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Quantitative Analysis of Gadget Usage Patterns and Self-Regulation on the Duration of Productive Study Time Among College Students

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ABSTRACT

This study analyzes the structural relationship between self-regulation mechanisms and students' daily productive study time, and examines contextual differences based on the context of digital device distractions. Using a quantitative approach with quota sampling across eight faculties at UPN "Veteran" East Java (N = 150), data were collected in full compliance with ethical standards and with complete anonymity. The analysis procedures in Python included stepwise multiple linear regression and one-way ANOVA. The final regression model significantly explained productive study time ($F(3,146) = 5.663$; $p = 0.00109$; $R^2 = 0.110$). Specifically, the perception of time wasted showed a significant negative relationship ($\beta = -0.5242$; $p = 0.0011$), while the perception of task duration ($\beta = 0.3310$; $p = 0.0367$) and the ability to avoid social media ($\beta = 0.2684$; $p = 0.0459$$) showed positive relationships. Conversely, a one-way ANOVA showed no significant differences based on the timing of the disruption ($p = 0.7443$) or the reason for use ($p = 0.0697$). These findings indicate that learning productivity is more strongly influenced by internal self-regulation than by environmental factors.

Keywords: Learning Productivity, Gadget Use, Multiple Linear Regression, One-Way ANOVA, Self-Regulation

I. INTRODUCTION

Currently, digital devices support students' academic activities, but they also provide access to social media, online games, and various other distractions that can interfere with productive study time. Therefore, gadget use needs to be evaluated not only based on frequency, but also on usage patterns, the resulting distractions, and students' ability to maintain focus.

Previous research has linked smartphone use to academic achievement and learning outcomes. Amez and Baert (2020) reported a negative correlation between the frequency of smartphone use and academic success, while noting that this relationship cannot be directly interpreted as a cause-and-effect relationship. Felisoni and Godoi (2018) emphasize the importance of measuring device usage based on actual data, while Rozgonjuk et al. (2018) examined problematic smartphone use, learning approaches, and social media use during college. Paterna et al. (2024), through a synthesis of 29 studies involving 48,490 participants,

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found a small negative association between problematic smartphone use and academic achievement. Chen et al. (2025), through a meta-analysis of 27 experiments, reported that distractions caused by cell phones have a negative impact on young adults' ability to recall information immediately.

However, academic achievement, the ability to recall information, and learning approaches do not directly reflect the duration of productive daily study time as self-reported by students. Therefore, further research is needed on this duration of productive study time in relation to perceptions of time lost due to gadget use, the time taken to complete assignments, and the ability to ignore social media. The time taken to complete assignments also needs to be interpreted in light of the wording of the questions and the questionnaire's scoring system, as higher scores may indicate longer completion times or students' perception that gadget use prolongs the time spent on assignments. Furthermore, analyzing differences based on when distractions occur and the primary purpose of gadget use can provide further insight into the study routines reported by students.

This study examined these aspects using questionnaire data from 150 students at the "Veteran" National Development University in East Java. Multiple linear regression was used to analyze the relationship between productive study time and the three selected predictors, while one-way analysis of variance was used to compare the average study time based on the category of when distractions occurred and the primary purpose of gadget use. Thus, this study includes two components of analysis: an analysis of the relationships among variables using regression and a comparison among groups using ANOVA. Both analyses are correlational or comparative in nature and are not intended to establish a cause-and-effect relationship. Based on the literature review and the research variables, the research hypotheses are formulated as follows:

- Hypothesis 1: The perception of time lost due to gadget use is negatively associated with the daily duration of productive study.
- Hypothesis 2: The duration required to complete tasks is associated with the daily duration of productive study. The direction of this relationship will be determined once the meaning and scoring of the questionnaire items have been established.
- Hypothesis 3: The ability to ignore social media is positively associated with the daily duration of productive study.
- Hypothesis 4: There is a difference in the mean daily duration of productive study based on the category of when distractions occur.
- Hypothesis 5: There is a difference in the mean daily duration of productive study based on the category of the primary reason for gadget use.

II. METHOD

A. Research Design

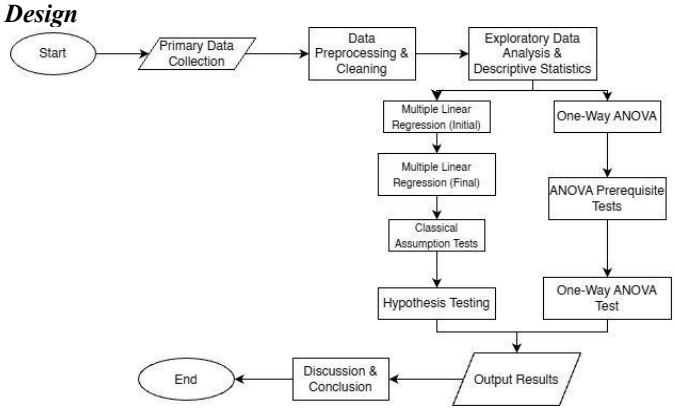

Figure 1. Flowchart

The systematic research process is illustrated in the figure. The study began with the collection of primary data using a Google Forms questionnaire distributed to respondents. The data obtained then underwent a data preprocessing and cleaning stage to ensure data quality, including checking data types and handling missing values, duplicate data, and outliers. Once the data was cleaned, exploratory data analysis and descriptive statistics were conducted to provide an overview of the characteristics of the research variables. Next, the analysis was divided into two parallel statistical methods. First, there is Multiple Linear Regression. This method begins by examining the initial regression model to identify the model and significant X variables. Next, the final model is constructed, consisting of the final significant X variables and the final model. The process then continues with assumption testing and hypothesis testing. Last there are One-Way ANOVA Path: This stage began with testing the prerequisites for ANOVA, namely the normality test for each group and the homogeneity of variances test. This is followed by conducting a one-way ANOVA to test for differences in means across groups. The results of both analyses are combined into the Output Results, which serve as the basis for the discussion and conclusions.

B. Variable and Data Collection

Primary data were collected via an online questionnaire based on Google Forms, which was distributed to currently enrolled students. Sampling was conducted using a quota-based sampling technique by determining the number or quota of respondents to be met from each faculty at Universitas Pembangunan Nasional "Veteran" Jawa Timur based on the criterion of students who actively use gadgets in their daily academic activities. The sample quotas were specified in detail for each faculty, namely the Faculty of Computer Science with 45 quotas, the Faculty of Medicine with 15 quotas, the Faculty of Economics and Business with 15 quotas, the Faculty of Law with 15 quotas, the Faculty of Agriculture with 15 quotas, the Faculty of Engineering with 15 quotas, the Faculty of Architecture and Design with 15 quotas, and the Faculty of Social and Political Sciences with 15 quotas. Each of these samples will yield 150 complete data samples. In addition, this questionnaire consists of 15 questions, including both numerical and categorical questions. Several of these questions will be selected to serve as the X and Y variables. The X variables consist of 10 numerical variables and 2 categorical variables; the 10 numerical variables will be analyzed using multiple linear regression, and the 2 categorical variables will be analyzed using ANOVA. Meanwhile, the Y variable used is the duration of learning productivity, which serves as the dependent variable.

C. Data Preprocessing and Cleaning

The dataset was imported into a Python environment for data preprocessing, including verification of variable types and sample size to ensure the data was ready for analysis. Next, data cleaning procedures were performed to address potential anomalies, ensuring that the final dataset was free of missing values, duplicate data, and outliers. This rigorous filtering ensures data integrity and minimizes bias in subsequent statistical modeling.

D. Descriptive Statistics and Exploratory Data Analysis

This phase of descriptive statistics and exploratory data analysis was conducted to examine descriptive statistics and graphical visualizations based on the data. The descriptive statistics analysis examined the mean, standard deviation, minimum value, and maximum value for 10 numerical variables. Additionally, graphical visualizations were created to compare gadget usage duration with learning productivity duration for each faculty.

E. Multiple Linear Regression

This multiple linear regression model describes the linear relationship between the dependent variable (Y) and the three self-regulation predictor variables (X_1, X_2, X_3), where is the intercept constant, β_1, β_2, and β_3 are the regression coefficients that measure the direction and strength of the relationship between each predictor variable and the dependent variable, and e represents the random error term.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

This regression model was used to create both the initial model and the final model. The initial model included 10 independent variables (X) used to examine their effects on the dependent variable (Y), namely the duration of learning productivity. The final model, on the other hand, contained the final independent variables that were found to be significant and had already undergone the variable selection process. For each of these models, we will examine the R^2 value, the coefficients of each variable, and the F-statistic. In addition, variables X with a p-value less than 0.05 in the initial model will be included in the final model. Afterward, we will assess whether the final model is a good fit and can accurately represent the actual data..

- ***Testing of Classical Assumptions***

Tests of classical assumptions were performed on the regression residuals using the statsmodels and scipy.stats libraries in a Python environment to ensure that the model met the Best Linear Unbiased Estimator (BLUE) criteria. The evaluation covered four main aspects: a normality test of the residuals using the Kolmogorov-Smirnov test, a multicollinearity test using the Variance Inflation Factor (VIF) and Tolerance indicators, a test for heteroscedasticity using the Breusch-Pagan test, and a test for autocorrelation using the Durbin-Watson statistic.

- ***Hypothesis Test***

Descriptive statistical analysis and data exploration are stages used to analyze the distribution of descriptive statistics for each X variable, while data exploration provides an explanation regarding the visualization of the data based on this dataset. The descriptive statistics to be analyzed are the mean, standard deviation, minimum, and maximum. Furthermore, this data exploration explains the relationship between gadget usage duration and productivity by faculty.

F. Analysis of Variance (ANOVA)

Before conducting the ANOVA test, the prerequisites for a one-way ANOVA were tested to ensure the validity and reliability of the data using the Kolmogorov-Smirnov normality test -Smirnov normality test to evaluate the distribution of data in each group of categorical variables, as well as Levene's test for homogeneity of variances to evaluate the equality of variances across groups, where both assumptions are considered met if the obtained p-value is equal to or greater than 0.05.

After conducting the ANOVA prerequisite tests, a one-way ANOVA was performed to evaluate differences in the mean productive study time (Y) across categorical groups, such as the time when distractions occurred and the main reasons for using gadgets. The evaluation was conducted by comparing the variation between groups (Sum of Squares Between) to the variation within groups (Sum of Squares Within), adjusted for their respective degrees of freedom, to calculate the mean squares. The ratio of these mean squares yields the F-test statistic, where a p-value < 0.05 indicates a statistically significant difference in means between categorical groups.

III. RESULT AND DISCUSS

A. Descriptive Statistics and Exploratory Data Analysis

Descriptive statistical analysis and data exploration are stages used to analyze the distribution of descriptive statistics for each X variable, while data exploration provides an explanation regarding the visualization of the data based on this dataset. The descriptive statistics to be analyzed are the mean, standard deviation, minimum, and maximum. Furthermore, this data exploration explains the relationship between gadget usage duration and productivity by faculty.

Table 1. Descriptive Statistics

Initial	Variable	Mean	Std. Deviasi	Min	Max

X_1	Non-Academic Gadget Usage Time (hours)	6.32	2.59	2.00	12.00
X_2	Frequency of Checking Devices (times)	4.21	2.11	0.00	8.00
X_3	Scale of Task Completion Duration	3.63	1.09	1.00	5.00
X_4	Learning/Work Outcome Satisfaction Scale	3.44	0.94	1.50	5.00
X_5	Strategies for Limiting Gadget Use	3.57	1.17	1.00	5.00
X_6	Focus Scale Without Gadgets	3.10	0.87	1.00	5.00
X_7	Time Loss Scale	3.45	1.01	1.00	5.00
X_8	Notification Distraction Scale	3.35	1.01	1.00	5.00
X_9	The Scale of Ignoring Social Media	3.23	1.00	1.00	5.00
X_{10}	The Extent of Errors Caused by Gadgets	3.37	0.98	1.00	5.00
Y	Duration of Productive Learning (hours)	4.37	1.77	1.00	8.00

Table 6 presents the descriptive statistics for the research variables. The average duration of students' productive study time was 4.37 hours per day, ranging from 1 to 8 hours. Meanwhile, the average duration of gadget use for non-academic activities was 6.32 hours per day, with a minimum of 2 hours and a maximum of 12 hours. The average frequency of checking devices was 4.21 times.

Among the scale-based variables, the duration of task completion (X_3) had a mean score of 3.63, while strategies for limiting gadget use (X_5) had a mean score of 3.57. The perception of time loss (X_7) had a mean score of 3.45, while the ability to ignore social media (X_9) had a mean score of 3.23. These descriptive statistics provide an overview of the respondents' gadget usage behavior and the duration of their study productivity prior to conducting regression analysis and ANOVA.

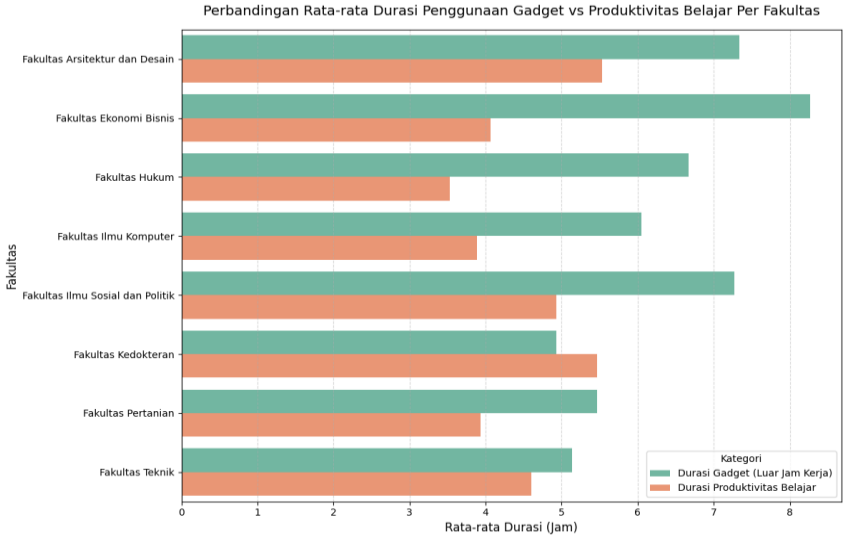

Figure 1. Distribution of Data by Faculty on Gadget Usage Outside of Work Hours and Study Productivity Duration

Figure 1 shows a graphical visualization of the distribution of data across faculties regarding gadget usage outside of work hours and study productivity duration. Based on the graph, the Faculty of Economics and Business had the highest average duration of gadget use (outside of work or study hours), at 8.25 hours. Meanwhile, the faculties with the highest average duration of productive study time were the Faculty of Architecture and Design and the Faculty of Medicine, each with an average of 5.5 hours.

B. Multiple Linear Regression Analysis

The multiple linear regression analysis stage is a regression analysis process that begins with the initial model, proceeds to the final model, and includes tests of classical assumptions and hypothesis testing. This is done to assess the quality of the resulting regression model and to identify which independent variables (X) influence the dependent variable (Y). Additionally, this analysis is expected to yield results consistent with the hypotheses.

Table 2. Goodness of Fit of the Multiple Linear Regression Model (Initial)

Model Fit	Value
R-squared (R^2)	0.117
Adjusted R-squared	0.053
F-statistic	1.840

Table 2 shows the goodness of fit of the multiple linear regression model in the initial stage. This was done to assess the goodness of fit or the level of significance of the initial model. Based on the table, the multiple linear regression model is not significant. This is evident from the Prob value (F-statistic) of 0.0590, which is above the significance threshold of 0.05. Furthermore, the coefficient of determination of 0.117 and the adjusted R^2 of 0.053 indicate that the ten independent variables (X) can explain only 11.7% of the variation in the duration of learning productivity, while the remaining 88.3% is influenced by other external factors outside the research model.

Table 3. Variable X in the Multiple Linear Regression Model (Initial)

Variable	Coefficient (B)	Std. Error	t-statistic	p-value (P>|t|)
(Constant)	3.0860	1.165	2.649	0.009
X_1 (Non-Academic Gadget Usage Time)	0.0716	0.057	1.268	0.207
X_2 (Frequency of Gadget Use)	0.0952	0.071	1.347	0.180
X_3 (Scale of Task Completion Duration)	0.2580	0.160	1.617	0.108
X_4 (Outcome Satisfaction Scale)	0.2321	0.162	1.429	0.155

X_5 (Strategies for Limiting Gadget Use)	-0.1980	0.132	-1.502	0.135
X_6 (Focus Scale Without Gadgets)	0.0484	0.187	0.259	0.796
X_7 (Time Loss Scale)	-0.3343	0.180	-1.855	0.066
X_8 (Notification Distraction Scale)	-0.1318	0.157	-0.838	0.404
X_9 (The Scale of Ignoring Social Media)	0.2707	0.158	1.714	0.089
X_{10} (The Extent of Errors Caused by Gadgets)	-0.0066	0.177	-0.037	0.970

Table 3 shows the X variables included in the initial multiple linear regression model. This was done to examine the effect of each variable on the dependent variable Y. Based on the table, all X variables (X_1 through X_{10}) individually showed p-values above $\alpha = 0.05$. This indicates that, individually, none of the ten predictor variables has a statistically significant effect on the duration of students' learning productivity (Y). Although some variables show a direction of association that appears theoretically plausible, such as a positive coefficient for task completion time ($X_3 = 0.2580$; $p = 0.108$), satisfaction with results ($X_4 = 0.2321$; $p = 0.155$), and the social media avoidance scale ($X_9 = 0.2707$; $p = 0.089$), as well as a negative coefficient for the time loss scale ($X_7 = -0.3343$; $p = 0.066$). The high p-values indicate that these relationships are not strong enough to prove a significant effect on either an increase or a decrease in students' productive study hours.

The lack of significance of the variables in this initial model is due to the inclusion of too many predictors, some of which are redundant or contain noise variance. Variables such as the gadget-free focus scale ($X_6 = 0.0484$; $p = 0.796$) and the gadget-induced error scale ($X_{10} = -0.0066$; $p = 0.970$) affect the Y variable that is very close to zero, thereby actually increasing the standard error of the model as a whole. This situation causes the actual contributions of potentially important predictors to be distorted, preventing them from accurately explaining changes in the duration of productive learning. Therefore, the findings from this initial model provide a strong basis for conducting variable selection and pruning procedures to produce a valid and significant final regression model.

Table 4. Goodness of Fit of the Multiple Linear Regression Model (Final)

Model Fit	
R-squared (R^2)	0.110
Adjusted R-squared	0.090
F-statistic	5.663

Table 4 shows the goodness-of-fit statistics for the multiple linear regression model (final). This was done to assess the model's goodness-of-fit and significance. Based on the table, the results of the multiple linear regression model fit evaluation show a coefficient of determination of 0.110 and an adjusted R^2 of 0.090, which means that the predictor variables related to self-control collectively explain 11.0% of the variance in students' daily productive study time, while the remaining 89.0% is explained by other factors outside the model. Furthermore, an F-statistic value of 5.663 indicates that the regression model as a whole is well-specified and

statistically significant in predicting productive study duration.

Table 5. Variable X in the Multiple Linear Regression Model (Final)

Variable	Coefficient (β)	Std. Error	t-statistic	p-value (P>|t|)
(Constant)	4.2183	0.130	32.523	0.000
X_3 (Scale of Task Completion Duration)	0.3310	0.157	2.111	0.037
X_7 (Time Loss Scale)	-0.5242	0.157	-3.341	0.001
X_9 (The Scale of Ignoring Social Media)	0.2684	0.133	2.014	0.046

Table 5 shows the independent variables (X) in the final multiple linear regression model. This was done to identify the final independent variables that influence the dependent variable (Y). Before arriving at the final three variables, the 10 variables from the initial model were gradually eliminated and evaluated based on their statistical significance (p-value < 0.05). This elimination process was conducted to remove redundant variables, reduce multicollinearity, and eliminate spurious variance from the seven insignificant variables (X_1, X_2, X_4, X_5, X_6, X_8, X_{10}), thereby producing a more efficient and valid regression model.

$$\hat{Y} = 4{,}2183 + 0{,}3310X_3 - 0{,}5242X_7 + 0{,}2684X_9$$

Based on the table above, a multiple linear regression equation can be formulated. This equation indicates an initial constant value for learning productivity duration (Y) of 4.2183 hours. Partially, all selected variables were found to have a statistically significant effect at $\alpha = 0.05$ ($p < 0.05$). The regression coefficient for the task duration scale variable ($X_3 = 0.3310$; $p = 0.037$) indicates that an increase in time allocation and commitment to academic tasks is directly proportional to an increase in productive study duration. Conversely, the time-wasted scale variable ($X_7 = -0.5242$; $p = 0.001$) had a significant negative effect, indicating that the more frequently students wasted time due to non-academic gadget use, the more their productive study duration would decrease. Meanwhile, the "ignoring social media" scale variable ($X_9 = 0.2684$; $p = 0.046$) made a positive contribution, demonstrating that the ability to resist social media distractions effectively increases the duration of productive study time.

Although the predictor variables in this final model were individually and simultaneously found to have a significant effect, overall the model has limitations in explaining the variation in the dependent variable (Y) because the coefficient of determination is relatively low. This indicates that the explanatory power of the combination of variables X_3, X_7, and X_9 regarding the fluctuations in the duration of students' learning productivity remains limited. Most of the variation in student learning productivity (Y) is influenced by other external factors outside the research model, such as personal time management, physical condition, and the learning environment. Therefore, although the regression coefficients of the remaining predictors are valid and statistically significant, this final model is more appropriately positioned as an explanation of partial relationships between variables rather than as an absolutely robust predictive model.

Table 6. Residual Diagnostics

Test	Method	p-value	Description
Normality Test	Kolmogorov-Smirnov (D)	0.21231	Fulfilled (Normal)
Multicollinearity Test (X_3, X_7, X_9)	VIF	1.4613; 1.4638; 1.0555	No Multicollinearity
Identity Test	Breusch-Pagan test	0.1767	Homoscedasticity Is Fulfilled
Independent Test	Durbin-Watson Statistic (d)	1.8698	No Autocorrelation (Fulfilled)

Before evaluating the regression coefficients, tests of classical assumptions were conducted to ensure that the model met the criteria for the Best Linear Unbiased Estimator (BLUE). As shown in Table 6, the Kolmogorov-Smirnov test confirmed that the residuals are normally distributed ($p = 0.21231 > 0.05$), and the Variance Inflation Factor (VIF) values for all predictor variables ($X_3 = 1.4613$; $X_7 = 1.4638$; and $X_9 = 1.0555$) are well below the threshold of 10, indicating the absence of multicollinearity. Furthermore, the Breusch-Pagan LM test confirmed that the residual variances are homogeneous ($p = 0.1767 > 0.05$), and the Durbin-Watson statistic ($d = 1.8698$) met the independence criterion around the ideal value of 2, confirming the absence of autocorrelation.

Table 7. F-Test

Regression Model	*F-Statistic*	*p-value*	*Actual Level (α)*	*Description*
Final Model	5.663	0.00109	0.05	Rejected H_0

Table 7 shows the F-test results. This was conducted to determine whether the variables X used in the model, taken together, have a significant effect on variable Y. For the formulated hypotheses, H_0 states that, taken together (simultaneously), the task duration scale (X_3), time loss scale (X_7), and social media neglect scale (X_9) do not have a significant effect on learning productivity duration (Y). Meanwhile, H_1 states that, taken together (simultaneously), the task duration scale (X_3), the time loss scale (X_7), and the social media avoidance scale (X_9) have a significant effect on the duration of learning productivity (Y). Furthermore, the table above shows that an F-statistic value of 5.663 was obtained with a significance level or p-value (Prob (F-statistic)), of 0.00109. In statistical hypothesis testing, the decision criterion is to reject H_0 if the p-value is less than $\alpha = 0.05$.

Since the obtained p-value (0.00109) is far smaller than 0.05, the null hypothesis (H_0) is rejected. This proves that, simultaneously or collectively, the variables of task completion duration, time lost due to gadget use, and the ability to ignore social media have a significant effect on the duration of students' productive study time. Thus, the final multiple linear

regression model is statistically valid and reliable for explaining variations in learning productivity.

Table 8. t-Test

Variables	*Regression Coefficient (β)*	*Std. Error*	*t-statistic*	*p-value (P>|t|)*	*Actual Level (α)*	*Description*
(Constant)	4.2183	0.130	32.523	0.0000	0.05	Significant
X_3 (Task Duration Scale)	0.3310	0.157	2.111	0.0367	0.05	H_0 Rejected
X_7 (Time Loss Scale)	-0.5242	0.157	-3.341	0.0011	0.05	H_0 Rejected
X_9 (Social Media Ignoring Scale)	0.2684	0.133	2.014	0.0459	0.05	H_0 Rejected

Table 8 shows the results. This was conducted to determine whether the variables X used in the model, taken together, have a significant effect on variable Y. For the formulated hypotheses, H_0 states that, taken together (simultaneously), the task duration scale (X_3), time loss scale (X_7), and social media neglect scale (X_9) do not have a significant effect on learning productivity duration (Y). Meanwhile, H_1 states that, taken together (simultaneously), the task duration scale (X_3), the time loss scale (X_7), and the social media avoidance scale (X_9) have a significant effect on learning productivity duration (Y). Furthermore, the table above shows that all remaining X variables in the final model have significance values or p-values less than $\alpha = 0.05$; therefore, the conclusion is to reject H_0. This can be seen from the p-values of the X variables; for instance, the task duration scale variable (X_3) yielded a calculated t-value of 2.111 with a p-value of 0.0367 (< 0.05), indicating that this variable has a positive and significant effect on learning productivity. The "time lost" scale variable (X_7) recorded a calculated t-value of -3.341 with a p-value of 0.0011 (< 0.05), meaning there is a significant negative effect: the higher the frequency of time lost due to gadget use, the more learning productivity decreases. Finally, the "ignoring social media" scale variable (X_9) yielded a t-value of 2.014 with a p-value of 0.0459 (< 0.05), proving that students' ability to ignore social media distractions has a positive and significant effect on increasing the duration of their learning productivity.

C. Analysis of Variance (ANOVA)

Analysis of variance (ANOVA) is used to test for differences in means among three or more independent groups. This test uses two categorical independent variables (X), namely "Gadget Distraction Time" and "Reasons for Using Gadgets." The dependent variable (Y) used is the duration of productive learning. Based on the specified independent variables, an ANOVA will be conducted to determine whether there are differences in the means of the dependent variable.

Table 9. One-Way ANOVA Test for the Variable "Gadget Distraction Time"

Sources of Variation	*df*	*SS*	*MS*	*F-statistic*	*p-value (Sig.)*	*Effect Size* (η^2)	**Description**
Distraction Time (X_1)	3.0	3.9084	1.3028	0.4124	0.7443	0.0084	Failure to Reject H_0

Residuals (Within Groups)	146.0	461.1849	3.1588	-	-	-	-

Table 9 shows the results of the one-way ANOVA test for the variable "gadget distraction time". Based on this table, the F-statistic value was 0.4124 with a significance level p-value of 0.7443. In statistical testing, a difference between groups is considered significant if the p-value is less than $\alpha = 0.05$. From these results, it can be seen that the p-value is 0.7443, which indicates that H_0 cannot be rejected. This proves that, statistically, there is no significant difference in the average duration of learning productivity among student groups based on different gadget distraction times. In other words, regardless of when students experience gadget-related distractions (whether in the morning, afternoon, evening, or at night), their average duration of productive study time tends to be the same and does not show any significant variation.

In addition to the significance test, an evaluation of the effect size using the eta-squared coefficient (η^2) yielded a value of 0.0084. According to statistical conventions, this value of (η^2) falls below the threshold for the "small effect" category (0.01). This indicates that variations in the timing of distractions are not only statistically insignificant but also have a very small and negligible effect on the variability in students' study productivity duration. In other words, regardless of when students experience gadget-related distractions (morning, afternoon, evening, or night), their average study productivity duration tends to be consistent and does not show any significant differences.

Table 10. One-Way ANOVA Test for the Variable "Reasons for Using Gadget"

Sources of Variation	***df***	***SS***	***MS***	***F-statistic***	***p-value (Sig.)***	***Effect Size (η^2)***	**Description**
Reasons for Unlocking a Device (X_2)	4.0	26.8383	6.7096	2.2199	0.0697	0.0577	Failure to Reject
Residuals (Within Groups)	145.0	438.2550	3.0224	-	-	-	-

Table 10 shows the results of the one-way ANOVA for the variable "reasons for using gadgets." Based on this table, the F-statistic is 2.2199 with a significance level (p-value) of 0.0697. In statistical testing, a difference between groups is considered significant if the p-value is less than $\alpha = 0.05$. From these results, it can be seen that the p-value is 0,0697; which indicates that the null hypothesis (H_0) cannot be rejected. This proves that, statistically, there is no significant difference in the average duration of productive study time among student groups based on their primary reasons for using their devices. In other words, regardless of whether the motivation for using gadgets was for social media, entertainment, replying to messages, or searching for references, the variation in the average duration of students' productive study time generally did not show any significant extreme differences.

Although the significance test yielded a result that was not statistically significant at $\alpha = 0.05$, a further analysis of the effect size using the eta-squared coefficient (η^2) yielded a value of 0.0577. As can be seen, this value of 0.0577 falls within the moderate effect category (where the threshold for a moderate effect begins at 0.06). This moderate effect size indicates that although the difference in the mean duration of learning productivity between groups based on reasons for using gadgets did not reach formal significance due to the limited statistical power of the sample, the reasons for using gadgets still contributed a measurable 5.77% to the variation in students' learning productivity.

D. Discussion

The results of the study indicate that several factors related to gadget use are statistically

associated with students' daily productive study time. In the final regression model, the perception of time wasted (X_7) was negatively associated with study duration ($\beta = -0.5242$; $p = 0.001$), while task completion time (X_3) and the ability to ignore social media (X_9) showed positive associations ($\beta = 0.3310$ and $\beta = 0.2684$, respectively; $p = 0.037$ and $\beta = 0.2684$; $p = 0.046$). The model as a whole is statistically significant ($F = 5.663$; $p = 0.001$), with $R^2 = 0.110$ and adjusted $R^2 = 0.090$, indicating that the model's ability to explain variation in study duration remains limited. The negative relationship between X_7 and study duration is generally consistent with previous research on problematic smartphone use and academic performance by Amez & Baert (2020) and Paterna et al. (2024). However, those studies examined outcomes different from daily productive study duration. The positive relationship with X_9 suggests that the ability to ignore social media may be related to students' study routines. Meanwhile, X_3 must be interpreted with caution because its meaning depends on the wording and measurement scale in the questionnaire. These findings indicate a statistical relationship rather than evidence of a causal relationship.

In the initial regression model, the duration of gadget use for non-academic purposes (X_1) and the frequency of checking gadgets (X_2) were not statistically significant ($p = 0.207$ and $p = 0.180$, respectively). The final model was obtained through a stepwise variable elimination process, which retained X_3, X_7, and X_9. Although the final model is statistically significant, the relatively low R^2 value indicates that most of the variation in productive study duration cannot yet be explained by the selected predictors. Furthermore, stepwise variable selection may influence the estimated coefficients and the resulting levels of statistical significance. Therefore, the results of the final model should be interpreted with caution.

The ANOVA results show that there are no statistically significant differences in the mean productive study duration based on distraction time categories ($F = 0.4124$; $p = 0.7443$; $\eta^2 = 0.0084$) or the main reasons for gadget use ($F = 2.2199$; $p = 0.0697$), at the 0.05 significance level. The small effect size in the distraction time analysis indicates that this factor explains only a small portion of the observed variation in study duration. However, these results do not prove that the means across all groups are equivalent. Since the distribution of responses in at least one category of reasons for gadget use is not normally distributed, a sensitivity analysis using an appropriate nonparametric test, such as the Kruskal–Wallis test, should be conducted and reported to assess the robustness of the study's results.

From a practical perspective, these findings suggest that the perception of time loss and the ability to ignore social media may be relevant aspects when discussing students' study routines. Nevertheless, the results of this study do not prove that changes in these two behaviors will necessarily increase the duration of productive study time. Several limitations should be noted. The study sample consisted of 150 students from a single university and was obtained through quota sampling; thus, the generalizability of the results to a broader population is limited. The use of a questionnaire relying on respondent reports also has the potential to introduce recall bias and differences in understanding regarding the duration of productive study time. Furthermore, the cross-sectional study design cannot establish temporal sequence or causal relationships. Future research is recommended to use a more diverse sample, validated measurement instruments, and a longitudinal design to examine these relationships in greater depth.

IV. CONCLUSION

This study examined the relationship between gadget-related factors and students' daily productive study duration among 150 students at Universitas Pembangunan Nasional "Veteran" Jawa Timur. The final regression model was statistically significant (($F = 5.663$), ($p = 0.001$)), with ($R^2 = 0.110$) and adjusted ($R^2 = 0.090$). Perceived time loss (X_7) was negatively associated with study duration, while task-completion duration (X_3) and the ability to ignore social media (X_9) showed positive associations. However, the model explained only 11% of the variation in study duration, and the findings do not establish causal relationships.

The ANOVA results showed no statistically significant differences in study duration based on distraction timing ($p = 0.7443$) or the primary reason for gadget use ($p = 0.0697$). These findings do not establish that the groups are equivalent. In practical terms, the results highlight the relevance of perceived time loss and social media self-regulation when examining students' study routines. However, the findings should be interpreted cautiously because the study used quota sampling, self-reported data, and a cross-sectional design involving students from a single university. Future research should involve more diverse samples and longitudinal designs to examine these relationships further.

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