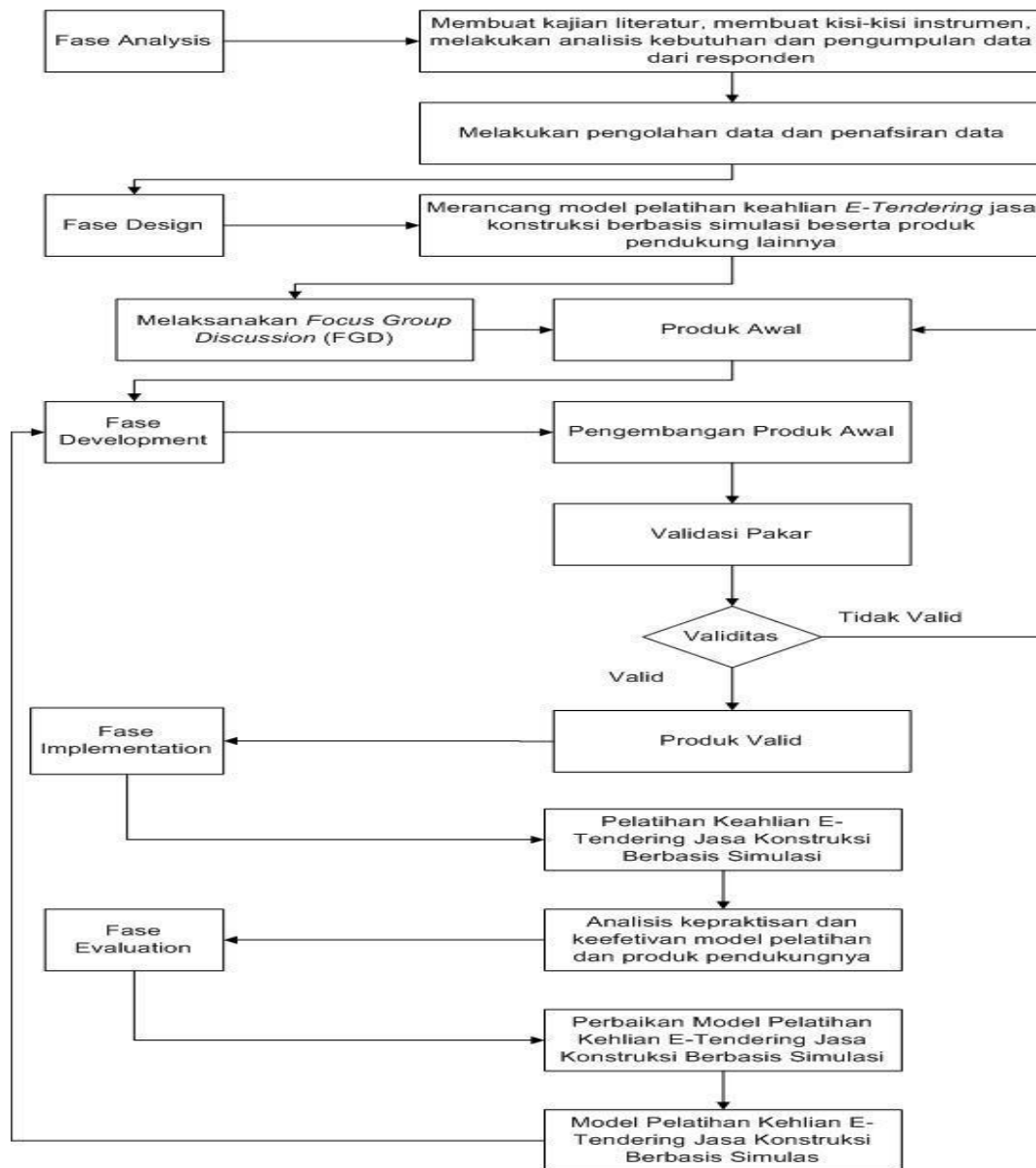


Figure 1. Stages of a simulation-based Construction Services E-Tendering Skill Model Development

Each phase of ADDIE was as follows:

1) Analysis phase

This phase began with a preliminary study to conduct a needs analysis. Needs analysis is the first step in development research. This stage aims to raise and determine the fundamental problems faced in developing E-Tendering construction services skills so that the skill model is needed for *Simulation-based Construction Services E-Tendering*. Needs analysis (*need analysis*) is carried out to aim that the skill model to be developed can answer the needs needed in professional skill for Diploma 3 of Civil Engineering Study Program students. It is essential to do so that the need for the skill model for *E-Tendering* construction services developed follows the Business and Industrial World (DUDI) and Diploma 3 of Civil Engineering Study Program students' needs. To find out and ensure the DUDI's needs and

Diploma 3 of Civil Engineering Study Program students' needs for this skill model of simulation-based construction services *E-Tendering*, respondents fill out a need's analysis questionnaire.

2) Design Phase

This phase allowed the researcher to prepare a *blueprint* or frame of reference for the applied model—this phase was input into the development phase (development).

3) Development phase

It is a skill model of *E-Tendering* construction services developed and validated by experts or experts. In this case, the author asked for validation by vocational experts, learning design experts and educational technology, Indonesian language experts, and information technology experts as validators for this skill model.

4) Implementation Phase

Implement a developed model to test the model to determine the practicalities and effectiveness of the model. Carry out practicality tests by giving questionnaires to participants (students of the Civil Engineering D3 Study Program). It was conducted by giving a pretest and post-test to determine the skills Model of Simulation-based Construction Services *E-Tendering* on Diploma 3 of Civil Engineering Study Program Students. And at this stage, the evaluation of training skill of construction services *E-Tendering* using Kirkpatrick's Model with *four levels of evaluation* of reactions (*reaction*), learning (*learning*), behavior (*behavior*), and the outcome (*result*)

5) Evaluation Phase

The model has been tested, and this revision is the result of the research and development of valid, practical, and useful models.

ANALYSIS AND RESULTS

The analysis of the need to develop a skill model for *Simulation-based Construction Services E-Tendering* is carried out by capturing information to Diploma 3 of the Civil Engineering Study Program and Business and Industrial world (DUDI), in this case, are contractors. The following are the results of the development needs analysis carried out:

1. Data Description of Needs Analysis of Development on Students

The assessment of needs analysis to students as the subject's test of development results in this study was carried out by distributing a needs analysis questionnaire distributed to 30 students of the Diploma 3 of Civil Engineering Study Program, Universitas Negeri Padang. The questionnaire consisted of two parts. The first part was to analyze the extent to which students' mastery of the competency in providing online-based construction services, while the second was a statement of students' willingness and student needs to take part in-tendering training for simulation-based services construction. The data descriptions can be seen in Table 1 below:

Table 1. Needs Analysis for Online-Based Construction Service Provision Competencies on Each Competency Items

No	Competencies	Average	Category Capability
1	Able to make construction service bidding documents	64	Not Capable
2	Able to make the right Budget Plan (RAB) following the construction service tender document	71	Enough
3	Able to make a good Unit Price List according to the construction service tender document	67	Enough
4	Able to make a good Unit Price Analysis following the construction service tender document	66	Enough
5	Able to use the electronic procurement system application properly (SPSE 4.3)	57	Not Capable
6	Able to make a suitable work implementation method according to the construction service tender document	62	Not Capable
7	Able to make a good <i>Time Schedule</i> (S curve) according to the construction service tender document	64	Not Capable
8	Able to make a schedule for the mobilization of equipment both following the construction service tender document	62	Not Capable
9	Able to make a good Material Mobilization Schedule according to the construction service tender document	63	Not Capable
10	Able to make a good Labor Mobilization Schedule according to the construction service tender document	61	Not Capable
11	Able to make a Plan document of Good occupational safety and health (RK3K) following construction service tender documents	65	Enough
12	Able to get construction service tender information through an electronic procurement system application	61	Not Capable
13	Able to download and upload construction service tender files through an electronic procurement system application	61	Not Capable
14	Able to use the <i>Aanwijzing</i> construction service tender facility through an electronic procurement system application	58	Not Capable

15	Able to carry out Reverse Auction construction service tenders through an electronic procurement system application	55	Not Capable
	Average	63	Not Capable

Based on Table 1, it can be confirmed that of the 15 sub-competencies for skills to provide online-based construction services, there are no abilities that are on average capable or mastered by students, there are four sub-competencies that are sufficiently mastered, and students do not master the remaining 11 sub-competencies. It can be understood because students only get theoretical knowledge of these sub-competencies. Students only know but cannot provide services construction online-based and other sub-jobs related to construction service e-tendering skills. Based on the overall average score, it is concluded that students do not have the competence in providing online-based construction services because the average ability score is only 63. Thus, students still need education and training in carrying out online-based service provisioning activities construction using the skill model of *Simulation-based E-tendering* construction service.

The assessment of the student's willingness to carry out training on the provision of online-based construction services using the skill model for *Simulation-based Construction Services E-Tendering* is known by filling out a questionnaire totaling 9 statement items. To find out the results of the data analysis conclusions can be seen in Table 2 below:

Table 2. Data Analysis Results

Indicators	Average Score	Category
Willingness	96	Very high
Desire	92	Very high
Need	92	Very high
Average	93	Very high

Table 2. Regarding data analysis, Students' perceptions of participating in training activities can be explained that students have very high perceptions of participating in skills training activities using the skill model for simulation-based *E-Tendering* construction services with an average score of 93%. Thus, students have a very high need to participate in construction services skills training using the skill model for simulation-based *E-Tendering* construction services. For more details, the results of the assessment of the needs analysis of the perception of needs following training in the skill Model for *E-Tendering* construction services based on simulation can be seen in the following histogram:

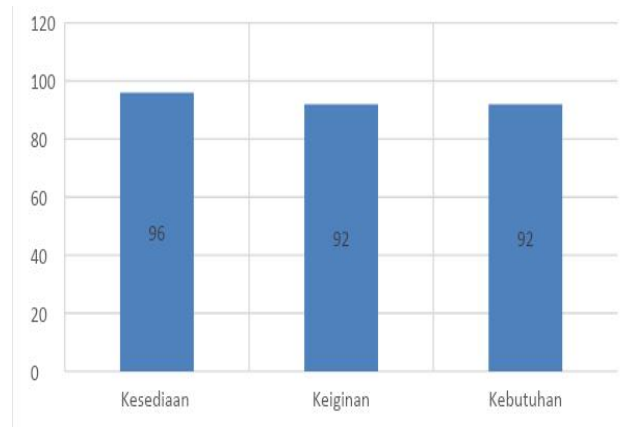


Figure 1. The average score of Perceptions of Needs to Participate in Activities by Students

2. Data Description of Needs Analysis of Development according to DUDI

Assessment analysis of the need for the Business World and the Industrial World in this research was carried out on contractors (contractors) who are industrial users of Diploma 3 of Civil Engineering Study Program graduates. The questionnaire was given in Gutman's scale statement to determine the four aspects of the capabilities needed to carry out E-Tendering for construction services. Descriptions of data descriptions that have been analyzed can be seen in Table

Table 3. Results of Data Analysis

Aspect	Average Score	Category Needs
Needs Skills / Competencies of E-Tendering Construction Services Needs	100	Very high
Types of E-Tendering Construction Services Skill	100	Very High
Skill in Making Construction Services Tender Documents	98	Very high
Skill in using the E-Tendering Application for Construction Services	94	Very High
Average	98	Very high

Based on the results of data analysis presented in Table 3 above, it can be stated that the four aspects of the expected capabilities by Diploma 3 of Civil Engineering Study Program graduates in carrying out construction service e-tender activities, DUDI has a response that the need for the intended ability is needed in a very high category. DUDI requires graduates who can carry out construction service e-tender activities with an average result of needs at a score of 98 in the very high category. Thus it can be said that to increase DUDI's confidence in the ability of graduates who are relevant to the needs and

development of competencies in the developing aspects of work in the industry, the E-Tendering skills training activity in Construction Services using the skills model *E-Tendering* for simulation-based construction services for students is essential for being implemented. For more details, results of needs analysis assessment of perception training need skill models of simulation-based construction services *E-Tendering* based on DUDI perception can be seen in the following histogram:

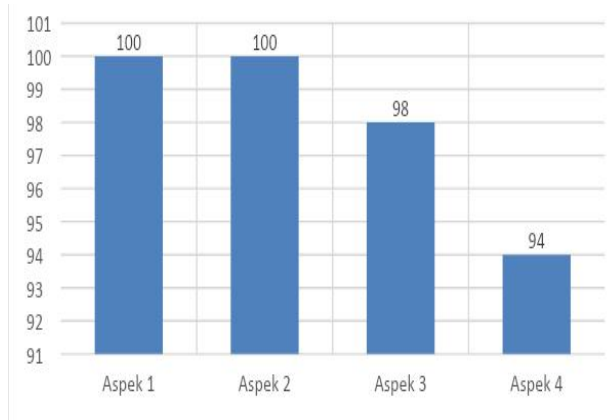


Figure 2. Results of Needs Analysis of E-Tender Capabilities Aspect According to DUDI

CONCLUSION

The conclusions of this study are as follows:

1. Development of a simulation-based *E-Tendering* Skills Training Model for construction services is needed to improve Diploma 3 of Civil Engineering Study Program students' skills at Universitas Negeri Padang in conducting online tenders.
2. This research will produce a Simulation-Based E-Tendering Skills Training Model with the following syntax: a) Introduction, b) Demonstration, c) Discussion, d) Implementation of ETJKBS Training, and e) Training Evaluation.
3. Based on the results of the research on the needs analysis of the Simulation-Based Construction Services E-Tendering Skills Training Model, the results show that the training process using the Simulation-Based Construction Services E-Tendering Skills Training Model for Diploma 3 of Civil Engineering Study Program students is needed to be implemented to increase professional expertise. Diploma 3 of Civil Engineering Study Program students follow the business and the construction service industry world's (DUDI) demands.

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