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FACTORS THAT INFLUENCE STUDENT TEAMS IN INFORMATION SYSTEM DEVELOPMENT PROJECT: STUDENT'S PERSPECTIVES

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Abstract

The success of information systems development activities is influenced by technology and human resources. Experience and knowledge of team members is the key to performance improvements in the software development process. Thus, the experience and knowledge are considered to be one of the main capitals in the success of a software development team. However, what if the information system development team are students who may not have experience at all? Is the information system developed by an un-experienced team always fail? Therefore, it is necessary to conduct a study to identify the factors that influence the student teams in information systems development project. The study was conducted with the literature study to establish research model. Furthermore, a survey conducted by distributing questionnaires to students of information systems whom are doing an internship in developing information systems. The results of the survey were analyzed quantitatively using Partial Least Square technique to test the proposed research model. The results of this study indicate that the development of information systems conducted by a team of students is significantly influenced by the Customer Relationship and Horizontal Relationship. Capability factor have a significant effect although the effect is small on the student teams.

Keywords: *information system development, partial least squares, student teams performance*

Abstrak

Keberhasilan pengembangan sistem informasi dipengaruhi oleh teknologi dan sumber daya manusia. Pengalaman dan pengetahuan anggota tim merupakan kunci peningkatan kinerja dalam proses pengembangan perangkat lunak. Oleh karenanya, pengalaman dan pengetahuan dianggap sebagai salah satu modal utama dalam kesuksesan suatu tim pengembang perangkat lunak. Namun, bagaimana jika tim pengembang sistem informasi adalah siswa yang mungkin tidak memiliki pengalaman sama sekali? Apakah sistem informasi yang dikembangkan oleh tim yang belum berpengalaman selalu gagal? Untuk menjawab pertanyaan tersebut, perlu dilakukan penelitian untuk mengetahui faktor-faktor yang mempengaruhi tim siswa dalam proyek pengembangan sistem informasi. Penelitian dilakukan dengan studi literatur untuk menetapkan model penelitian. Selanjutnya, dilakukan survei yang dilakukan dengan menyebarkan kuesioner kepada mahasiswa sistem informasi yang sedang melakukan magang di bidang pengembangan sistem informasi. Hasil survei dianalisis secara kuantitatif dengan menggunakan teknik Parsial Least Square untuk menguji model penelitian yang diajukan. Hasil penelitian ini menunjukkan bahwa pengembangan sistem informasi yang dilakukan oleh tim siswa secara signifikan dipengaruhi oleh Customer Relationship dan Horizontal Relationship. Faktor kemampuan memiliki pengaruh yang signifikan meskipun pengaruhnya kecil pada tim siswa.

Kata Kunci: *pengembangan sistem informasi, partial least squares, kinerja tim siswa*

1. Introduction

In general, the higher education institutions in Indonesia, which has an Information System course or the like, requiring students to undergo an internship. Internships are practical fieldwork activities undertaken by working directly on the real world. For students who took the information systems specialization, an internship is expected to produce a product that can be either a software application or information system. Software development aims to produce information technology [1]. Software development involves setting requirements, designing, implementing, testing and use of information technology products. Whereas information systems have a broader scope because it aims to improve organizations through the adoption and use of information technology applications [1]. The information system was built based on the needs of the client. The client is the institution or company where the students are doing their internship. Therefore, an internship in this discussion is to develop an information system activities conducted by student teams.

The success of information systems development activities are not only influenced by technological aspect, but it is also influenced by aspects of human resources. Many studies have examined the key influences on the improvement of the information system development process, which includes the support and participation of employees [2], the time and resources involved [2], the experience of the staff [3], as well as the knowledge and experience of team members[4]. Experience and knowledge of team members is the key to performance improvements in the software process [4]. So the experience and knowledge are to be one of the main capital in the success of a software development team. However, what if the information system development team are students who may not have experience at all? Is the information system developed by an un-experienced team always fail? Some studies related learning information systems development has been done. In general, the study discusses the learning process of information systems development and assessment of the capabilities and performance of students in the study [1] [4-5]. Therefore, it is necessary to conduct a study to identify the factors that influence the student teams in information systems development project.

The success of information systems development activities are influenced by aspects of technology and human resources aspects. Although the discipline of information systems development has been well established, failure and dissatisfaction with the of information systems still exist [6-7]. Study [6] showed a correlation between the success and failure factors in information system development. So the identification of factors that influence the development of information systems in the area and specific characteristics need to be identified. This research will try to identify what factors influence the development of the information system is developed by the student teams. This study will focus on the student team as a developer of information systems, in which teams of students have little experience or no experience at all. Though the experience and knowledge of the team members is the key to performance improvements in the software development process [4] [8].

Previous research has been carried out by [4] which measures the ability of the student in the learning development of information systems and correlate to the results of student performance which are assessed by their teachers. The ability of students in the development of information systems includes an understanding about knowledge of domain, methodology, and implementation. In addition, [4] also added a motivational aspects of students to excel in learning information systems development. Aspect of motivation is derived from each individual student. Another factor affecting student learning is the development of information systems competence and self confidence factor [5].

Several other studies about information systems development conducted based on socio-technical perspective suggests that project performance is influenced by the rapid changes in business needs and technological aspects of systems development. Therefore, information systems development team flexibility plays an important role in determining the performance of the project [7][9-10]. Information systems development teams need to integrate and reconfigure available resources at the right time. However, the resources available to the team are often limited. This means that the team may not have all the necessary resources, thereby potentially

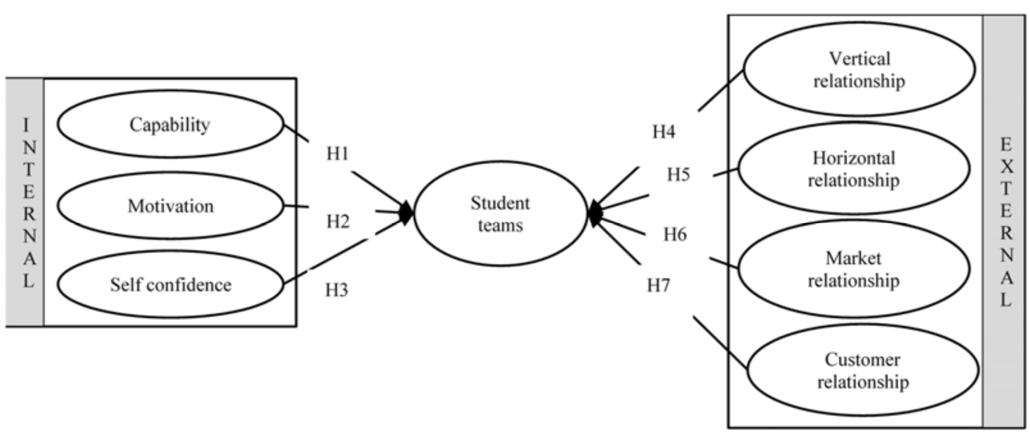

Figure 1. Research Model

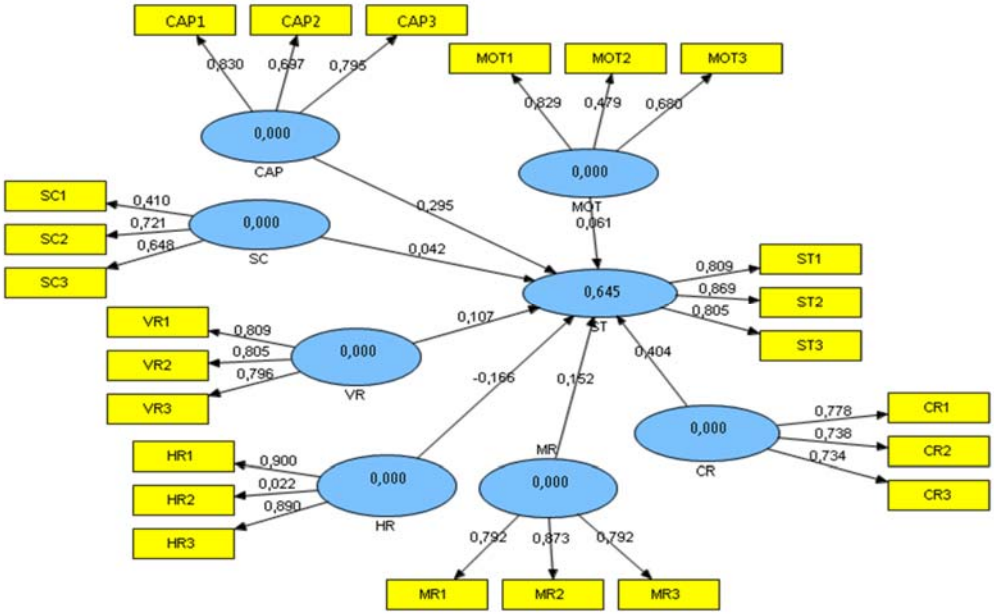

Figure 2. Model Evaluation

affecting the performance of the project. To improve the effectiveness of the project, information systems development teams are encouraged to build external relationships to access informative resources and other support at the right time [7].

In a study conducted by [7], the factors that affect the flexibility of information systems development team are as follows: First, Vertical Relationship factor refers to the relationship of information systems development team with the boss. A good Vertical Relationship characterized by mutual respect and the employer willing to take risks, share responsibility for the development of projects of information systems, providing access to the resources that they hold to support the development team of information systems, and can help the team to negotiate with the client with regard to the changes, or to provide information to the team to evaluate the need for change. In the case of a team of interns, the supervisor is the person who is sponsoring an information system development project within the institution where the internship is happening. Second, Horizontal Relationship factor refer to the relationship of information systems development team with other social units (e. g, business units or other development teams) in an organization. A good Horizontal Relationship facilitates the sharing of knowledge and work experience as well as technical support from other teams who may have the necessary competence when it appears that the system requirements change unexpectedly. Third, Market Relationship factor which refers to the relationship of information systems development teams with extra-organizational entities (eg professional associations outside the institution where the internship happening). Extra-organizational is known as "knowledge marketplace" that serves as a source of knowledge which contains knowledge sharing practices and new technologies that are being disseminated.

Other success factors in improving the performance of information systems development project is user involvement [11-12]. User involvement can be done with good communication between the project team with the user. Therefore, users are advised to get more involved or even be part of the information system development team. Users are expected to help to better understand their needs, thus reducing development time and increase innovation. In this study, users are end-users who actually use this system to finish the job.

Based on the results of the literature study, a hypothesis is formed that can be categorized into internal factors and external factors that affect student teams in information systems development projects. The proposed research model is shown in Figure 1.

Internal Factors

H1: Capability (CAP) [4-5] has positive influence toward Student Teams (ST)
H2: Motivation (MOT) [4] has positive effect toward Student Teams (ST)
H3: Self Confidence (SC) [5] has positive influence on Student Teams (ST)

External Factors

H4: Vertical Relationship (VR) [7] has positive influence on Student Teams (ST)
H5: Horizontal Relationship (HR) [7] has positive influence on Student Teams (ST)
H6: Market Relationship(MR) [7] has positive influence on Student Teams (ST)
H7: Customer Relationship (CR) [11] [12] has positive effect on Student Teams (ST)

2. Method

This study was conducted with two approaches. First, the authors conducted a literature study to identify any factors that generally affect the student teams in information systems development projects. Factors resulted from literature study will be used as the basis to build the research model. The model in this research formed by merging variables that exist in previous research models. The variables are then categorized into two groups: internal variables and external variables group. Second, the authors conducted a survey by distributing a questionnaire which is based on the research model that has been proposed. The sampling technique used in this study was purposive sampling. Questionnaires were distributed to students with specialization in the field of information systems and has completed an internship assignment. Questionnaires distributed online via email to 145 respondents. Questionnaires were responded to as many as 72 respondents.

Based on the model of the proposed research, there are seven factors that affect student teams in information system development. The proposed research model will be analyzed based on survey data. Data obtained from the survey will be analyzed to determine whether any proposed indicators are relevant or not.

Survey data were analyzed by using structural equation modeling (SEM). SEM is an analytical technique that is commonly used to measure the variables that can not be measured directly, such as trust, satisfaction, etc. So, SEM is used when the research involves the unobserved variables (latent variables) and the manifest variables or observed variables (indicators). This technique is a combination of factor analysis and multiple regression analysis [13]. The SEM technique consists of covariance-based SEM (CB SEM) and Partial Least Square (PLS). In this research, data analysis performed using PLS technique. PLS technique is used when the research is to develop a theory or construct theory [13], data are limited sample [14], basic theory of non-existent or weak theoretical basis [14], the complexity of large models with many constructs and many indicators [13], and the data were not normally distributed [13]. The PLS technique consist of evaluating the measurement model (outer model), the evaluation of the structural model (inner model), hypothesis testing, and quality indexes models.

3. Result and Analisys

Data analysis was performed using Smart PLS software version 2.0 M3. The process measurement model and the structural model have details on the following stages [13-14]:

Evaluation of Measurement Model

Evaluation of the measurement model used to assess the validity and reliability of the model, i.e. the value of the validity and reliability of the indicators and the latent variables. The model evaluation can be seen in Figure 2. In this study, the methods used to determine the value of validation between the indicator and the latent variable is Convergent Valida-

TABLE 1.
LOADING FACTOR

CAP		MOT		SC		VR		HR		MR		CR		ST	
I	LF	I	LF	I	LF	I	LF	I	LF	I	LF	I	LF	I	LF
1	0.830	1	0.829	1	0.410	1	0.809	1	0,900	1	0.792	1	0,778	1	0.809
2	0.697	2	0.479	2	0.721	2	0.805	2	0,022	2	0.873	2	0.738	2	0.869
3	0,795	3	0.680	3	0.648	3	0.796	3	0.890	3	0.792	3	0.734	3	0.805

Description: I = indicator; LF = Loading Factor; validation value is in a valid state or the relationship between indicators of the latent variable is the value of loading factor greater than 0.7 [16]

TABLE 2.
AVE, COMMUNALITY, AND COMPOSITE RELIABILITY

Variables	AVE	Communality	Composite Reliability
CAP	0.601719	0.601718	0.818462
MOT	**0.459707**	**0.459706**	0.709168
SC	**0.368780**	**0.368779**	**0.625325**
VR	0.644883	0.644883	0.844905
HR	0.534398	0.534398	0.701644
MR	0.672861	0.672861	0.860277
CR	0.562734	0.562734	0.794158
ST	0.685652	0.685652	0.867291

The value of AVE and communality who received> 0.5; Composite Reliability earned value> 0.7 [16]

TABLE 3.
LOADING FACTOR RESULTS FINAL MEASUREMENT EVALUATION

CAP		MOT		SC		VR		HR	
I	LF	I	LF	I	LF	I	LF	I	[illegible]
1	0.823	1	0.819	2	1.000	1	0.809	1	0.
3	0.883	3	0.764			2	0.805	3	0.
						3	0.796		

I = indicator; LF = Loading Factor; validation value is in a valid state or the relationship between indicators of the latent variable is the value of loading factor greater than 0.7 [16]

TABLE 4.
AVE, COMMUNALITY, AND COMPOSITE RELIABILITY EVALUATION MEASUREMENT END RESULTS

Variables	AVE	Communality	Composite Reliability
CAP	0.728574	0.728574	0.842817
CR	0.562726	0.562726	0.794147
HR	0.801369	0.801369	0.889730
MOT	0.626837	0.626837	0.770409
MR	0.672955	0.672955	0.860327
SC	1.000000	1.000000	1.000000
ST	0.685535	0.685535	0.867258
VR	0.644899	0.644899	0.844915

The value of AVE and communality who received> 0.5; Composite Reliability earned value> 0.7 [16]

tion. The convergent validity is done by measuring the value of the loading factor, Average Variance Extracted (AVE), and communality.

The loading factor value is the value that states the relationship between construct indicators with their latent variables. The higher the resulting value, the higher the correlation between the indicator construct with their latent variables. Validation value is declared as valid or is there any relationship between indicators with their latent variables, if the value of loading factor is greater than 0.7 to be regarded as confirmatory study [16]. The results of measuring loading factor can be seen in the Table 1. Based on the result in Table 1, there are several variables that their indicators do not meet the required value of loading factor. Indicators having their loading factor values ineligible will be removed step by step starting from the smallest value. Furthermore, the model is re-evaluated to obtain indicators with qualified loading factor. First indicator removed is HR2 with the smallest loading factor value, then the model is evaluated again and so on.

Beside loading factor, the evaluation is also seen from the value of AVE. AVE measures the variance captured by a latent construct, that is, the explained variance. Conceptually, the AVE test is equivalent to saying that the correlation of the construct with its measurement items should be larger than its correlation with the other constructs [17]. AVE value is the value of variance of indicators related to the latent variables. Acceptable value for AVE is greater than 0.5 [16]. The results of measuring AVE can be seen in the Table 2. Based on that result, there are two variables do not meet their required AVE minimum value i.e. MOT and SC.

Communality expressed some variance that can be explained by the extracted factors. Communality obtained from square value of loading factor that exist in indicators and latent variables relation. Acceptable value of communality is greater than 0.5 [16]. The results of measuring Communality can be seen in the Table 2. Based on that result, there are two variables do not meet their required Communality minimum value i.e. MOT and SC.

In addition, the model evaluation phase also carry out tests to measure the reliability. Composite Reliability value is used to conduct reliability test. Value Composite Reliability acceptable is greater than 0.7 [16]. The SC variable also does not meet the value Composite Reliability.

The evaluation is then performed by gradually removing indicator that does not meet the required loading factor as described previously. The final results that are eligible are presented in Table 3. The results of the final evaluation can be seen in Table 4, which shows that all the variables are qualified for AVE value, Communality, and Composite Reliability.

Structural Model Evaluation

Evaluation of a structural model or inner models aims to predict the relationship between latent variables. Evaluation of the structural model can be done by looking at the value of R-Square (R^2) and the effect size (f^2) Results of the evaluation of structural models in this study are as follows

R-Square (R^2)

R^2 values represent the amount of construct variance which explained by the model. According to [16], R^2 with value of 0.67 indicates that the model is strong, value of 0.33 indicates moderate model, and the value of 0.19 indicates that the model is weak. Based on the results of data processing in this study the value of R^2 in the variable ST is 0.645336, so that the model in this study is Moderate.

TABLE 5.
EFFECT SIZE

Variables	Effect size (f^2)	
CAP	0.060530	Small
CR	0.403623	Large
HT	0.165684	Intermediate
MOT	0.294702	Intermediate
MR	0.151718	Intermediate
SC	0.042054	Small
VR	0.106699	Small

TABLE 6.
AV HYPOTHESIS TESTING

Variables	Effect Size	T-Statistics	Significance	Hypothesis
CAP -> ST	Small	2.1729	Significant	Be accepted
CR -> ST	Large	4.0679	Significant	Be accepted
HR -> ST	Intermediate	2.6889	Significant	Be accepted
MOT -> ST	Intermediate	0.9322	Not Significant	Denied
MR -> ST	Intermediate	1.3468	Not Significant	Denied
SC -> ST	Small	1.5358	Not Significant	Denied
VR -> ST	Small	1.6523	Not Significant	Denied

Effect Size (f^2)

The value of f^2, where the value of 0.02 indicates that the effect size is small, 0.15 shows medium effect size and 0.35 indicate large effect size. The result effect size measurement can be seen in Table 5. Based on the Table 5, there are three variables has small effect i.e. CAP, SC, and VR. Beside that, there are three variables has intermediate effect i.e. HR, MOT, MR and the other one has large effect i.e. CR.

Hypothesis Testing

The value of significance will be taken into consideration to evaluate research models that have been proposed. To see the significance values, re- sampling has to be done with bootstrapping method. Level of significance to be used in this study was 5%, so the t-value taken as a reference parameter is 1.96. The results of significance measurements of this study can be seen in Table 6. Based on the Table 6, out of 7 (seven) tested the hypothesis, there are 3 (three) hypothesis that are accepted and 4 (four) hypothesis are rejected. Accepted hypothesis is the Customer Relationship, Horizontal Relationship and Capability, while the hypothesis rejected are, Motivation, Self Confidence, Market Relationship, and Vertical Relationship.

4. Conclusion

The results of this study indicate that the development of information systems conducted by a team of students is significantly influenced by Customer Relationship and Horizontal Relationship. Capability factors have a significant effect although the effect on student teams is small. Other factors in the hypothesis such as Motivation, Self Confidence, Vertical Relationship, and Market Relationship have a medium/small effect but not significant influence. Based on these results, it can be concluded that communication with end users and organizational units or other development teams within organizations have a very important role. Therefore, it is recommended that the student teams, who will develop an information system, have to improve its ability to communicate. In addition, student teams also must have the ability to understand the knowledge of domain, methodology, and implementation. This capability will support the team in developing information systems.

In this study, the relationship has not been observed among respondents who are in the same team. So the distribution of questionnaires carried out just as long as the student meets the criteria for candidate respondent in this study. This problem will be next job for the future study.

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