TEPIAN Vol. 6 No. 2 (June 2025) 79-84 p-ISSN 2721-5350 e-ISSN 2721-5369
https://doi.org/10.51967/tepian.v6i2.3302 © 2025 Tepian Politeknik Pertanian Negeri Samarinda

Measuring Work Performance from Keyboard and Mouse Use

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Submitted: 2025-05-04; Accepted: 2025-05-15; Published: 2025-06-01

***Abstract*—**In this modern and in age of industrial era 4.0 that was fostered by Covid-19 pandemic the challenge of increasing employee productivity is the main key to company success. One of the predictors of work performance for office workers are the use of computer aids such as keyboard and mouse. This study aims to explore how keyboard and mouse usage behavior affects work performance. The study shows that in the IoT era, poor predictability of work-related behavior from the use of computer accessories is encouraged. The sampling technique with accidental sampling, distributing 100 questionnaires to the target respondents giving the respond rates of 76% respondents using several survey techniques. The instruments use is developed from previous studies that prove to be effective in asking the perception of respondents. The data were analyzed using multiple linear regression, simple linear regression, and correlation through the Statistical Package for the Social Sciences (SPSS) version 27. The findings of this study revealed that keyboard usage behavior plays a significant and positive role in influencing work performance. In contrast, mouse usage behavior was not found to have a significant impact on work performance. This may be because some employees have other alternatives compared to using a mouse, namely a touchpad. Several recommendations for organization that employed office workers that mostly rely on computer for their work is posed to support work performance. This study is the bridging study to computer related study that can measure the productivity, and others work performance variables using more specific IoT tools such as sensors that enable to more accurate results better than perception study.

***Keywords*—**Use Behaviour, Mouse use Behaviour, Work Performance, Multiple Regression Analysis, Internet of Things.

I. INTRODUCTION

In this modern age of industrial era 4.0 that was fostered by Covid-19 pandemic the challenge of increasing employee productivity is the main key to company success. There is no doubt that after the Pandemic the acceleration of the usage of Internet and Internet of Things (IoT) technology has become an innovation that plays an important role in achieving this goal. By utilizing real-time connectivity and data integration, IoT technology opens up new opportunities to improve operational efficiency and employee performance in various industrial sectors. A strategy that is put forward to optimize employee productivity in the industry also involves the effective integration of data from various sources. Research in the area of strategic management showed that IoT technology enables comprehensive data collection and analysis, opening the door to faster and more informed decision-making, therefore the goals of maximizing employee productivity can be achieved.

Integration of data from work aids related to computer use as well as smart devices not only provides a comprehensive picture of operational performance but also allows management to identify trends, patterns and opportunities that can improve efficiency. For example, real-time production data can be integrated with inventory data to ensure supplies are always available according to production needs. The application of the Internet of Things (IoT) has opened new avenues to increase employee productivity in various industrial sectors From the use of sensors for performance monitoring to data integration that enables fast decision-making. This technology forms the foundation for higher operational efficiency. In addition, the development of an adaptive work environment and IoT-based employee training also contribute to creating conditions that support the growth of individual performance.

The utilisation of networked computers has become a fundamental aspect of contemporary workplaces, exerting a considerable impact on employee performance. The advent of computers has facilitated seamless communication, data sharing and collaborative tasks, thereby enabling employees to access resources and information in real-time. This has resulted in increased

productivity and efficiency The utilisation of networked systems enables the collaboration of teams across disparate departments or locations, thereby reducing the time spent on manual processes and enhancing the overall workflow. Furthermore, computer networks facilitate the effective monitoring of progress and performance metrics by managers, offering insights that can inform superior decision-making and resource allocation. Consequently, the integration of networked computers not only supports the day-to-day operations of an organization but also contributes to enhancing its overall performance and achieving its strategic objectives. Furthermore, computer networks facilitate the effective monitoring of progress and performance metrics by managers, offering insights that can inform superior decision-making and resource allocation. Consequently, the integration of networked computers not only supports the day-to-day operations of an organization but also contributes to enhancing its overall performance and achieving its strategic objectives. Organizations should create an environment that supports digital autonomy and encourages employees to use their digital skills in innovative ways. Digital transformation especially after the Pandemic offers opportunities for better stress management in turn can increase work performance. Human-computer interactions with ubiquitous digital devices could be used for real-time monitoring of work-related stress. Productivity outcomes were defined as variables assessing work-related tasks (e.g.typing, mouse), whereas performance outcomes were categorized as any variables assessing cognition that did not mimic work-related tasks. The use of a computer mouse is a pivotal element in optimizing employee performance, facilitating precision, velocity and straightforward interaction with digital interfaces. As an indispensable input device, the mouse enables employees to navigate software applications, manage data, and execute tasks in an efficient manner, while reducing the physical strain typically associated with such activities. The ergonomic design and functionality of the mouse directly impact user comfort, which is crucial in reducing fatigue and increasing productivity over extended periods of work. Additionally, the intuitive use of a mouse minimizes the learning curve for new software, allowing employees to adapt quickly and perform tasks with accuracy. Therefore, the effective use of a mouse not only supports day-to-day operations but also plays a significant role in improving overall job performance and job satisfaction. Acknowledging this phenomenon raises issues whereas the usage of keyboard mice that the design is not changed in the last 3 decades as well and its functions to operate several commands in computer software that also not changed so much in the last decade can lead to employee performance.

In recent years, a variety of alternative keyboard designs have emerged with the primary goal of enhancing user comfort and productivity compared to conventional keyboards Keyboard use in the modern workplace has a significant impact on employee performance, affecting both productivity and health. With the rise of digitalization and the integration of computers in almost every sector, employees are required to spend long hours typing every day. However, prolonged keyboard use can lead to several health risks, including strain on the hands and wrists, which can lead to conditions such as carpal tunnel syndrome and muscle fatigue. If left unaddressed, these issues can lead to discomfort, reduced productivity and even demotivation. In addition, keyboard ergonomics and design play a crucial role in influencing work efficiency. In line with the usage of the keyboard, this study also questions the keyboard design and features that might affect employee performance.

The contribution of this study is aimed to fill the gap between behavioral science and computer science studies. As such highlight that the urge to transform traditional industries into modern industries needs an intelligent manufacturing monitoring process, hence employee productivity can be achieved. As we can see from previous studies that keyboard use behavior is more related to stress, and introduction to tablet devices leads to fatigue and that mouse clicking is deemed to be the fatigue stressor. Little study show how the use of a keyboard and mouse in workplace can actually predict work performance. Therefore, understanding the relationship between mouse and keyboard use, ergonomics and health is essential to creating a work environment that supports both optimal performance and employee well-being. This study is the first attempt to study behavioral aspects of computer users by examining their perception regarding the use of a mouse and keyboard as an indicator of work performance. The research aims to analyze the relationship between mouse and keyboard use in predicting work performance. Three hypotheses were posed:

H1 : There is a relationship between keyboard use behavior and work performance.

H2 : There is a relationship between mouse use behavior and work performance

H3 : There is a simultaneous relationship between keyboard use behavior and mouse behavior on work performance.

II. METHODOLOGY

There are several steps taken to ensure the methodology taken was appropriate for this type of project. The first is to determine the population criteria. The criteria of respondents are those who spend more than 60% of their office working on computers. The second is capturing several white-collar sectors ranging from industry, education, banking, and start-up industries, By setting this criterion the generalization of the study can be optimized. This research project uses a quantitative survey using Google Forms to collect responses from white-collar workers in Indonesia. Implementing a sampling method with an accidental sampling technique to collect workers' responses related to keyboard use behavior and mouse use behavior to be an effective tool. This non-probability sampling method is considered appropriate when we send questionnaires to workers via email, Instagram, and other social media platforms. The number of respondents who answered was 76 workers. This study used SPSS Statistics and Microsoft Excel to complete the data analysis. The

data were analyzed using multiple linear regression, simple linear regression, and correlation through the Statistical Package for the Social Sciences (SPSS) version 27.

The next step deemed to be important for this project was assessing relevant literature in the area of behavioral sciences and computer science to develop questionnaires that reflect the characteristics of the population. The variables used are developed from multidimensional knowledge, ranging from behavioral science, design science and computer science. The keyboard use behavior is adopted from which measures the perception of keyboard design and features followed by modified questions that measure the workload related to using the keyboard. Furthermore the mouse use behavior, we adopt ndicating the design and features of the mouse followed by modified questions that measure the workload-related behavior while using the keyboard to navigate control of software in the computer. Lastly, for work performance, we use standard employee performance measures both quantitative and qualitative aspects of work performance behaviors as defined by.

For testing hypotheses, we use multiple regression analysis. Multiple linear regression is regression that contains two or more independent variables and one dependent variable. Multiple regression will be used to determine and understand the relationship between the independent variable (Keyboard Use Behavior and Mouse Use Behavior) and dependent variable (Work Performance) of this study. Research work would be incomplete without data presentation. Data presentation involves the pictorial/graphical representation of data collected with the primary objective of summarizing and communicating the research data.

III. Results and Discussion

After distributing the questionnaires through several approaches as mentioned on the methodology section, total of 100 respondents are agreed to fill the questionnaires on the given time, but due to their time limitations and others reasons, only 76% of respondents are completed to fill all the questionnaires.

Table 1. Respondent's Characteristics

Gender	Total	Precentage
Male	32	42%
Female	44	58%
Age (<25)	30	39%
Age (25-30)	27	36%
Age (>30)	19	25%
Experience (<1)	18	24%
Experience (13)	38	50%
Experiences(>3)	20	26%
Total	76	100%

According to Table 1, the total number of respondents is 76. The majority, constituting 42%, are male (32 individuals), while 58% are female (44 individuals). The age group between <25 years old has the highest representation with 30 respondents (39%), while the > 30 years old group has the lowest with 19 respondents (25%). Workers with work experience of less than one year were 18 respondents (24%). There were 38 respondents (50%) with work experience between one and three years. and workers with work experience of more than three years were 20 respondents (26%).

The psychometric of the instrument is considered to be good and meets all the required assumptions beyond the multiple regression. If the calculated correlation coefficient (r-value) exceeds the critical value (r table) at a significance level of 5% or 0.05, the instrument is said to be valid, and vice versa. In this study, with 76 respondents, the critical r table value was obtained at 0.190. The results of the validity test show that all items in the Keyboard Use behavior (X1), Mouse Use Behavior (X2), and Work Performance (Y) variables have a correlation value (r) above the r table value, which is 0.254, which means that the item is valid. In the Keyboard Use behavior (X1) variable, items X1.1 to X1.4 have correlation values ranging from 0.664 to 0.732, all of which are valid. For the Mouse Use behavior variable (X2), items X2.1 to X2.5 have correlation values between 0.628 to 0.839, all valid. Likewise, for the Employee Performance variable (Y), items Y1.1 to Y1.6 have correlation values between 0.642 to 0.904, and all are valid.

Furthermore, the reliability test to Table 2 is employed to assess the extent of dependability of an instrument used in research. In this study, the Cronbach Alpha formula was utilized through SPSS. A variable is considered good or reliable if it possesses an alpha value greater than 0.6, while an alpha value less than 0.6 indicates that the variable is not reliable.

Table 2. Reliability Test

Variable	Cronbach Alpha Score	Information
X1	0.638	reliable
X2	0.832	reliable
Y	0.839	reliable

A. Classical Assumption Test

A variable is considered A multicollinearity test is conducted to identify the presence or absence of multicollinearity in the regression model, utilizing the "Tolerance Value" and "Variance Inflation Factor" (VIF) values. A regression model is considered free from multicollinearity if it has a VIF value of less than 10 and a tolerance value greater than 0.1.

Table 3. Multicollinearity Test Result

Variable	Collinearity Statistics	
	Tolerance	VIF
X1	0.665	1.504
X2	0.665	1.504

The data in Table 3 above indicates that variables X1 and X2 have tolerance scores of 0.665 (greater than 0.1), and the VIF scores for both independent variables are 1.504 (less than 10). Based on the results of the multicollinearity test, it can be concluded that the

independent variables in this study do not exhibit symptoms of multicollinearity.

B. Multiple Linear Regression

Table 4 shows the multiple regression analysis indicating that the coefficient of determination value is 0.540, indicating that the independent variables, Keyboard Use behavior and Mouse Use behavior, collectively influence the dependent variable, work performance, by 54%.

Table 4. Coefficient of Determination

R	R Square	Adjust R Square	Std. Error of Estimate
0.540	0.292	0.273	3.261

Meanwhile, the remaining 29.2% of the influence on the dependent variable is attributed to other independent variables not explored in this research. Table 5 shows the constant score is 11.219, indicating that with no change in the independent variables (Keyboard Use behavior and Mouse Use behavior), or if both variables are assumed to be 0, the estimated value of the dependent variable (work performance) is 11.219 units.

Table 5. Coefficient of Regression Result

Model	Standardized Coefficient Beta
Constant	11.219
X1	0.695
X2	0.136

The regression coefficient for keyboard use is 0.695, suggesting that an increase in Keyboard Use behavior is associated with an increase in work performance. Then, the regression coefficient for Mouse Use behavior is 0.139, indicating that an increase in Mouse Use behavior is associated with an increase in work performance, considering other variables remain constant

B. Hypothesis Test

The hypothesis testing can be seen both in Table 6 for the partial test and Table 7 for the simultaneous test:

Table 6. T-Test Result

Independent Variable	Unstandardized Coefficient		Standardized Coefficient		
	Beta	Std. Error	Beta	T	Sig
Constant	11.219	2.361		4.752	<0.001
X1	0.695	0.184	0.456	3.777	<0.001
X2	0.136	0.128	0.128	1.058	0.239

From the analysis above we can conclude that

H1: The Influence of Keyboard Use behavior (X1) on Work Performance (Y) The direct hypothesis testing of the keyboard use behavior variable on employee performance reveals a t-value of 3.777, which is greater than the critical t-table value of 2.642, with a significance level of 0.000, which is less than 0.05. This suggests that there is a direct positive and statistically significant influence between the Keyboard Use behavior variable and the work performance variable.

H2: The Influence of Mouse Use behavior (X2) on Work Performance (Y) The direct hypothesis testing of the mouse use behavior variable on employee performance yields a t-value of 1.508, which is less than the critical t-table value of 2.642, and a significance level of 0.239, which is greater than 0.05. This indicates that there is no direct significant influence between the Mouse Use behavior variable and the work performance variable.

The significance of the F-test can also be evaluated based on the significance level (α), where if the significance value is less than 0.05, the regression model can predict the determined independent variables. The subsequent results of the F-test are presented in Table 7.

Table 7. F- Test Result

Model	Sum of Square	Df	Mean Square	F	Sig
Regression	394.774	2	197.387	15.054	<0.001
Residual	957.160	73	13.112		
Total	1351.934	75			

Regarding whether these two supporting devices, which is the keyboard and mouse can lead to work performance, we conclude that:

H3: The Influence of Keyboard Use Behavior and Mouse Use Behavior Simultaneously on Work Performance. According to the data in the Table above, the F-table value with degrees of freedom N1=2 and N2=73 is 3.12. The results indicate that the independent variables, keyboard use, and mouse use have a significant influence on the dependent variable, employee performance. This is evident as the F-count (15.504) is greater than the F-table (3.12). The significance value (Sig) is 0.000, and when compared with the significance level (α = 0.05), Sig 0.00 < 0.05. Consequently, it can be concluded that there is a simultaneous and significant influence between the Keyboard Use Behavior variable (X1) and the Mouse Use Behavior variable (X2) on Work Performance (Y).

It can be concluded that the respondent of this research is predicted to be more productive using a keyboard than the mouse to increase their performance. This supports the study of indicating that a better ergonomic design of a keyboard can increase the change of employee productivity. As proposed by enabling a co-customizable keyboard can increase joyful of working with a computer which in turn can increase work performance. In the age of IoT, the company is suggested to renew the keyboard in the workplace therefore it can be a trigger for employees to be more comfortable with the keyboard so working is more enjoyable and thus can increase work performance. However, from the analysis results it doesn't mean that mouse use behavior cannot increase employee performance, as the lower value indicates that the design and features of the mouse used by the respondent may not be the latest of it kind in the industry.

As Lourenço and Coelho suggest the extensive use of mice in everyday work should be followed by

simplification of software business processes that allow limiting use of mice.

Furthermore, also suggests that the ergonomics of the mouse should be suited to the physical environment and hence can make the employee enjoy navigating the mouse in the workplace, this suggests that the company needs to keep up to date with the software that limits the use of mouse navigation by enabling this the potential benefit of extensive mouse usage of mouse can be limited and can increase work performance.

Finally, it can be assumed that in creating environment that enable productive behavior for office workers that rely on computer need support from organization to provide better and contemporary infrastructure such as the latest tech keyboard available on market as well as modification of software that able to limit the frequency of mouse clicking. We believe that enabling this positive progress from organization support, work performance can be maintained at the maximum capacity.

IV. Conclusion

The findings of this study revealed that keyboard use behavior plays a significant and positive role in influencing work performance. Although employees always try to improve their work quality with the computer devices provided by the company and prioritize individual and group targets and try to complete tasks on time, task completion depends on the quality and features adopted by the technology used, especially the keyboard. In contrast, mouse use behavior was not found to have a significant impact on work performance. This may be because some employees have other alternatives compared to using a mouse, namely a touchpad. This study attempts to analyze the perception of the workers while using a keyboard and mouse at their designated workplace where we can't control the quality of the mouse and keyboard quality that meet the standard. Therefore several limitations of this study can be considered for others researchers in the field:

The population of the study was generated from researchers' network, limiting the access to potential respondents that are not in the reach of researcher where possibly have better characteristics. The adoption of the instrument is more on the behavioral perspectives, limiting the realism of computer related behavior perspectives. The analysis is only using simple multiple regression method, where future studies should allow others analysis such as covariances analysis.

Future studies are encouraged to other scholars in this area to better treat the respondents, such us a combination of field experiments that are common on computer-behavior studies combine with perception study that mainly use to access respondents' behavior in given time. Also, this study is the bridging study to computer-related study that can measure productivity and other work performance variables using more specific IoT tools such as sensors that enable more accurate results better than perception study can be carried out in the future.

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