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Competition preparation guideline in undergraduate program of information system school of Industrial Engineering Telkom University based on knowledge conversion

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Abstract. The role of higher education in the development of science and technology is not only from the contribution of the high-quality alumni but also from the research and relevant competition with the needs of development in such a country. In a competition, the student can improve their soft skill and academic skill such as analytical and critical thinking, communication skills and mental. The number of relevant competition by students is also included in accreditation clause, therefore student involvement in competition is seen as important for the undergraduate program in University. The most problem in university is the high turnover from the student. Bachelor program in Indonesia usually takes 4 years to complete, and the high turnover causes the student come and go as they are a graduate from the institution without preserving the knowledge and experience from the competition to other students. This research aims to develop a guidance for competition preparation in the university by using knowledge conversion. The object of this research is an information system undergraduate program in the school of industrial engineering Telkom University. The best practice selection is done by using factor rating method. Delphi method is used to identify the criteria, and AHP method is used to calculate the weight of each criterion. From the factor rating result it is known that from 3 respondent, best practice from respondent A (7.321) is used for preparing the programming competition in an undergraduate program of information system in the school of industrial engineering Telkom University. FGD is done to disseminate the selected best practice into the process stakeholder which is head of the student affair of the school of industrial engineering, students, and laboratory assistants. Future research can be done to create more comprehensive criteria for selecting the best practice.
Keywords: Analytical Hierarchy Process, Competition Guideline, Delphi Method, Knowledge Conversion

1. Introduction

The role of higher education in the development of science and technology is not only from the contribution of the high-quality alumni but also from the research and relevant competition with the needs of development in such a country. The quality of a university can be seen from the quality of alumni that can compete and survive in the development of science and technology. The graduate from a university must have competencies to support from and act as a competitive advantage from such person. The company usually want the fresh graduate that not only good at the academic but also good at soft skill such as communication, thinking, loyalty, competition and etc.

Table 1. Graduate Competency Criteria

Higher Education Graduate	Academic Skill
	Competent
	Implement the Study
	Analytic Thinking Critical Thinking Good Communication Professional Ethics Competition

University can provide the student to improve their soft skill by giving them a chance to compete in a competition. In a competition, the student can improve their soft skill and academic skill such as analytical and critical thinking, communication skills and mental. It is often said that competition is strong motivators that help students learn the real world design [1]. Institution must have a good accreditation to increase the relevance of programmes [2]. According to Ministry of Research, Technology and Higher Education of Indonesia (RISTEKDIKTI) number of relevant competition by students are included in accreditation clause, therefore students involvement in competition is seen as important for undergraduate program in University. The most problem in university is the high turnover from the student. Bachelor program in Indonesia usually takes 4 years to complete, and the high turnover causes the student come and go as they are a graduate from the institution without preserving the knowledge and experience from the competition to other students. Knowledge consists of experience, value, contextual information, and expert insight that develop a framework to evaluate and combine the experience with new information [3]. According to [4], there is only 20% of knowledge that is preserved in the organization, the rest of 80% lies within people. If the knowledge is not preserved in program study level, there is slight chance that the continuous improvement process for the competition is not well managed and can affect to the study program accreditation. Preparation phase for entering the competition is considered as an important thing. University involvement in such process can help the students to gain the desired result in competitions [1].

Telkom University is one of leading private university in Indonesia. Consists of 7 faculties that range from art, science to management the university provide the students with various competencies and activities. One of the faculties is School of Industrial Engineering (SIE). SIE consist of three study program which is an undergraduate program of industrial engineering, undergraduate program of the information system, and magister program of industrial engineering. SIE needs to manage the competition to maintain the accreditation of each program. For the undergraduate program, only information system study program that is given “B” for the accreditation. The number of participation in the competition is relatively high and the competition won by the students is also high, but there is no assurance nor guarantee that the process can keep the participation is high. This research aims to develop a guidance for competition preparation in the university by using knowledge conversion by [5]. The object of this research is an information system undergraduate program in the school of industrial engineering Telkom University. Previous research about the knowledge conversion practice is the research from [6] that focused on multiple organizations. Research from [7] focused on knowledge conversion application in Railway company. Research from [8] focused on knowledge conversion in military organizations. Another research of knowledge conversion application is the research from [9] that focused on knowledge conversion in research institution.

2. Methods

The purpose of this research is to develop a guidance for competition preparation in the university by using knowledge conversion. [5] describe the four phase of converting knowledge which is socialization, externalization, combination, and internalization. Socialization consists of sharing

process and creation of tacit knowledge through interaction and direct observation. Externalization consists of articulation of tacit knowledge into explicit knowledge through dialogue and reflexion. Combination consists of the conversion process of explicit knowledge into new explicit knowledge through systemization and information. Internalization consists of the learning process and knowledge acquisition by organization member towards explicit knowledge that spread into the organization through self-experience so it can be tacit knowledge of organization member. Figure 1 shows the SECI Phase.

Figure 1. SECI Phase

2.1. Socialization
In this phase, the knowledge of competition preparation that is still tacit knowledge will be transferred to the interviewer for the externalization phase. The transfer process from tacit to explicit is done by interview, the main topic of the interview is the identification of business process of competition preparation and identification of the tacit and explicit knowledge from the preparation. The socialization phase is finished when the data about the process business of competition preparation and their tacit and explicit knowledge is identified.

2.2. Externalization
In this phase, the business process of competition preparation is documented. The documenting process starts from the preliminary activities, a grouping of students, practice session, supporting activities preparation (book, software, and administration) and tutoring phase.

2.3. Combination
In this phase, the process business will be converted into explicit knowledge so there will be new knowledge in form of best practice of competition preparation. The best practice will be presented and confirmed by the stakeholder which is head of the student affair in the school of industrial engineering. Factor rating method is used in the selection process. First of all the data will be reconfirmed to the stakeholder. After the data is re-confirmed the next step is to create criteria for selection process using Delphi. After the criteria are identified the next step is weighing process of each criteria using AHP (Analytical Hierarchy Process). After the instrument is finished, the next step is an assessment of each business process to choose the best of the best practice.

2.4. Internalization
In this phase, selected best practice from the previous phase is socialized to the academic community of the school of industrial engineering Telkom University so the best practice can be used as a guidance for preparing a competition.

3. Result and Discussions
In this section, the result of knowledge conversion process is presented.

3.1. Socialization

Socialization is a sharing process and the creation of tacit knowledge through interaction and live experience. Socialization is a capturing process of competition preparation from the former competition participants. The interview is done with 3 people which are a former participant of programming competition. The competition participant has a knowledge about what to be done and prepared when participating in a competition. The experience from the former participant is still in a tacit form that will help another participant in next competition. Figure 2 shows the socialization phase scheme.

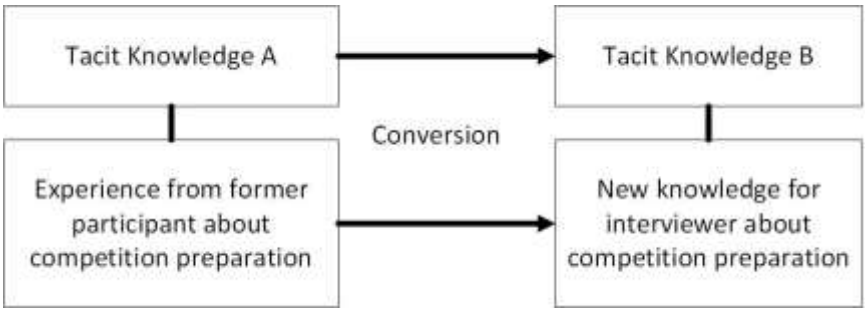

Figure 2. Socialization Phase Scheme

3.2. Externalization

In this phase, the business process of competition preparation is documented. From the result of the interview it is known that there is distinct business process which is business process for "PIMNAS PMKT", "PIMNAS PKMM" and programming. The three business process describes the activities that must be done, the process owner, and the flow from the beginning of the process. Figure 3 shows the externalization phase scheme, example of the business process is presented in Appendix A. In externalization phase, the tacit and explicit knowledge can be identified. The identification is gained from the interview process.

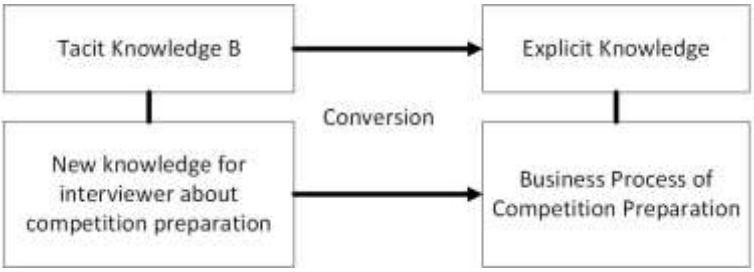

Figure 3. Externalization Phase Scheme

3.3. Combination

In this phase, the process business will be converted into explicit knowledge so there will be new knowledge in form of best practice of competition preparation. Figure 4 shows the combination phase scheme.

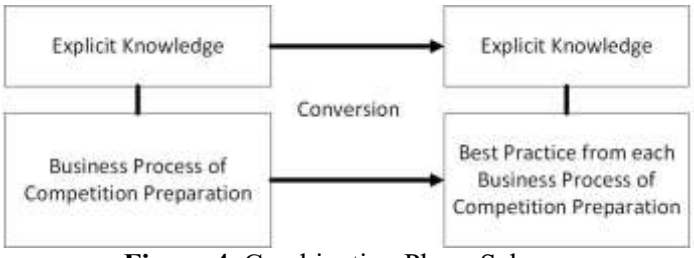

Figure 4. Combination Phase Scheme

3.3.1. Criteria Selection. In combination phase Delphi method is used to identify criteria for best practice selection, the method ends when every respondent have the same answer and consensus. The questionnaire is used to gain the criteria. The respondent is asked which criteria is considered important in selecting the best practice of a process. Table 2 shows the default Delphi criteria list.

Table 2. Default Delphi Criteria List

No.	Criteria
1	Number of Activity in a Business Process
2	Time needed in one activity
3	Number of person in activity
4	Availability of tacit knowledge
5	Availability of explicit knowledge

The questionnaire is given to 3 respondent. The criteria are obtained after the respondent consensus in three cycles of Delphi. Table 3 shows the final criteria list. A number of activity in the business process is a set of actions that must be done by process performer to prepare for the programming competition. A process performer needs explicit knowledge in form of documentation for the competition which is guidance of the competition, availability of relevant reference for competition, supporting article, and availability of software/hardware for the competition. Availability of tacit knowledge is needed to help the competition process.

Table 3. Final Criteria List

No.	Criteria
1	Number of Activity in a Business Process
2	Availability of tacit knowledge
3	Availability of explicit knowledge

3.3.2. Criteria weighting. AHP is used to identify the weight of each criterion, the AHP questionnaire is given to the respondent. The respondent is the former participant of programming competition because they are considered as an expert in the competition and understand the business process of programming competition. Table 4 shows the weighting result for a programming competition.

Table 4. Weighting of Programming Competition Preparation Business Process

No.	Criteria	Weight
1	Number of Activity in a Business Process	0.374
2	Availability of tacit knowledge	0.339
3	Availability of explicit knowledge	0.286

The consistency test is done to know the consistency of the result of the questionnaire. The result is shown in Table 5. From Table 5 it is known that the value of CR is below 0.1, it means that the AHP questionnaire is consistent [10].

Table 5. Consistency Test Result

Criteria	Value
CI	0.018
CR	0.032

3.3.3. Best Practice Selection. After the weight is identified, the next step is the selection process of business process forms each respondent. The comparison between criteria is shown in Table 6.

Table 6. Criteria Comparison Result

Respondent	Number of Activity	Explicit Knowledge	Tacit Knowledge
A	12	Well documented and can be used	Available but incidental
B	13	Well documented and can't be used	Available and managed
C	8	Not well documented and can't be used	Available but incidental

Factor rating method is used to select the best of best practice. The result from table 6 then transforms into a quantitative value. The quantitative result is shown in Table 7.

Table 7. Quantitative Criteria Comparison Result

Respondent	Number of Activity	Explicit Knowledge	Tacit Knowledge
A	12	10	5
B	13	5	10
C	8	0	10

The result of quantitative comparison then normalized and multiplied by each criteria weights. From factor rating result, it is known that the total weight of respondent A is the largest between three respondent, therefore the best practice that will be used is the best practice from respondent A. Table 8 shows the factor rating result.

3.4. Internalization

Internalization phase is the last step in knowledge conversion. In this phase, the explicit knowledge which is the best practice is disseminate into tacit knowledge. Figure 5 shows the internalization phase scheme.

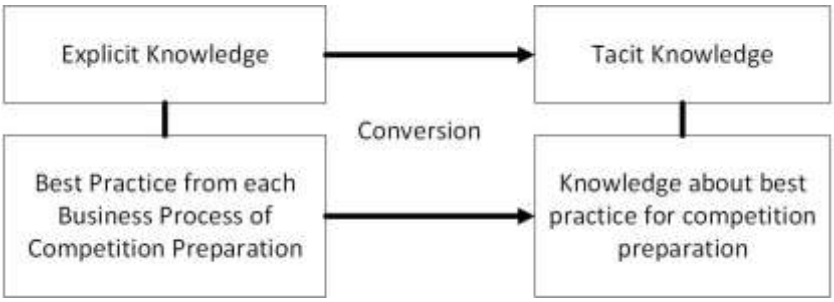

Figure 5. Internalization Phase Scheme

In this phase, Focus Group Discussion (FGD) is done to discuss the best practice result to the process stakeholder, which is the head of students affair of the school of industrial engineering, students, and laboratory assistants. The purpose of FGD is to convert explicit knowledge in form of best practice to tacit knowledge of each process stakeholder. From the FGD result, it is known that the best practice can be applied in an undergraduate program of the information system.

Table 8. Factor Rating Result

Respondent	Weight	Number of Activity 0,374	Explicit Knowledge 0,339	Tacit Knowledge 0,286	Total
A	Normalized	6,667	10	5	7.321
	Weight	2.495	3.396240806	1.4302	
B	Normalized	6.153	5	10	6.862
	Weight	2.303	1.698	2.860	
C	Normalized	10	0	10	6.603
	Weight	3.743	0	2.860	

4. Conclusions

This research intends to develop a guidance for competition preparation in the university by using knowledge conversion. The documentation of knowledge from tacit knowledge is documented. The best practice selection is done by using factor rating method. Delphi method is used to identify the criteria, and AHP method is used to calculate the weight of each criterion. From the factor rating result it is known that from 3 respondent, best practice from respondent A (7.321) is used for preparing the programming competition in an undergraduate program of information system in the school of industrial engineering Telkom University. FGD is done to disseminate the selected best practice into the process stakeholder which is head of students affair of the school of industrial engineering, students, and laboratory assistants. Future research can be done to create more comprehensive criteria for selecting the best practice.

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