# FACTORS AFFECTING PROGRAMMER'S PERFORMANCE ON WEB-BASED PROGRAMMING

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## ABSTRACT

The purpose of this research is to determine the factors that are significantly influence and contribute to the performance of programmers. Data obtained using questionnaires distributed to randomly chosen programmers in Jakarta. The method uses Confirmatory Factor Analysis as measurement model and multiple linear regression analysis as the structural model.  The data was processed using SPSS AMOS. The results are the factors that affect the performance of a programmer are: Knowledge of Software, GPA, Analytical Skills, Income Level, Level management of best practice, leadership of supervisors, Teamwork skill, Business Process Knowledge, Organizational Experiences, and the work environment. It is suggested that these factors should be considered both in hiring process and in development of training materials for web programmers.

**Keywords :** *Factors, Programmer's Performance, Programmer*

## 1.  INTRODUCTION

Today, the changes that occur in the field of IT is repositioning its role from just to support back office to strategic role. Thus, this change has led to high demand for IT professionals who have the competence and also updated on the utilization of new technologies. Besides they are also required to master the appropriate skills to achieve organizational goals. This trend explains why many organizations continue to look for reliable IT professionals.

This may imply that there is an increased need for information systems to meet business needs. So the demands on the IT division at each company that would enable the development of effective systems is increasing.

Each company is definitely in need of growing use of computerized technology in any operational activities in order to enhance the performance of their employees. In addition to high system reliability requirements, the need for new systems to support the business is very high. However, based on observation, the level of delay and failure of a project is still quite high.

In order that the company can maintain and even improve the effectiveness of application development, in particular the performance of programming ability of the programmers, then companies need to know the factors that influence the performance of their programmers. By knowing these factors, then the company can determine the critical criteria in recruiting programmers, and also the company can improve the performance of existing programmers in developing enterprise applications and in devising training programs. Thus, the company can develop applications faster that suit business needs.

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## 2.  LITERATURE REVIEW

(Gibson, Ivancevich, & Donnelly, 1996) states that there are three groups of variables that affect the behavior and performance of the work, namely: individual variables, organizational variables and psychological variables. All three of these variables affect the behavior of the group work, which in turn affects the performance of personnel. Behavior that affect performance are related to job tasks that must

be completed to achieve the goal of a position or task.

Research conducted by (Lee, 2008) which analyzed the capabilities needed by a programmer/analyst as an entry level in a survey conducted on 500 companies. The results show that a programmer/analyst in 500 companies is expected to be able to meet the combination of computer programming abilities and also understand the business of the company. These results are discussed on the implications for the IS curriculum model.

Fang, Lee, Lee, & Huang, (2004) conducted a study that aims to explore this important issue using survey research methodology. From 213 seniors majoring in MIS in three different U.S. universities were participated in the survey. Critical factors identified in this study include internship experience, the nature of the internship experience, double majors, time passed, the value of the average GPA, and gender differences. The research findings in this study indicated that student GPA, internship oriented networking, and multiple majors identified as key items that affect the job offer.

Rodrigues & Rebelo (2009) discussed the relationship between work sample test (WST) and the size of the work experience (JE) with task and contextual performance. Hypothetically, WST and JE are related to task performance, because both are connected with task and intrinsic technical elements other than work. Using a sample of 60 assembly workers, the results indicate that the sample is valid in predicting labor duties, but could not predict contextual performance. In connection with work experience, the results revealed a moderate correlation with both dimensions of performance.

Taylor, England, & David (2001), discusses the results of a study involving 20 case studies in the UK organization that aims to investigate : 1. skills and knowledge required for the job of website development, 2. how the skills and knowledge used in actual practice, and 3. mechanisms that skills and knowledge can be acquired and improved. The result is the required knowledge in web development, are namely: 1. Technical capability, consisting of Design, Programming, Testing, Debugging, Security. 2. Analytical capabilities, consisting of requirements analysis, cost benefit analysis, debugging, interpreting user requirements. 3. The ability of the business, which consists of business terminology, business Procedures, legislation, security, interpreting user requirements.

Chilton, Hardgrave, & Armstrong, (2010) conducted a study that examines the impact of changes in technology, and focusing on working conditions which affect individual performance, health, and welfare by implementing person- job fit theory to software developers who have moved into the development approach object oriented. Current research recognizes the dynamics of the IT workplace and investigates the impact of the work environment is changing rapidly at the individual IT workers by including a comparison of the fit at two different points in time. The results show IT managers must be able to direct their efforts towards the dimensions of the work environment that can improve worker performance and reduce the adverse effects of stress and tension. This, in turn, can have a positive effect on the development of the overall system. This study provides insights for managers regarding the pressures felt by software developers moving to a new development environment.

Payne (2004), examined the use of three component models of communication skills (motivation, knowledge, and skills) and its relationship with organizational context (performance of work, the level of positioning) and communication skills. Analysis of the data showed a high work have a significant relationship with motivation to adapt and communication skills (empathy, communication adaptation, and interaction management). Supervisors also need more motivation than subordinate capabilities. Later, job performance and job position does not have a significant impact.

Mondello&Maxcy (2009) conducted a study that aimed to evaluate he effects of both salary and incentive pay dispersion on team performance using data from the National Football League over the years 2000-2007. This paper uses regression analysis. The relationship between increased performance in the field and an increase in salary, the lower level of salary dispersion, and increased incentives found. This suggests that a more compressed wage structure improves performance on the field. This study is unique in addressing how the dispersion of wages in combination with incentive pay correlates to team success as measured by both the win and the production of income. While the authors use the NFL as an organization under study.

Politis (2013) examined the effects of authentic leadership and servant leadership on team performance using samples obtained from the United Arab Emirates (UAE). Structural equation modeling determined whether the influence of servant leadership on team performance greater than that of authentic leadership. Findings from 181 respondents indicated that servant leadership has a

significantly greater effect on team performance in comparison to authentic leadership. In addition, authentic leadership affects team performance and leadership considerations influence on team performance was found comparable to authentic leadership. The results also showed that authentic leadership and servant leadership accounted for 59 % of the variance in team performance, shows the organization must train and or hire leaders who behave in ethical leadership, authentic leadership and servant leadership if they want to maintain and or improve the performance of the team.

## 3. METHODOLOGY

This research looks at the major factors affecting the performance of the programmer. Identification of factors that become hypotheses were drawn from the literature, papers, and discussion forum to then become a model study. Model studies later demonstrated empirically in the form of hypothesis testing with data obtained from the questionnaire.

This research will take the population of programmers that develop web-based applications that lives in Jakarta.

At 16 variables exist, 13 of which will be measured using the operational variables, and 3 of them will be measured directly. Once the data is obtained, the operational variables obtained will be analyzed by the method of Confirmatory Factor Analysis (CFA).

The statistical method used is Regression Analysis to find out the relation between the hypothesized independent variables that affect the performance of programmer as in the following equation :

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_{15} X_{15} + \varepsilon$$

Where :

Y = Programmer's Performance
$\beta_0, \beta_1, \beta_2, \beta_3, \ldots \beta_{15}$ = Regression Parameters
$X_1, X_2, X_3, \ldots, X_{15}$ = Independent variables

The next, to calculate the estimator of $\beta_1$, $\beta_2$, $\beta_3, \ldots \beta_{15}$ (Regression Parameters) is performed by regression techniques of Ordinary Least Square (OLS) and the data processing is using statistical package SPSS Amos.

Based on the formulation of the problem in this study, the hypothesis that will be tested are as follows:

H1 : There is a positive relationship between GPA with programmer's performance.

H2 : There is a positive relationship between working experience with programmer's performance.

H3 : There is a positive relationship between organizational experience with programmer's performance.

H4 : There is a positive relationship between Analytical Skills with programmer's performance.

H5 : There is a positive relationship between Knowledge of Software with programmer's performance.

H6 : There is a positive relationship between Business Process Knowledge with programmer's performance.

H7 : There is a positive relationship between the level of discipline with programmer's performance.

H8 : There is a positive relationship between the level of creativity with programmer's performance.

H9 : There is a positive relationship between Teamwork skill with programmer's performance.

H10 : There is a positive relationship between intrapersonal skills with programmer's performance.

H11 : There is a positive relationship between communication skills with programmer's performance.

H12 : There is a positive relationship between work environment with programmer's performance.

H13 : There is a positive relationship between the leadership of supervisors with programmer's performance.

H14 : There is a positive relationship between the Income Level with programmer's performance.

H15 : There is a positive relationship between Level management of best practicewith programmer's performance.

## 4. RESULTS AND DISCUSSION

Research questionnaires were distributed via random deployment to companies domiciled in Jakarta. A total of 162 respondents were willing to fill out the questionnaires. Questionnaires distributed to respondents who worked as programmer and web developer.

The results of the hypothesis testing using regression, is provided in the following table (Table1).

Table1.*Regression Analysis Results*

|        |      |        | Estimate | S.E. | P |
|--------|------|--------|----------|------|---|
| KP | <--- | IPK | .083 | .046 | .072* |
| KP | <--- | PKA | .000 | .000 | .974 |
| KP | <--- | PO  | .034 | .016 | .036** |
| KP | <--- | KA  | .077 | .027 | .004** |
| KP | <--- | PL  | .115 | .037 | .002** |
| KP | <--- | PB  | .040 | .023 | .084* |
| KP | <--- | TD  | .023 | .042 | .582 |
| KP | <--- | TK  | .006 | .016 | .682 |
| KP | <--- | KS  | .041 | .021 | .055* |
| KP | <--- | KI  | .010 | .017 | .582 |
| KP | <--- | KK  | -.018 | .028 | .508 |
| KP | <--- | LK  | .033 | .020 | .090* |
| KP | <--- | SP  | .053 | .024 | .023** |
| KP | <--- | TPN | .075 | .024 | .002** |
| KP | <--- | BP  | .060 | .023 | .010* |

*P<0.10; **P<0.05; Dependent Variable = KP

The regression equation can be written as follows:

$$KP = 0.083\ IPK + 0.034\ PO + 0.077\ KA + 0.115\ PL + 0.040\ PB + 0.041\ KS + 0.033\ LK + 0.053\ SP + 0.075\ TPN + 0.060\ BP$$

Where :
KP    : Programmer's Performance
IPK   : GPA
PKA   : Working Experiences
PO    : Organizational Experiences
KA    : Analytical Skills
PL    : Knowledge of Software
PB    : Business Process Knowledge
TD    : Level of discipline
TK    : Level of creativity
KS    : Teamwork skill
KI    : Intrapersonal skills
KK    : Communication skills
LK    : Work environment
SP    : Leadership of supervisors
TPN   : Income Level
BP    : Level management of best practice.

Hypothesis H1 which states that the GPA would have a positive effect on Programmer performance is significantly acceptable. This is consistent with the research (Fang, Lee, Lee, & Huang, 2004). Due to its significant influence, variable GPA is required to be considered by a company in recruiting new programmers.

Hypothesis H2 stating work experience will have a positive influence on programmer performance could not be accepted or insignificant. According to Rodrigues & Rebelo (2009), work experience will be directly proportional to the work of a technical nature. But it does not have a strong relationship to the work that is CONTEXTUAL. This might be due to the programming work is more concerned with analytical skills and problem solving.

Hypothesis H3 states that the experience of the Organization will have a positive effect on programmer performance is significant acceptable. This is in line with the findings of Smeenk, Teelken, Eisinga, &Doorewaard, (2009). Because of organizational experience will have an impact on the performance of programmers, then the company needs to consider this in recruiting new programmers.

Hypothesis H4 which states that the analytical capability will have a positive impact on programmer performance is significantly acceptable. These results are consistent with studies conducted by Lee, (2008), Taylor, England, & David, (2001) which states that the ability to analyze the requirements of skills needed by a programmer. Because analysis skills will have an impact on the performance of programmers, then the company needs to consider in recruiting new programmers.

Hypothesis H5 states that the knowledge of the Software will have a positive impact on programmer performance is significantly acceptable. These results are consistent with studies conducted by Lee, (2008), Todd, McKeen, and Gallupe, (1995) which states that knowledge into a software skill requirements needed by a programmer. Because of the knowledge of the software will have an impact on the performance of programmers, then the company needs to consider this in recruiting new programmers.

Hypothesis H6 which states that knowledge of Business Process will have a positive impact on performance is significantly acceptable. These results are consistent with studies conducted by Lee, (2008), Taylor, England, & David, (2001) which states that the business process knowledge into skill requirements needed by a programmer. Because of the knowledge of business processes will have an impact on the performance of programmers, then the company needs to consider

it in hiring new programmers and also need to hold training on business processes to the programmer.

Hypothesis H7 states Discipline rate would have a positive influence on programmer performance could not be accepted or rejected as insignificant. This is not in line with the research Hanif& Pervez, (2004). This might be due to programming jobs have flexible working hours, so the degree of discipline does not have a strong influence.

Hypothesis H8 stating Creativity rate will have a positive influence on performance of Programmers could not be accepted or rejected as insignificant. This finding is not in line with the findings Chao - Sen, Cheng - Jong, & Tsai, (2012). This might be due to programming jobs do not require a person to creativity.

Hypothesis H9 which states that the ability co-operation will have a positive effect on performance of is significantly acceptable. These results are consistent with studies conducted by Politis, (2013) which states that teamwork has a positive effect on job performance. Because of the ability of co-operation will have no impact on the performance of programmers, then the company needs to improve the ability of the programmer cooperation with training that can improve collaboration capabilities.

Hypothesis H10 states intrapersonal ability would have a positive impact on programmer performance could not be accepted or rejected as insignificant. This result is contrary to the study conducted by Payne, (2004). This may be due to differences in culture and philosophy of the state of research; cultural differences and philosophies can lead to a view of the specific values to be different anyway.

Hypothesis H11 states Communication Ability will have a positive influence on programmer performance could not be accepted or rejected as insignificant. This result is contrary to the study conducted by (Payne, 2004). This may be due to differences in culture and philosophy of the state of research, cultural differences and philosophies can lead to a view of the specific values to be different anyway.

Hypothesis H12 which states that the Working Environment will have a positive impact on performance is significantly acceptable. This is consistent with studies Chilton, Hardgrave, & Armstrong, (2010). Good Work Environment naturally also have a positive impact on the performance of employees. Because of the work environment will have an impact on the performance of programmers, then the company needs to improve the comfort of the work environment to improve the performance of the programmer.

Hypothesis H13 which states that the leadership of Supervisors will have a positive impact on performance is significantly acceptable. These results are consistent with studies conducted by Politis, (2013) and also Payne, (2004) which states that the leadership of the supervisor has a positive influence on job performance. Because of the leadership of the supervisor will have an impact on the performance of programmers, then the company needs to improve the ability of supervisors with training that can enhance the capabilities of the supervisory team leader for them.

Hypothesis H14 which states that the level of income will have a positive impact on performance is significantly acceptable. This is in line with the findings of Mondello&Maxcy, (2009). This indicates the level of income will have an impact on the performance of programmers. Because of the level of income will have an impact on the performance of programmers, then the company can evaluate the programmer income level to improve the performance of programmers.

Hypothesis H15 which states that the level of management Best Practice will have a positive impact on performance is significantly acceptable. This suggests that the level of management best practice to have an influence on the performance of programmers with significant influence. These results are consistent with studies conducted by Politis, (2013), Shook, (2006). Due to the level of best practice management has a positive influence on the performance of programmers, companies need to improve the management of existing best practice.

## 5. CONCLUSIONS

From the research it can be concluded that the following are factors having in the order of which the largest influence to the smallest influence on the programmer's performance on a web-based programming:

1. Knowledge of Software
2. GPA
3. Analytical Skills
4. Income Level
5. Level management of best practice
6. Leadership of supervisors
7. Teamwork skill
8. Business Process Knowledge
9. Organizational Experiences
10. Work environment

## 6. SUGGESTIONS

It is suggested for a company that has a programmer could do the following to improve the performance of their programmers:

- Take notice of GPA, organizational experience, analytical skills and software knowledge when hiring a programmer.
- Provide training on business processes and team building to improve teamwork.
- Provide leadership training for supervisors and team leaders programmers.
- Improving the comfort in the workplace.
- Evaluate the programmer income for increasing motivation.
- Improving the management of existing best practice in the company.

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