

Factors Influencing Time Performance in Storied Building Construction Project Based on Perception of Project Main Actors

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ABSTRACT

The aim and purpose of this research were to know the influential factors on time performance dependent variable, in the storied building construction project. The research conducted by using survey research method, with several samples representing population as respondents. Respondents in this research were the project main actors namely project owner, consultant and contractor. Through the problem background, this research initiated by knowing the gap took place in project activities, then set the problem formulation and research purpose, the relevant research and literature study, research instrument setting and validity and reliability testing. After data collected then were analyzed by statistics, by the Structural Equation Modeling-Partial Least Square (SEM-PLS) method that would result in path analysis and also factor analysis simultaneously. This research would result in the significant influential variables on the construction project time performance and the dominant significant influential variable on the construction project time performance in Central Java Province.

KEYWORDS: time performance, PLS

INTRODUCTION

Construction service is the back bone for infrastructure development in all countries includes Indonesia. Construction service activities involving planning, implementation and control may be divided into some groups namely (a). Civil work project include dam and irrigation, road and bridge, mass transportation system, water treatment system, airport and port, (b). Solid processing fabrication buildings include cement processing plant, stone mill, iron and copper mining processing plant, (c). Manufacture fabrication include automotive factory, heavy equipment factory, plane factory, (d). Liquid processing process fabrication buildings include petrochemical plant, organic and inorganic chemicals plant, LNG base industry, (e). Solid and liquid processing process fabrication buildings include paint processing factory, paper mills, (f). Architecture & Engineering and commercial projects include office buildings, shopping centre building, health facility building, school building, storied dwelling house, (g). Power plant fabrication buildings include nuclear power plant, coal processing plant, power plant, (h). Facilities project include, airplane examination facilities, research and development facilities, (i). Housing project includes restoration project, revamp project, dwelling house project, turn-around plant, dormitory house project. [1][2][3][4].

The cases reviewed in order to be found out its effect on the construction project activities are on planning, implementation and control activities, which implemented collectively by the project owner, planning/control consultant, and contractor as the project main actors, [5][6][7]. Motive of the research conducted was that because it still needed improvement on the existing time performance in Indonesia in general and in Central Java in particular.

Time performance is influenced by mental attitude, motivation, discipline, and ethics, educated (formal and/or informal), skill, experience, relation, working efficiency and effectiveness of the workers. [6][7]. In other side, time performance influenced by quantity of work, quality of work, spirit of work, job knowledge, creativeness, cooperation, dependability, initiative, and personal quantities. [8]. Figure 1 presented the Flow of Thought Research. Therefore, time performance is an intact problem for improving performance productivity in construction project, in which, today, the needs on construction project rise quickly [1][2][9]. The involvement of the project main actors within construction project hold is the very important roles. [3]. Based on the review and based on facts, and expectations then it established the problem formulation intended in order that the research guided, problem formulation is revealing the goal, [10][11][12][13][14]. In which in this research is, which is as the perception/attitude of factors respondents significantly influential on the time performance of construction project and which is the dominant variable significantly influential on the time performance of construction project in Central Java?

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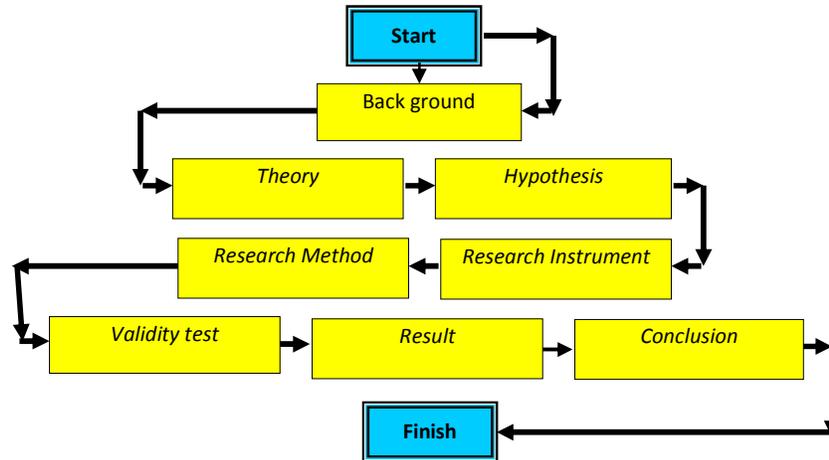


Figure 1. The Flow of Thought Research

MATERIALS AND METHOD

Consequence Variable

Time management in a construction project is belonging to process needed for managing the completion time of construction project. Time management of construction project includes process activities as follow: (1). Establish activity, establish specific action for the project success, and establish actions in order that project may be accomplished consistent with the schedule. (2). Sequence of project activities to establish relationship between activities in project work scope, (3). Estimate activities resources, estimate type and quantities of materials, workforce, equipment, supplies needed in activities of each project, (4). Estimate activity time duration, estimate the amount of time period needed for accomplishing activity individually/each one by estimating resources, (5). Set-up scheduling, make activities analysis sequence, such as duration of time, resources needed, and scheduling limit to make project scheduling, (6) Control sales, make monitoring of project status/project progress, for updating project progress, and manage changes on scheduling baseline. [7]. Many construction project that waste time, the available times regarded as easy to extend it, but it is not realized that by time extension the cost usage will increase. Time has different behaviour to another management elements, if time does not used properly then will lose other opportunities. [9]. Time performance so important to implement the construction project that complex, unique and non-repeated in short time. Time performance becomes one of benchmarks to achieve the success of construction project. The use of construction project implementation time that precise on the time planned is a benchmark in a success of project activities.

Cause Variable

Independent variables defined as follow: (1). X1. Quantity of work is the amount of work conducted in a time period established, (2). X2. Quality of work is the quality of work achieved based on its conformity and readiness terms, (3). X3. Spirit of work is the spirits of every job implementation, (4). X4. Job knowledge is the width of knowledge concerning its work and skill, (5). X5. Creativeness is the authenticity of idea that be emerged and the action to accomplish the problems emerged, (6). X6. Cooperation is readiness to cooperate with others of organization member fellow, (7). X7. Dependability is an awareness to discipline and to be reliable in work attendance and accomplishment, (8). X8. Initiative is spirit to implement new tasks and in enlarge the responsibility, (9). X9. Personal qualities are concerning personality leadership, hospitality and personal integrity. Y1. Time performance dependent variable defined as time duration used for implementation in project activities. [7][8]. This research was conducted with 99 samples of 132 populations taken as purposive sampling, [12][13], was analysed by *Structural Equation Modelling (SEM)* statistics method used *Partial Least Square (PLS)* that will result in path analysis and factor analysis simultaneously. [14][15][16]. While, relation between variables and indicator description are as follow. Figure 2 presented the Relation of Variable.

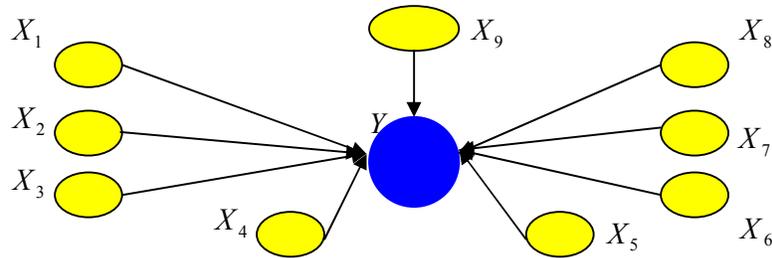


Figure 2. Relation of Variable

Each of independent variables and dependent variable has 3 (three) indicators as describe following, namely:

1. Independent variable X1, Quantity of work includes indicators (a). Quantity of work scope, (b). Quantity of materials stock, (c). Quantity of equipment use.
2. Independent variable X2. Quality of work includes indicators (a). Examination of raw materials quality, (b) Examination of each work scope result, and (c) Examination before work commissioning.
3. Independent variable X3. Spirit of work includes indicators (a) spirit of each work scope, (b) spirit of materials procurement, (c) spirit of equipment mobilization.
4. Independent variable X4. Job knowledge includes indicators (a). Expertise of core staffs, (b). Expertise of field supervising staffs, (c) Expertise of laboratory staffs.
5. Independent variable X5. Creativeness includes indicators (a) Creativity of new innovation adaptation, (b) Creativity of new technology adaptation, (c) Creativity of information technology (IT) adaptation.
6. Independent variable X6. Cooperation includes indicators (a) Cooperation with staffs, (b) Cooperation with inter-team project, (c) Cooperation with stakeholder.
7. Independent variable X7. Dependability includes indicators (a) Reliable of work method application, (b) Reliable of teamwork executor, (c) Reliable of work output.
8. Independent variable X8. Initiative includes indicators (a) Initiative of settlement if take place natural disaster, (b) Initiative of settlement if take place governmental policy, (c) Initiative of settlement if take place internal conflict.
9. Independent variable X9. Personal qualities includes (a). Worker has will, (b). Worker has high loyalty, (c). Worker has work ethos.
10. Dependent variable Y1. Time Performance Variable includes indicators (a) No bureaucratic roadblocks, (b) No poor lead time on project, (c). No too much travel. [1][2][3][7][9][17][18][19][20].

Hypotheses

Hypotheses of this research [11][12][13] are (1). Establish the cause variables are independent variables consisted of 9 (nine) variables are X1 Quantity of work, X2 Quality of work, X3 Spirit of work, X4 Job knowledge, X5 Creativeness, X6 Cooperation, X7 Dependability, X8 Initiative and X9 Personal qualities have no effect on Consequence variable is the dependent variable that only 1 (one) variable is Y1. Time Performance and (2). Establish one of independent variables that dominant influential on Time Performance variable of construction project implementation in Central Java Province.

Study Design

Activities order in this research design is as follow, *First*: Introduction discusses about expectation and reality in field, *Second*: Materials and Methods, discussing about (a) cause variable and (b).consequence variable include theory base, (c) hypotheses, (d) research design, (e) population and sample, (f) research instrument, (g) results of research trial, and. (h) statistics analysis use, *Third*: Conclusion provide conclusion of research results.

Population and Sample

Population of all variables selected [11][12], are on project with the large cost category with the strong classification executor contractor as respondents in implementation for 3(three) last year from 2012-2014 on projects in public work area (housing, road-bridge and irrigation) as many as 132 (one hundred thirty two) respondents. Sample numbers of the population have resulted in sample numbers representing population of 99 (ninety nine) respondents selected according to cluster sampling.

Instrument of the Research

Assessment on the respondent perception and attitude in dependent variable and independent variables have been established is using Likert scale with 5 (five) level to answer questions from questionnaire have been

established as follow: (1) Strongly Disagree, with a score value of 1, (2) Disagree, with a score value of 2, (3) Neutral, with a score value of 3, (4) Agree, with a score value of 4, (5) Strongly Agree, with a score value of 5, [11][12].

Results of Trial Instrument of the Research

Trial instrument of the research be in answers for questions from questionnaire to determine item trial result, construct validity test and reliability test. Of 30 (thirty) respondents tested on indicators of each independent variable and dependent variable that research can be continued on the actual research due to the instrument has complied with item test ≥ 0.30 , construct validity test $\geq 60\%$ and reliability test ≥ 0.60 as explained in the following table: Table 1. Results of item test trial, validity test, and reliability test.

Table 1. Results of item test trial, validity test, and reliability test

Variable and indicator	Item $\geq 0,30$	Valid $\geq 0,60$	Reliable $\geq 0,60$
X1. Quantity of work		0,762	0,905
X1.1.	0,871		
X1.2.	0,847		
X1.3.	0,874		
X2. Quality of work		0,740	0,885
X2.1.	0,895		
X2.2.	0,768		
X2.3.	0,848		
X3. Spirit of work		0,716	0,874
X3.1.	0,800		
X3.2.	0,888		
X3.3.	0,782		
X4. Job knowledge		0,746	0,895
X4.1.	0,863		
X4.2.	0,800		
X4.3.	0,885		
X5. Creativeness		0,861	0,856
X5.1.	0,789		
X5.2.	0,767		
X5.3.	0,838		
X6. Cooperation		0,741	0,875
X6.1.	0,871		
X6.2.	0,832		
X6.3.	0,774		
X7. Dependability		0,897	0,961
X7.1.	0,927		
X7.2.	0,943		
X7.3.	0,958		
X8. Initiative		0,766	0,905
X8.1.	0,871		
X8.2.	0,826		
X8.3.	0,892		
X9. Personal quality		0,832	0,933
X9.1.	0,931		
X9.2.	0,890		
X9.3.	0,888		
Y		0,779	0,911
Y1.1.	0,883		
Y1.2.	0,885		
Y1.3.	0,844		

Source: Results of Research Processing

The Use of PLS Statistic Analysis

This research used statistic analysis Structural Equation Modelling (SEM) based on variance or Partial Least Square-PLS by software Smart PLS, due to some reason as follow: (1) that all variables in the form of formative variable, (2). that all variables needed Factor Loading analysis of each indicator, (3). limited respondent numbers by considering the numerous variables and indicators, (4). that the research was predictive. [14][15][16].

RESULTS AND DISCUSSION

Equation and Model

Analysis of statistical data Partial Least Square (PLS) by using Smart PLS software with the independent variables of Quantity of work, Quality of work, Spirit of work, Job knowledge, Creativeness, Cooperation,

Dependability, Initiative, Personal qualities as while the dependent variable is Time performance. Testing the model produces standardized regression weight values to variables.

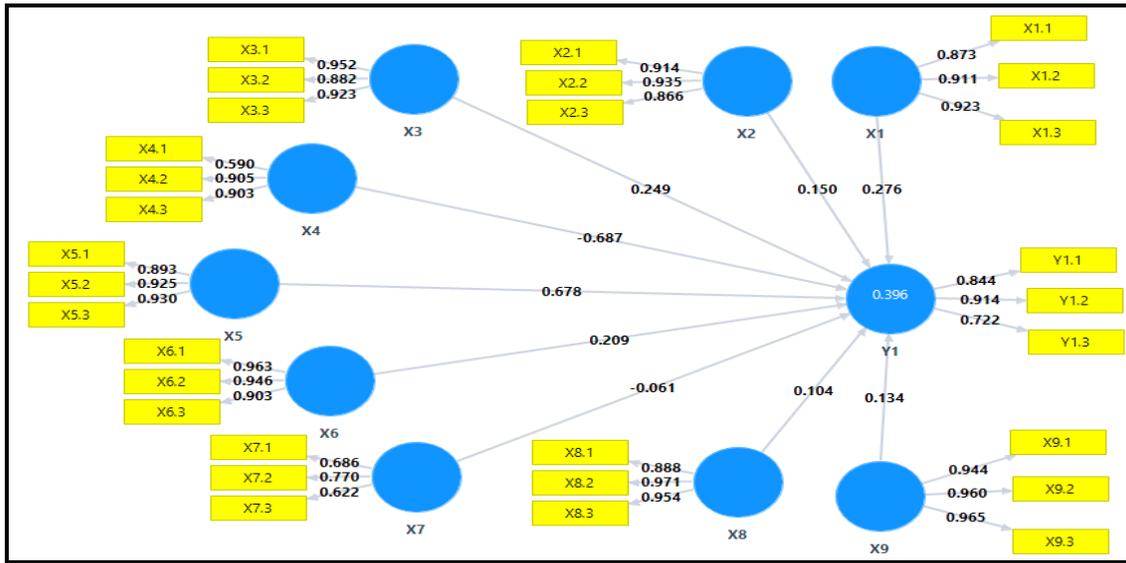


Figure 3 Path Coefficient

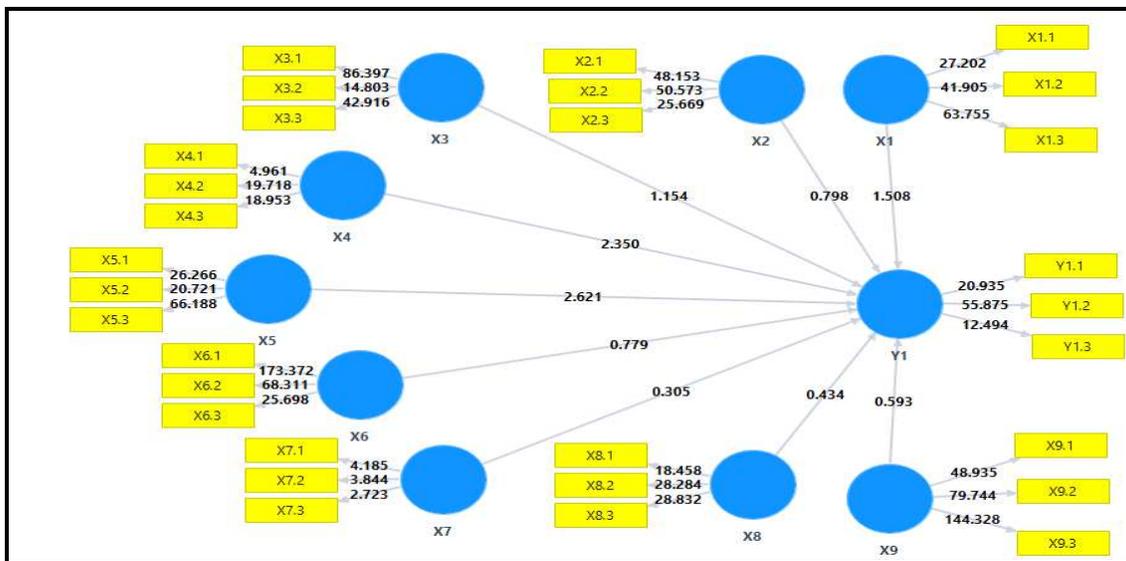


Figure 4 T-Statistics

Of the results of statistic analysis by Partial Least Square-PLS using Smart PLS software it was obtained the equation as follow: $Y1 = 0.276 X1 + 0.150 X2 + 0.249 X3 - 0.687 X4 + 0.678 X5 + 0.209 X6 - 0.061 X7 + 0.104 X8 + 0.134 X9$. It showed that the independent variables Quantity of work, Quality of work, Spirit of work, Cooperation, Dependability, Initiative, Personal qualities were insignificantly influential on the dependent variable of Time Performance and variables of Job knowledge, Creativeness were significantly influential on the dependent variable of Time Performance, while the independent variable of Creativeness was that dominant significantly influential on the dependent variable of Time Performance of the work implementation.

Table 2 Testing Between Latent Variables

No	Latent Variables		Path Coef	T-Stat	T-Table	Remarks
1	X1-Y1	Quantity of work – Time Performance	0,276	1,508	1,96	InSig
2	X2-Y1	Quality of work - Time Performance	0,150	0,798	1,96	InSig
3	X3-Y1	Spirit of work - Time Performance	0,249	1,154	1,96	InSig
4	X4-Y1	Job knowledge - Time Performance	-0,687	2,350	1,96	Sig
5	X5-Y1	Creativeness - Time Performance	0,678	2,621	1,96	Sig
4	X6-Y1	Cooperation - Time Performance	0,209	0,779	1,96	InSig
5	X7-Y1	Dependability - Time Performance	-0,061	0,305	1,96	InSig
6	X8-Y1	Initiative - Time Performance	0,104	0,434	1,96	InSig
6	X9-Y1	Personal qualities - Time Performance	0,134	0,593	1,96	InSig

Source: Result of Research

Contribution of Variable Relationship

The determinant coefficient of determination (*R-square*), is a coefficient determining how is the relationship contribution may be described by each variable may be explained as follow: relationship contribution of the independent variables of Quantity of work, Quality of work, Spirit of work, Job knowledge, Creativeness, Cooperation, Dependability, Initiative, and Personal qualities on the dependent variable of Time Performance was of 39.6 %

Correlation if Indicators against Variables

Indicators correlation with independent variable and dependent variable as showed in the following table: Table 3. Correlation between indicators and variables

Table 3 Correlation between indicators and variables

Factor loading	T-Stat	T-table	Remark
X1.1. = 0,873	27,202	1,96	
X1.2. = 0,911	41,905	1,96	
X1.3. = 0,923	63,755	1,96	biggest
X2.1. = 0,914	48,153	1,96	
X2.2. = 0,935	50,573	1,96	biggest
X2.3. = 0,866	25,669	1,96	
X3.1. = 0,952	86,397	1,96	biggest
X3.2. = 0,882	14,803	1,96	
X3.3. = 0,923	42,916	1,96	
X4.1. = 0,590	4,961	1,96	
X4.2. = 0,905	19,718	1,96	biggest
X4.3. = 0,903	18,953	1,96	
X5.1. = 0,893	26,266	1,96	
X5.2. = 0,925	20,721	1,96	
X5.3. = 0,930	66,188	1,96	biggest
X6.1. = 0,963	173,372	1,96	biggest
X6.2. = 0,946	68,311	1,96	
X6.3. = 0,903	25,698	1,96	
X7.1. = 0,686	4,185	1,96	
X7.2. = 0,770	3,844	1,96	biggest
X7.3. = 0,622	2,723	1,96	
X8.1. = 0,888	18,458	1,96	
X8.2. = 0,971	28,284	1,96	biggest
X8.3. = 0,954	28,832	1,96	
X9.1. = 0,944	48,935	1,96	
X9.2. = 0,960	79,744	1,96	
X9.3. = 0,965	144,328	1,96	biggest
Y1.1. = 0,844	20,935	1,96	
Y1.2. = 0,914	55,875	1,96	biggest
Y1.3. = 0,722	12,494	1,96	

Source: Result of Research

Biggest Correlation of Indicators against Variables

In this section is determining the largest correlation of each of indicators on the independent variables that significantly influential/insignificantly influential on the dependent variable of Time performance. Of 9 (nine)

independent variables that significantly influential/insignificantly influential and indicator correlation and dependent variable are as follow:

1. Indicator correlation with Independent Variable X1. Quantity of work, (insignificantly influential).
Independent variable of Quantity of work is insignificantly influential on Time Performance and has path coefficient of 0.276 with T-Statistics = 1.508 < 1.96. Each indicator has correlations (loading factors) as follow: (a). Quantity of work scope, (b). Quantity of material stock, (c). Quantity of equipment use which has the largest correlation with variable X1. Quantity of work is indicator X1.3. Quantity of equipment is with loading factor 0.923.
2. Indicator correlation with Independent Variable X2. Quality of work, (insignificantly influential).
Independent variable of Quality of work is insignificantly influential on Time Performance and has path coefficient of 0.150 with T-Statistics = 0.798 < 1.96. Each indicator has correlations (loading factors) as follow: (a). Examination of raw materials quality, (b). Examination of each work scope result, (c). Examination before work commissioning which has the largest correlation with variable X2. Quality of work is indicator X2.2. Examination of each work scope result with loading factor 0.935.
3. Indicator correlation with Independent Variable X3. Spirit of work, (insignificantly influential).
Independent variable of Spirit of work is insignificantly influential on Time Performance and has path coefficient of 0.249 with T-Statistics = 1.154 < 1.96. Each indicator has correlations (loading factors) as follow: (a). spirit of each work scope, (b). spirit of materials procurement, (c). spirit of equipment mobilization which has the largest correlation with variable X3. Spirit of Work is indicator X3.1. Spirit of each work scope is with loading factor 0.952.
4. Indicator correlation with Independent Variable X4. Job knowledge, (significantly influential).
Independent variable of Job knowledge is significantly influential on Time Performance and has path coefficient of 0.687 with T-Statistics = 2.350 > 1.96. Each indicator has correlations (loading factors) as follow: (a). Expertise of core staffs, (b). Expertise of field supervising staffs, (c). Expertise of laboratory staff which has the largest correlation with variable X4. Job knowledge is indicator X4.2. Expertise of field supervising staffs is with loading factor 0.905.
5. Indicator correlation with Independent Variable X5. Creativeness, (significantly influential).
Independent variable of Creativeness is significantly influential on Time Performance and has path coefficient of 0.678 with T-Statistics = 2.621 > 1.96. Each indicator has correlations (loading factors) as follow: (a). Creativity of new innovation adaptation, (b). Creativity of new technology adaptation, (c). Creativity of information technology (IT) adaptation which has the largest correlation with variable X5. Creativeness is indicator X5.3. Creativity of information technology (IT) adaptation is with loading factor 0.930.
6. Indicator correlation with Independent Variable X5. Cooperation, (insignificantly influential).
Independent variable of Cooperation is insignificantly influential on Time Performance and has path coefficient of 0.209 with T-Statistics = 0.779 < 1.96. Each indicator has correlations (loading factors) as follow: (a). Cooperation with staffs, (b). Cooperation with inter-team project, (c). Cooperation with stakeholder which has the largest correlation with variable X6. Cooperation is indicator X6.1. Cooperation with staffs is with loading factor 0.963.
7. Indicator correlation with Independent Variable X7. Dependability, (insignificantly influential).
Independent variable of Dependability is insignificantly influential on Time Performance and has path coefficient of -0.061 with T-Statistics = 0.305 < 1.96. Each indicator has correlations (loading factors) as follow: (a). Reliable of work method application, (b). Reliable of teamwork executor, (c). Reliable of work output which has the largest correlation with variable X7. Dependability is indicator X7.2. Reliable of teamwork executor is with loading factor 0.963.
8. Indicator correlation with Independent Variable X8. Initiative, (insignificantly influential).
Independent variable of Initiative is insignificantly influential on Time Performance and has path coefficient of 0.104 with T-Statistics = 0.434 < 1.96. Each indicator has correlations (loading factors) as follow: (a). Initiative of settlement if take place natural disaster, (b). Initiative of settlement if take place governmental policy, (c). Initiative of settlement if take place internal conflict which has the largest correlation with variable X8. Initiative is indicator X8.2. Initiative of settlement if take place governmental policy is with loading factor 0.971.
9. Indicator correlation with Independent Variable X9. Personal qualities, (insignificantly influential).
Independent variable of Personal qualities is insignificantly influential on Time Performance and has path coefficient of 0.134 with T-Statistics = 0.593 < 1.96. Each indicator has correlations (loading factors) as follow: (a). Worker has will, (b). Worker has high loyalty, (c). Worker has work ethos which has the largest correlation with variable X9. Personal qualities are indicator X9.3. Worker has work ethos is with loading factor 0.965.
10. Indicator correlation on Dependent Variable Y1. Time performance.

Each of indicators has correlations (loading factors) as follow: (a) No bureaucratic roadblocks, (b) No poor lead time on project, (c). No too much travel which has the largest correlation with variable Y1. Time Performance is indicator Y12. No poor lead time on project is with factor loading 0.912.

CONCLUSION

Analysis results can be concluded as follow, that (1). Multiple regression equation of Time Performance is: $Y1 = 0.276 X1 + 0.150 X2 + 0.249 X3 - 0.687 X4 + 0.678 X5 + 0.209 X6 - 0.061 X7 + 0.104 X8 + 0.134 X9$, (2). There are 2 (two) independent variables of Job knowledge and Creativeness are significantly influential on the dependent variable of Time Performance, while other 7 (seven) independent variables are insignificantly influential, (3). Of 9 (nine) independent variables then there is 1 (one) independent variable of Creativeness, dominant significantly influential on the dependent variable of Time Performance, (4). Indicator having largest correlation with the independent variable of Job Knowledge (the first has significant effect on the dependent variable of Time Performance) is indicator Expertise of field supervisor staffs, (5). Indicator having largest correlation with independent variable of Creativeness (the second has significant effect on the dependent variable of Time Performance) is indicator Creativity of information technology (IT) adaptation.

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