A method to develop performance indicators based on performance criteria of Indonesian National Occupational Competency Standards (SKKNI) for construction safety technician competency

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Abstract. In the Indonesian National Occupational Competency Standards (SKKNI), performance indicators are not described in detail, where performance indicators are important measures for assessing performance achievements. Due to this gap, the researchers intend to propose a method to develop performance indicators based on performance criteria of the Indonesian National Occupational Competency Standards (SKKNI) for the Construction Safety Technician positions. The competency unit to be developed for its performance indicators was the Competency Unit "Hazard Identification and Risk Control". The researchers propose a method to develop the performance indicators based on the performance criteria of Indonesian National Occupational Competency Standards (SKKNI) for Construction Safety Technician competency. The method was based on competency levels in Bloom’s taxonomy theory which was combined with a functional analysis theory. This method resulted in performance indicators for each performance criterion in three competency domains. By testing the performance indicators Construction Safety Professional and Human Resource Management Professional and also conforming to expert judgments, the results of compiled performance indicators are able to assess any performance achievements of each performance criterion.

1. Introduction
A reference for construction OHS competency standards in Indonesia consists of the Indonesian National Occupational Competency Standards (SKKNI) for construction safety human resource based on the Manpower and Transmigration Ministerial Decree number 350 of 2014. SKKNI for construction safety human resource is a basis for issuing OHS construction skill certificates through competency tests for workers, which can guarantee that the construction OHS human resources have work competency qualifications required to carry out related tasks/jobs properly and correctly, complying the mandate of regulations. In the mandate of Government Regulation No. 31 of 2006 concerning the National Occupational Training System, competency standards are the reference in developing competency-based training programs and the extent to where graduates have met the required competency standards [9].
SKKNI for construction safety human resource is according to the Regional Model Competency Standard (RMCS). The RMCS is a model for developing competency standards introduced by the International Labor Organization (ILO), whose developments use a functional approach from the work process of a similar business/industrial activity [9].

In the RMCS model of each competency element, there is a measure of performance criteria. Performance criteria are the performance standards or tasks involved in each relevant job function. In the SKKNI, performance criteria are set for each element of competency. Further, there are also variable limits and assessment guidelines for each competency unit. The assessment guidelines consist of the assessment contexts, competency requirements, required knowledge and skills, work attitudes, and critical aspects.

| Unit Code : |
|------------|
| Unit Title : |
| Unit Description : |

| Competency Element | Performance Criteria |
|--------------------|----------------------|
| 1.                 | 1.1                  |
|                    | 1.2                  |
|                    | 1.3                  |
| 2.                 | 2.1                  |
|                    | 2.2                  |
|                    | 2.3                  |
| 3.                 | 3.1                  |
|                    | 3.2                  |
|                    | 3.3                  |

Variable Limit
- Variable Context
- Tools and Equipment
- Regulations Requirement
- Norm and Standard

Assessment Guidance
- Assessment Context
- Competency Requirement
- Knowledge & Skill Required
- Attitude Required
- Critical Aspect

Figure 1. SKKNI structure for each competency unit.

Performance standards are the minimum benchmarks of performance which must be achieved by any individual or groups on all performance indicators. Each performance indicator meets particular criteria. In measuring performance, thus, there must be any criteria or sizes which have to be taken into concern [4].

Referring to the SKKNI structure in figure 1, the performance indicators are not described in detail for each performance criterion, where performance indicators are the important measures for assessing performance achievements. Due to this gap, the researchers intend to propose a method for developing performance indicators based on the performance criteria of the SKKNI for the Construction Safety Technician positions.
2. Literature Review

A functional analysis is a method used to examine the proficiencies of the laborers which are imprescriptible in a productive function. The function could be set on the level of an occupational sector, enterprise, group of enterprises, or the whole sector of production/services. The implementation of a functional analysis may be established in different initial stages: an occupation (PC repairman); mainstream occupations at diverse fields (occupational safety and health); or occupational sector (hotel). This thing evidently shows the functional analysis’ flexibility. Being designed as a large-scale analysis tool, it does not mean that the functional analysis cannot be used to examine professions in particular subsectors or organizations [10].

A functional analysis cannot be defined as a precise method. By applying a deductive strategy, this analysis may be defined as a working approach to the expected competencies. The analysis starts by determining the primary goals of the productive function or service understudy. After that, the analysis is continued by raising inquiries to investigate the functions which are needed to be executed for achieving the prior function. The analysis is ideally conducted towards a group of laborers who already recognize the functional object of the analysis. This approach is worth to be used as a tool since it is derived directly from its representative qualities. To maintain uniform criteria, particular instructions are adhered to during the preparation. The structure below represents how the main purpose or key function is usually explicated [10]:

![Function Analysis Structure](image)

**Figure 2.** Function Analysis Structure [10].

The analysis of functions aims to identify any crucial functions to meet the major goal, which is, recognizing the value-added of the functions. The analysis results are then presented in a functional tree or functional map [10].

The functional tree or functional map is a graphic representation of functional analysis results. It is designed like a tree which is displayed horizontally. The functional tree reflects the methodology which is followed by its drawing-up. The map presents how the key function disassembles in succession – when it has been set- into its component functions. The branches of the tree are “causes” which are graphically connected to the left (or downwards, according to how the branches are presented) to their corresponding “consequences”. Reading the tree branches from left to right or bottom to top, we will discover the answers to “how” the main functions are implemented by executing the basic functions which constitute them. By reading the tree branches from right to left, conversely, we will figure out the answers to “what for” of each function, which are embodied in the function of the immediate following level. Below is a graphic representation depicting an example of a functional map [10].

![General Outlines of a Functional Map](image)

**Figure 3.** General Outlines of a Functional Map [10].
Referring to the figure 3, in the SKKNI, a basic function is represented as a competency unit/unit title, whereas sub function is represented as a competency element. Questions of “How?” or “What needs to be done?” can reflect the sub function from the basic function. The researchers propose to implement this method for developing performance indicators for each performance criterion.

![Figure 4. OHS profession certification pattern [6].](image)

The figure 4 presents the pattern of OHS profession certification nationally. According to the certification pattern above, the Construction Safety Technician is categorized in level 4 of qualification. Each qualification level has its own knowledge parameter which can be observed in figure 5.

Moving on to the theory of taxonomy, taxonomy in education is used to classify instructional objectives; commonly called learning goals, performance goals, or learning goals. There are three general classifications or domains of the instructional objectives, namely: (1) cognitive domains (related to learning goals and oriented to thinking abilities); (2) the affective domains (related to feelings, emotions, value systems, and heart attitudes); and (3) psychomotor domains (oriented to motor skills or the use of skeletal muscle). Currently, there are various types of instructional objective taxonomies which are named after their inventors, one of which is: Bloom’s taxonomy [2]. The relationship between the level of categories in Bloom’s taxonomy and the level of qualification for Construction Safety Technician positions is illustrated in figure 5.
Figure 5. Relationship of cognitive domains and competency levels in Bloom’s taxonomy and Construction Safety Technician competencies along with their knowledge parameters.

As presented in the figure 5, the knowledge parameter of Construction Safety Technician qualification is at the levels “Apply” until “Evaluate”. It means that all tasks becoming Construction Safety Technician responsibilities are located between the levels “Apply” until “Evaluate”. Researchers suggest combining Bloom’s taxonomy operational verbs with functional analysis theory to develop performance indicators.

3. Methodology
In this study, the competency unit to be developed for its performance indicators was the Competency Unit "Hazard Identification and Risk Control". In developing the performance indicators, the researchers combined Bloom’s taxonomy operational verbs with functional analysis theory.

Performance Indicator = Operational Verb (from Taxonomy Bloom) + Output (as Object) + Tools & Substance (as Condition) +

Figure 6. Diagram to develop performance indicators.

The first stage was to determine any output from each performance criterion. The output must be a noun and used as an object. The next stage was to determine any condition and aspect which influenced the performance indicators, including substances and tools. Substances and tools must be selected from variable limits and assessment guidelines for each competency unit in SKKNI. The last stage was to determine any operational verb which could accurately describe the level of each performance. In a tabular form, each step was arranged in an easy to understand form. Below is an example of the performance criteria from the Competency Unit “Hazard Identification and Risk Control”.

- Use a broad of basic knowledge by linking a number of theoretical concepts
- Make analytical interpretations of any available data
- Make decisions based on applicable rules
Table 1. Example of performance indicator development process.

| Performance Criterion a | Output | Substance b | Tool b | Operational Verb (Cognitive / Affective / Psychomotor) c |
|-------------------------|--------|-------------|--------|-------------------------------------------------------|
| 1.2 Construction documents and method statement, assessing the potential hazards | List of potential hazards | • Construction document  
• Method Statement | • Manpower and Transmigration Ministerial Regulation No. 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors at Workplace  
• Manpower and Transmigration Ministerial Regulation No. PER-01/MEN/1980 on Occupational Health and Safety in Building Construction  
• Public Work Ministerial Regulation No. 05/PRT/M/2014  
• Environmental information and data and demographic conditions of the construction workplace community  
• Results of workshop with related parties | • Cognitive : Deconstruct  
• Affective : Adjust  
• Psychomotor : Make |

a Performance Criterion in “Hazard Identification and Risk Control” Competency Unit in SKKNI.
b Based on variable limits and assessment guidelines for “Hazard Identification and Risk Control” Competency Unit in SKKNI.
c Based on operational verbs for each knowledge level and domain in Bloom’s taxonomy.

4. Result
The performance indicator resulted from the example of performance criteria in the table 1 above is then described in the table 2 below.

Table 2. Example of performance indicator result.

| Performance Criterion a | Performance Indicator | Cognitive Domain | Psychomotor Domain | Affective Domain |
|-------------------------|-----------------------|------------------|-------------------|-----------------|
| 1.2 Construction documents and method statement, assessing the potential hazards | Deconstruct potential hazards in construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors at Workplace | Make a list of potential hazards in construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors at Workplace | Adjust the list of potential hazards in construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors at Workplace |

6
Deconstruct potential hazards in construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. PER-01/MEN/1980 on Occupational Health and Safety in Building Construction

Make a list of potential hazards in construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. PER-01/MEN/1980 on Occupational Health and Safety in Building Construction

Adjust the list of potential hazards in construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. PER-01/MEN/1980 on Occupational Health and Safety in Building Construction

Deconstruct potential hazards in construction documents and method statement based on environmental information data and demographic conditions of the construction workplace community

Make a list of potential hazards in construction documents and method statement based on environmental information data and demographic conditions of the construction workplace community

Adjust the list of potential hazards in construction documents and method statement based on environmental information data and demographic conditions of the construction workplace community

Deconstruct potential hazards in construction documents and method statement based on the results of workshop with related parties

Make a list of potential hazards in construction documents and method statement based on the results of workshop with related parties

Adjust the list of potential hazards in construction documents and method statement based on the results of workshop with related parties

| Performance Criterion in “Hazard Identification and Risk Control” Competency Unit in SKKNI. |

The performance indicator result of all performance criteria in Competency Unit “Hazard Identification and Risk Control” is attached at the end of this paper. Performance indicators were also tested to Construction Safety Professional and Human Resource Management Professional, and also based on expert judgments. The results of compiled performance indicators can be used to assess any performance achievement in each performance criterion.

5. Conclusion, Limitation and Recommendation

Researchers propose a method of approach to develop performance indicators based on performance criteria in the Indonesian National Occupational Competency Standards (SKKNI) for Construction Safety Technician competency. The method was based on the competency level theory of Bloom’s taxonomy which was combined with the functional analysis theory. By implementing the approach, this research resulted in the development of performance indicators for each performance criterion on three competency domains. Further, by testing the performance indicator to Construction Safety Professional and Human Resource Management Professional and conforming to expert judgments, the results of compiled performance indicators are able to assess performance achievement in each performance criterion.

However, this research still lacks enough sufficient expert validation to test the validity of the performance indicators. This research still can be developed until becoming a case study to evaluate the performance of Construction Safety Technician by using performance indicators which will have been validated. The evaluation, then, can be used to discover any competency gaps which need to be improved.
6. Appendix

Table 3. Performance indicator result of “hazard identification and risk control” unit competency.

| Competency Unit Title | Performance Indicator | Knowledge | Skill | Attitude |
|-----------------------|-----------------------|-----------|-------|----------|
| Unit Code: S.941200.011.01 |
| | 1. Identify potential hazards in the construction work environment |
| | 1.1 Various types of construction work to be executed are inventoried. |
| | Classify various types of construction work in construction work contract documents |
| | Make a list of construction work types |
| | Adjust the list of construction work types based on construction work contract documents |
| | 1.2 Construction documents and a method statement, assessing the potential hazards |
| | Deconstruct potential hazards in the construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors at Workplace |
| | Make a list of potential hazards in the construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors at Workplace |
| | Adjust the list of potential hazards in the construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors at Workplace |
| | Deconstruct potential hazards in the construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. PER-01/MEN/1980 on Occupational Health and Safety in Building |
| | Make a list of potential hazards in the construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. PER-01/MEN/1980 on Occupational Health and Safety in Building |
| | Adjust the list of potential hazards in the construction documents and method statement based on the Manpower and Transmigration Ministerial Regulation No. PER-01/MEN/1980 on Occupational Health and Safety in Building |
| | Deconstruct potential hazards in the construction documents and method statement based on the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management |
| | Make a list of potential hazards in the construction documents and method statement based on the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management |
| | Adjust the list of potential hazards in the construction documents and method statement based on the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management |
| System (SMK3) of Public Work Sector | (SMK3) of Public Work Sector | (SMK3) of Public Work Sector |
|-------------------------------------|-----------------------------|-----------------------------|
| **Deconstruct** potential hazards in the construction documents and method statement based on environmental information data and demographic conditions of the construction workplace community | **Make a list of** potential hazards in the construction documents and method statement based on environmental information data and demographic conditions of the construction workplace community | **Adjust the list of** potential hazards in the construction documents and method statement based on environmental information data and demographic conditions of the construction workplace community |
| **Deconstruct** potential hazards in the construction documents and method statement based on workshop results with related parties | **Make a list of** potential hazards in the construction documents and method statement based on workshop results with related parties | **Adjust the list of** potential hazards in the construction documents and method statement based on workshop results with related parties |
| **1.3 The list of potential hazards is arranged in a working order.** | **Classify** potential hazards according to the working order. | **Make a list of** potential hazards in the working order | **Adjust the list of** potential hazards based on any changes in contract documents, environmental conditions, and workshop results |
| **2. Conduct an assessment of hazard risk in the construction work environment** | **2.1 Facilities, techniques, processes and methods of hazard risk assessment are established.** | **Choose** the tools, techniques, processes, and risk assessment methods to be used, in accordance with the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management System (SMK3) of Public Work Sector | **Make a list of** tools, techniques, processes, and risk assessment methods to be used, in accordance with the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management System (SMK3) of Public Work Sector | **Adjust the list of** tools, techniques, processes, and risk assessment methods to be used, in accordance with the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management System (SMK3) of Public Work Sector |
| **2.2 The hazard risk assessment is conducted.** | **Carry out** a hazard risk assessment on the list of potential hazards according to the established tools, techniques, processes, and methods | **Make a list of** hazard risk assessment on the list of potential hazards according to the established tools, techniques, processes, and methods | **Adjust the list of** hazard risk assessment on the list of potential hazards according to the established tools, techniques, processes, and methods |
| **2.3 The level of risk is determined.** | **Choose** the classification level of hazard risk based on the risk assessment table | **Match** the level of hazard risk in the risk assessment table | **Adjust the level of hazard risk based on any changes in the** |
on the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management System (SMK3) of Public Work Sector based on the classification level of hazard risk list of potential hazards

3. Conduct any hazard risk control in the construction work environment

3.1 A hazard risk control plan is arranged. Make any target and hazard risk control plan based on the work contract and the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management System (SMK3) of Public Work Sector Make a table for establishing the targets and hazard risk control programs based on the work contracts and the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management System (SMK3) of Public Work Sector Adjust the table of established targets and hazard risk control programs based on the work contracts and the Public Work Ministerial Regulation No. 05/PRT/M/2014 on Occupational Health and Safety Management System (SMK3) of Public Work Sector

3.2 The danger risk control is conducted. Implement any risk control based on the target and OHS program table which has been prepared Practice the hazard risk control monitoring in the OHS target and program table Adjust the monitoring of risk control based on any changes in targets and the OHS program table

3.3 The risk control is evaluated. Check the risk control of hazards based on the results of monitoring the risk control of hazards, and arrange changes/improvements, to the discrepancy of findings in the field, with plans and targets that have been made, at each step of the activity/work Make a summary of hazard control, based on the results of monitoring of risk control, and make a list of changes/improvements, to the discrepancy of findings in the field, with plans and targets that have been made, at each step of the activity/work Adjust the summary of hazard control, based on changes in the results of monitoring of hazard risk control, and adjust the list of changes/improvements, based on changes in nonconformity findings in the field, with plans and targets that have been made, at each step of the activity/work

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