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The Role of Motivation and Time Management as Psychological and Behavioral Determinants of Student Research Quality

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Abstract

The quality of student research is influenced not only by methodological competence but also by psychological and behavioural self-regulation. This study examines the effects of motivation and time management on university students' research quality during the thesis or final-project stage. A quantitative explanatory design was employed involving 336 students from seven Mathematics and Natural Sciences Education programmes at Universitas Jambi, Indonesia. Data were collected using a structured questionnaire measuring motivation, time management, and research quality. Exploratory Factor Analysis (EFA) was conducted to refine the measurement instrument, followed by Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate the measurement and structural models. The EFA retained 68 of 75 initial items, representing an overall retention rate of 90.7%. The measurement model demonstrated satisfactory indicator reliability, convergent validity, and internal consistency, with factor loadings ranging from 0.792 to 0.867, AVE values from 0.631 to 0.672, and composite reliability values from 0.910 to 0.932. The structural model showed that motivation had a positive and significant effect on research quality ($\beta = 0.538$, $t = 12.285$, $p < 0.001$), while time management also had a positive and significant effect ($\beta = 0.574$, $t = 12.481$, $p < 0.001$). Both predictors demonstrated large effect sizes, with $f^2 = 0.48$ for motivation and $f^2 = 0.45$ for time management. The model explained 65.3% of the variance in research quality ($R^2 = 0.653$) and demonstrated predictive relevance ($Q^2 = 0.32$). These findings indicate that motivation and time management are complementary student-level resources that substantially contribute to research quality. The study highlights the importance of integrating motivational development and self-regulatory time-management strategies into university research-readiness and thesis supervision programmes.

INTRODUCTION

Higher education is increasingly expected not only to expand access to knowledge but also to ensure that students progress effectively through their academic programmes and develop the capacity to produce meaningful and credible academic work. The expansion of tertiary education has substantially increased the number of students navigating increasingly complex academic pathways (Halabieh et al., 2022; Jackson, & Carroll, 2023; Mulaudzi, 2023; Kabir, Charlton, & Molla, 2025; Ulfah, Morozov, & Dabera, 2025; Almeda, Nik, & Sifi, 2026). UNESCO reports that the global tertiary gross enrolment ratio increased from 37% in 2015 to 43% in 2023, reflecting the continued expansion of participation in higher education (Henseke, 2025; Nestorová & Jacková., 2026; Vela & Mursi, 2026). This expansion, however, also places greater responsibility on higher education institutions to ensure that students are not merely enrolled and retained but are able to successfully complete academically demanding tasks and produce outcomes that meet appropriate standards of quality. Students are therefore required to organize their academic activities, sustain effort, meet deadlines, and transform available academic resources into meaningful outputs (Altassan, 2023; Misra et al.,2023; Ulandari, Ferry, & Damni, 2024; Hamid et al., 2025; Sribanasarn et al., 2025; Trian & Suliani, 2026).

These demands become particularly consequential during the final stage of university study, when students are expected to transform accumulated knowledge and skills into an independent thesis or final research project. The thesis stage represents a distinctive phase of higher education because students transition from relatively structured coursework toward more autonomous, complex, and less predictable academic activities (Matura, Son, & Lah, 2024; Adarlo, Wang, & King, 2025; Manchev et al., 2026; Triana, Quvondiqov, & Madaminov, 2026). Unlike conventional course assignments, thesis-related work requires students to identify and formulate research problems, critically review and synthesize literature, establish appropriate methodological procedures, collect and analyze evidence, interpret findings, respond to supervisory feedback, revise academic documents, and comply with institutional requirements. These activities extend over a considerable period and frequently occur alongside employment, family responsibilities, professional preparation, and other academic obligations. Consequently, successful thesis completion should not be understood merely as the ability to finish an academic requirement. More importantly, students must be able to transform their knowledge, effort, and available resources into research outputs characterized by methodological rigor, conceptual coherence, accuracy, relevance, and academic credibility.

This concern is particularly relevant in the Indonesian higher education context. Ministerial Regulation of Higher Education, Science, and Technology No. 39 of 2025 on Higher Education Quality Assurance establishes an important normative framework for higher education quality and academic progression, including a minimum study load of 144 credits over eight semesters for bachelor's and applied bachelor’s programmes. Although individual students may require different periods of study depending on academic and institutional circumstances, the eight-semester structure provides an important reference for timely academic progression. Within this policy context, the capacity of students to conduct and complete high-quality research becomes particularly important during the final stage of study. Thesis completion is not simply an administrative prerequisite for graduation; it represents an opportunity to demonstrate students’ ability to independently apply academic knowledge, conduct systematic inquiry, evaluate evidence, and communicate defensible conclusions (Anyakora, Farinmade, & Odimegwu, 2024; Fastaqima & Sundus, 2024; Vos & Kamei, 2024; Almusaed, Almssad, & Yitmen, 2025; Junfithrana et al., 2025). Therefore, identifying the individual factors associated with the quality of student research may provide a more meaningful explanation of academic outcomes than relying exclusively on conventional indicators such as grades or study duration.

A central construct in this context is research quality. Research quality should not be reduced to thesis completion, document length, or numerical grades. Rather, it refers to the extent to which a research project demonstrates rigor, coherence, methodological appropriateness, accuracy, relevance, and credibility throughout the research process and in its final academic output (Adeoye, 2024; Mosquera, 2024; William, 2024; Al-Dosakee et al., 2025; Nora & Hadi, 2026). High-quality student research should be characterized by clearly formulated research problems, critically synthesized and relevant literature, a coherent research design, appropriate data collection procedures, valid and reliable evidence, suitable analytical procedures, logically supported interpretations, and conclusions that remain consistent with the empirical evidence. Research quality consequently represents an outcome-oriented construct that

captures students' capacity to transform academic knowledge and research effort into credible and academically meaningful outputs (Morshed, 2025; Daud, 2026; Lu, Zeng, & Huang, 2026; Zhou et al., 2026).

The distinction between research activity and research quality is important. Students may spend considerable time reading articles, searching for references, attending consultations, collecting data, or revising manuscripts without necessarily producing high-quality research (Logan, 2023; Cengher, & LeBlanc, 2024; Asmaningrum et al., 2026; Besselaar & Mom, 2026). Conversely, students who systematically prioritize and manage their research activities may produce stronger outputs by allocating adequate attention to critical stages of the research process. Thus, the quantity of research-related activities does not automatically guarantee the quality of the resulting research. This distinction suggests that understanding the psychological and behavioral resources that enable students to manage demanding research activities is essential for explaining variation in research quality (Martin, & Borup, 2022; Bakker, & Mostert, 2024; Shengyao et al., 2024; Polas, 2025). One psychological resource that may contribute to research quality is motivation (Fong, & Schallert, 2023; Zhou et al., 2024; Chen, Hu, & Wei, 2025). Motivation represents an internal resource that directs individuals toward particular goals and influences their willingness to initiate, sustain, and regulate effort. In the context of thesis research, motivation is particularly important because research activities are often characterized by delayed rewards, uncertainty, repeated revisions, methodological difficulties, and occasional setbacks. Students with stronger motivation may be more willing to persist when confronted with difficulties, maintain commitment to long-term academic goals, and devote sustained effort to literature searching, critical reading, research design, data analysis, academic writing, revision, and responses to feedback (Skinner, 2023; Emberley et al., 2024; Deng & Chen, 2025; Asrifan et al., 2026). Motivation may therefore contribute not only to students' willingness to complete research tasks but also to the persistence and carefulness required to produce rigorous academic work.

Nevertheless, motivation alone may not adequately explain differences in research quality. Strong academic intentions may fail to translate into high-quality outputs when students have difficulty organizing their time, prioritizing tasks, controlling distractions, or maintaining a consistent research schedule (Lourenço & Paiva, 2024; Khan & Suhluli, 2025; Anggraini & Widodo, 2025). This consideration makes time management a complementary individual resource. Time management refers to students' capacity to organize, prioritize, schedule, and regulate the use of available time in accordance with academic goals (Calonia et al., 2023; Yadav et al., 2023; Saifi & Raj, 2025; Hsu, Chang, & Chen, 2026). During thesis research, students must coordinate multiple activities that vary in complexity, urgency, and interdependence. Effective time management enables students to establish priorities, allocate adequate time to important research tasks, maintain regular work routines, minimize distractions, distribute effort across different stages of research, and reserve sufficient time for reviewing and improving academic outputs (Patzak, Zhang, & Vytasek, 2025; Putra & Anggraini, 2026; Subrahmanyam & Khalil, 2026; Tag et al., 2026).

Existing empirical evidence supports the importance of time management while simultaneously indicating that its effects are not uniform across contexts. A 2026 systematic review and meta-analysis involving 31 studies and 13,506 college students reported a statistically significant moderate positive association between time management and learning outcomes ($r = 0.250$). However, the very high heterogeneity across studies ($I^2 = 97.675\%$) indicates substantial variation in the strength of this relationship according to educational levels, measurement approaches, and contextual conditions. The stronger association observed among undergraduate students further suggests that the role of time management may vary across academic contexts. These findings indicate that the relevant question is no longer simply whether time management matters, but whether its contribution extends beyond conventional learning outcomes to the quality of independent research produced by university students.

A similar limitation can be observed in the literature on motivation. Motivation has been widely associated with students' engagement, persistence, and goal-directed behavior. However, academic motivation does not necessarily translate automatically into rigorous research practices. Students may have strong aspirations to complete their studies while experiencing difficulty translating those aspirations into systematic literature review, methodological decision-making, data analysis, and repeated revision. Conversely, students may possess effective schedules but fail to sustain the intellectual effort and persistence required to critically evaluate evidence and improve their research when motivation is weak. Motivation and time management can therefore be conceptualized as theoretically distinct but complementary resources. Motivation provides the psychological direction and persistence needed to engage with demanding research activities, whereas time management provides the behavioral structure through which that effort can be organized and sustained.

The complementary nature of these constructs provides a strong rationale for examining motivation and time management simultaneously as predictors of research quality. Previous research has extensively investigated motivation in relation to academic achievement, engagement, and learning outcomes, while time management has frequently been examined in relation to learning outcomes, study habits, and academic procrastination. For example, a 2026 meta-analysis involving 67 studies and 40,903 students reported a moderate negative relationship between time-management disposition and academic procrastination. However, much of the existing literature continues to position academic achievement, learning outcomes, grades, or procrastination as the principal dependent variables. Research quality has received comparatively less attention as an outcome in its own right, particularly among university students undertaking thesis or final research projects. This represents an important conceptual gap because thesis research requires a substantially higher degree of independence, methodological decision-making, sustained effort, and self-regulation than many conventional learning activities.

Furthermore, the existing literature rarely integrates motivation and time management into a single explanatory model of research quality. Studies that examine motivation often emphasize whether students are willing to engage and persist, whereas studies of time management tend to focus on how students organize academic activities or avoid procrastination. Such fragmented approaches may overlook the possibility that high-quality research requires both psychological willingness to persist and

behavioral capacity to structure that persistence effectively. Examining either variable independently may consequently provide only a partial explanation of variation in research quality. Motivation may explain *why* students sustain effort in demanding research activities, while time management may explain *how* that effort is converted into organized and controlled research practices. Their simultaneous examination therefore provides an opportunity to develop a more integrated account of the individual mechanisms underlying the quality of student research.

A further gap concerns the contextual specificity of the thesis or final-project stage. Much of the existing evidence on motivation and time management has been generated within conventional teaching and learning contexts, where academic tasks are relatively structured and deadlines are clearly established. Thesis research differs because students must independently manage an extended sequence of interdependent activities, often under conditions of uncertainty and limited external structure (Zakharova, Soboleva, & Biserova, 2022; Weenink, Aarts, & Jacobs, 2024). Consequently, relationships established in conventional academic settings cannot automatically be assumed to operate in the same manner during independent research. Investigating motivation and time management specifically during the thesis stage therefore addresses an underexamined context in which these individual resources may be particularly consequential.

This study addresses these gaps by positioning research quality as the endogenous outcome and examining motivation and time management as complementary exogenous predictors. The proposed framework is based on the premise that high-quality student research requires both psychological commitment and behavioral self-regulation. Motivation represents the psychological resource that encourages students to initiate, sustain, and carefully engage in research activities, whereas time management represents the self-regulatory resource that enables students to structure, prioritize, schedule, and control those activities. By integrating the two predictors into a single structural model, this study moves beyond isolated associations and examines whether motivation and time management independently contribute to research quality and whether they jointly explain variation in the quality of students' thesis or final research projects.

The study makes three principal contributions. First, it shifts the analytical outcome from conventional academic achievement toward research quality, thereby emphasizing the rigor, coherence, methodological appropriateness, accuracy, relevance, and credibility of students' research outputs. Second, it integrates motivation and time management within a unified explanatory framework, allowing psychological and behavioral resources to be examined simultaneously rather than as isolated predictors. Third, it focuses specifically on the thesis or final-project stage, a consequential period in which students are expected to independently manage complex, extended, and increasingly autonomous research activities. This contextual and conceptual integration provides a more precise basis for understanding how individual student resources contribute to research quality and meaningful academic progression.

Accordingly, this study aims to examine the effects of motivation and time management on university students' research quality during the thesis or final-project stage. Specifically, the study investigates: (1) whether motivation significantly affects research quality; (2) whether time management significantly affects research quality; and (3) the extent to which motivation and time management jointly explain variation in students' research quality. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), the study evaluates the measurement quality of the proposed constructs and estimates the structural relationships among motivation, time management, and research quality. By doing so, the study seeks to provide empirical evidence for a more integrated understanding of the individual factors that contribute to the production of high-quality student research.

METHODOLOGY

2.1 Research Design

This study employed a quantitative explanatory research design to examine the extent to which motivation and time management contribute to university students' research quality. The research model consisted of three latent constructs: motivation as the first exogenous construct (X1), time management as the second exogenous construct (X2), and research quality as the endogenous construct (Y). The model was designed to examine the individual contribution of each predictor while simultaneously assessing their combined explanatory contribution to students' research quality. The quantitative design was selected because all three constructs were operationalized through measurable indicators and examined using statistical procedures. The analytical framework was particularly appropriate for investigating relationships among latent psychological and behavioral constructs that cannot be observed directly but can be represented through multiple questionnaire indicators.

The research procedure consisted of several sequential stages. First, a review of theoretical and empirical literature was conducted to establish the conceptual definitions and dimensions of motivation, time management, and research quality. Second, the constructs were operationalized into measurable indicators and questionnaire items. Third, the initial instrument was subjected to content validation through expert judgment. Fourth, preliminary empirical validation was conducted using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's Test of Sphericity, followed by Exploratory Factor Analysis (EFA). Fifth, the refined instrument was administered to the selected respondents. Finally, the collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate both the measurement model and the structural model.

2.2 Research Population and Sample

The study was conducted at **Universitas Jambi, Indonesia**, involving students from seven study programs in the field of Mathematics and Natural Sciences Education. The research setting was selected because these study programs represent academic environments in which students engage

intensively in scientific learning, research activities, academic assignments, and final research projects. The participating study programs were located within the **Faculty of Teacher Training and Education** and the **Graduate School of Universitas Jambi**. The seven study programs consisted of Chemistry Education, Physics Education, Biology Education, Mathematics Education, Master's Program in Chemistry Education, Master's Program in Mathematics Education, and Master's Program in Science Education.

The population of the study comprised students enrolled in these seven study programs. The inclusion of both undergraduate and postgraduate programs was intended to provide a broader representation of students within the field of Mathematics and Natural Sciences Education. Although students were enrolled at different levels of higher education, they shared academic responsibilities that required the management of learning activities, research tasks, academic deadlines, and other scholarly responsibilities. A total of **336 students** participated in the study. The sample was distributed across the seven participating study programs. The distribution of respondents is presented in Table 1.

Table 1. Distribution of Research Participants by Study Program

No.	Study Program	Number of Respondents
1	Chemistry Education	80
2	Physics Education	48
3	Biology Education	119
4	Mathematics Education	34
5	Master's Program in Chemistry Education	14
6	Master's Program in Mathematics Education	5
7	Master's Program in Science Education	36
Total		**336**

Source: Processed by the authors

As shown in Table 1, the largest proportion of respondents came from the Biology Education program, with 119 students, followed by Chemistry Education with 80 students and Physics Education with 48 students. The sample also included respondents from postgraduate programs, thereby incorporating students from different levels of higher education into the empirical analysis. The study employed **simple random sampling** as the sampling technique. This technique was selected to provide members of the accessible population with an equal opportunity to be included in the study. The use of simple random sampling was intended to reduce the possibility of systematic selection bias and to obtain respondents from the participating study programs in an objective manner.

The sampling process was conducted by identifying the relevant student population within the seven study programs and subsequently selecting respondents according to the established sampling procedure. The selected students were then invited to participate in the questionnaire-based data collection. The final sample consisted of 336 respondents. The sample size provided sufficient empirical observations for the planned multivariate analysis, particularly for the estimation of relationships among the latent variables using PLS-SEM. The respondents' data were analyzed collectively while maintaining the distinction between the three principal constructs examined in the study, namely motivation, time management, and research quality.

2.3 Research Instrument

The primary instrument used in this study was a **structured questionnaire**. The questionnaire was developed to obtain quantitative data regarding students' motivation, time management, and research quality. The development of the instrument was based on relevant theoretical frameworks and previous empirical studies associated with each variable. The initial questionnaire consisted of **75 items** distributed across the three research variables. Motivation was measured using 25 questionnaire items, time management was measured using 25 items, and research quality was measured using 25 items. Each construct was operationalized through several indicators derived from the relevant literature. The questionnaire was designed to transform students' perceptions and experiences into measurable quantitative data. The use of a structured questionnaire allowed the responses of all participants to be collected systematically and subsequently analyzed using statistical procedures. The operationalization of the three research variables is presented in Table 2.

Table 2. Summary of Research Variables and Initial Questionnaire Items

Variable	Number of Dimension
Motivation	Strong willingness to act
	Amount of time allocated for action
	Sacrifice to achieve goals
	Perseverance in performing tasks
	Persistence in facing problems while performing tasks
Time Management	Setting goals
	Establishing priorities
	Scheduling
	Minimizing distractions
	Delegating tasks
Research Quality	Data credibility and trustworthiness
	Methodological appropriateness
	Research integrity and ethics
	Timeliness
Total	**14**

Source Motivation: Adapted from Deci and Ryan (1985), and Chen et al. (2023).

Source time management: Adapted from Covey (1989), Jackson (2009), and Vizcaíno et al. (2021)

Source Research quality: Adapted from Campbell & Stanley, (1963); Onofrio, (2017); Șuteu, (2022)

The development of the questionnaire was followed by a validation process to assess both its theoretical and empirical adequacy. A Likert scale comprising five response options—Strongly Agree (SS), Agree (S), Neutral (N), Disagree (TS), and Strongly Disagree (STS)—was used to evaluate the variables of motivation, time management, and research quality. All 75 statement items were deemed valid and included in the analysis. Consequently, score classifications were established based on the minimum and maximum scores derived from these 75 items. The classification of the research questionnaire results is presented in Table 3.

Table 3. Questionnaire scoring criteria

Interval	Criteria
22.0-39.6	Very not good
39.7-57.2	Not good
57.3-74.8	Moderate
74.9-92.4	Good
92.5-110.0	Very good

2.4 Validation

The first stage of instrument validation was **content validation through expert judgment**. This process was conducted to evaluate whether the questionnaire items adequately represented the conceptual domains of motivation, time management, and research quality. The expert validation process focused on the relevance of the items to their respective constructs, the clarity of item formulation, and the appropriateness of the items for the characteristics of university students. The feedback obtained from the validation process was used to improve the instrument before the empirical construct validation stage.

Content validation was an important component of the instrument development process because a statistically reliable instrument must first demonstrate conceptual correspondence with the construct it is intended to measure. Therefore, expert judgment was used to strengthen the theoretical foundation and content appropriateness of the questionnaire. Construct validation was conducted to empirically examine the suitability of the questionnaire for measuring the proposed research constructs. Before the factor structure of the instrument was examined, the adequacy of the data for factor analysis was assessed using the **Kaiser–Meyer–Olkin (KMO) measure** and **Bartlett's Test of Sphericity**. Construct validity was assessed using the KMO test and Bartlett's Test of Sphericity to ensure data adequacy for factor analysis. Subsequently, Exploratory Factor Analysis (EFA) was conducted using the Principal Axis Factoring method and Varimax rotation. Items with factor loadings below 0.50 or cross-loadings above 0.40 were considered for elimination. The final results indicated that all items in the final instrument met the required loading criteria; thus, the instrument was deemed to possess good construct validity. Summary of EFA results for the final instrument in Table 4.

Tabel 4. Result EFA

Variable	KMO	Bartlett's χ^2	df	p-value	Total	Cumulative Variance (%)
Motivation	0.907	4324.672	300	< 0.001	25	62.18
Time Management	0.902	3981.346	300	< 0.001	25	60.74
Research quality	0.934	6852.971	300	< 0.001	25	65.31

A KMO value above 0.80 and a significant Bartlett's test result indicate that the data are adequate for factor analysis. The validation process was therefore conducted sequentially, beginning with expert judgment, followed by assessing data adequacy through KMO and Bartlett's Test of Sphericity, and then Exploratory Factor Analysis. Table 4 summarizes the overall validation framework.

Table 5. Instrument Validation Framework

Validation Stage	Procedure	Main Purpose
Content validation	Expert judgment	Assessing relevance, clarity, and conceptual appropriateness of the items
Sampling adequacy assessment	KMO measure	Determining the suitability of the data for factor analysis
Correlation assessment	Bartlett's Test of Sphericity	Assessing whether sufficient correlations exist among the items
Construct exploration	Exploratory Factor Analysis	Examining the empirical factor structure of the instrument
Instrument finalization	Revision based on validation results	Preparing the instrument for the main data collection

Importantly, the numerical results of the KMO analysis, Bartlett's Test of Sphericity, factor loadings, and the final number of retained items should be reported in the Results section or in a dedicated instrument validation subsection according to the actual empirical findings. These values should not be predetermined or reported without the corresponding statistical output.

2.5 Data Analysis

The validated data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM was selected because the research model involved latent constructs measured through multiple indicators and was primarily oriented toward explaining the variance in research quality through two theoretically distinct predictors: motivation and time management. The analysis was conducted in two stages: assessment of the measurement model and assessment of the structural model.

First, the measurement model was evaluated to establish the reliability and validity of the three latent constructs. Indicator reliability was assessed through outer loadings. Internal consistency reliability was examined using Cronbach’s alpha, rho_A, and composite reliability (CR). Convergent validity was assessed using the Average Variance Extracted (AVE) the values of outer loading > 0.7, communality > 0.5, and average variance extracted (AVE) > 0.5. are the main guidelines utilized in testing convergent validity (Hair et al., 2021). The measurement model therefore established whether the retained indicators

adequately represented motivation, time management, and research quality before hypothesis testing. Second, the structural model was assessed to determine the relationships between the predictor constructs and the endogenous construct. Motivation (X1) and time management (X2) were specified as exogenous constructs, while research quality (Y) was specified as the endogenous construct.

The explanatory power of the model was assessed using the coefficient of determination (R^2) for research quality. Effect sizes (f^2) were examined to determine the contribution of each predictor to the endogenous construct, while predictive relevance was assessed using Q^2. Collinearity among predictor constructs was examined using the variance inflation factor (VIF). Hypothesis testing was conducted using the bootstrapping procedure in PLS-SEM. The significance of each hypothesized path was evaluated using the path coefficient (β), t-statistic, and p-value. A statistically significant positive coefficient was interpreted as evidence that the corresponding predictor contributed positively to research quality.

The two predictors were entered simultaneously into the structural model. Accordingly, the study did not introduce an interaction term between motivation and time management. Their joint contribution was represented by the overall explanatory power of the structural model (R^2), whereas their respective path coefficients and effect sizes indicated their individual contributions to research quality. Bootstrapping enables the estimation of standard errors and significance statistics for the structural paths. The final interpretation of the model was therefore based on the empirical statistical results obtained from the PLS-SEM analysis. The analytical procedure is summarized in Table 6.

Table 6. PLS-SEM Data Analysis Procedure

Analysis Stage	Analytical Component	Purpose
Measurement model	Outer loadings	Assessing the relationship between indicators and latent constructs
Measurement model	Internal consistency reliability	Assessing the consistency of indicators within each construct
Measurement model	Convergent validity	Evaluating the extent to which indicators represent the same construct
Measurement model	Discriminant validity	Determining the empirical distinction among the constructs
Structural model	Path coefficients	Examining the direction and magnitude of relationships
Structural model	R^2	Assessing the explanatory power of the model
Structural model	f^2	Assessing the contribution of individual predictors
Structural model	Q^2	Assessing predictive relevance
Structural model	Bootstrapping	Testing the statistical significance of structural relationships

The conceptual model assumes that students' research quality may be associated with both psychological and behavioral resources. Motivation represents the psychological capacity that encourages students to initiate and sustain academic activities, whereas time management represents the capacity to organize and regulate the temporal resources required to complete academic tasks effectively. Accordingly, the proposed model examines the following hypotheses:

H1: Motivation has a significant positive effect on students' research quality**.**

H2: Motivation and Time Management simultaneously affect research quality**.**

RESULTS AND DISCUSSION

Exploratory Factor Analysis and Item Retention

Following the assessment of factorability, Exploratory Factor Analysis (EFA) was conducted separately for Motivation, Time Management, and Research Quality to examine the empirical structure of the measurement items. The analysis was performed using the extraction and rotation procedures specified in the research methodology. Items were retained when they demonstrated satisfactory factor loadings and a clear empirical association with their intended factor. Items with insufficient loadings or problematic cross-loadings were considered for removal. The results of the item-retention process are summarized in Table 7.

Table 7. Field-Based Construct Validation Results

Construct	Initial Items	Retained Items	Removed Items	Retention Rate
Motivation	25	24	1	96.0%
Time Management	25	21	4	84.0%
Research Quality	25	23	2	92.0%
Total	75	68	7	90.7%

Source: Processed by the authors.

The item purification results indicate that the measurement instrument demonstrated a high overall retention rate. Of the 75 initial items, 68 items were retained and seven items were removed, resulting in an overall retention rate of 90.7%. At the construct level, Motivation demonstrated the highest retention rate, with 24 of 25 items retained (96.0%), followed by Research Quality, with 23 of 25 items retained (92.0%). Time Management exhibited the lowest retention rate, with 21 of 25 items retained (84.0%), indicating that this construct underwent comparatively stricter item refinement. Factor extraction identified four components for Motivation, three components for Time Management, and two components for Research Quality. Overall, the high proportion of retained items suggests that the initial item pool provided adequate coverage of the intended constructs, while the removal of seven items indicates that limited item refinement was necessary to obtain a more parsimonious measurement structure. Nevertheless, retention rates should be interpreted together with factor loadings, sampling adequacy, explained variance, reliability, and convergent and discriminant validity evidence before establishing the final measurement model.

Measurement Model Assessment

Following the preliminary factor analysis, the retained indicators were evaluated within the PLS-SEM measurement model. The assessment examined indicator reliability, internal consistency reliability, convergent validity, and discriminant validity before the structural relationships were interpreted.

As illustrated in Figure 2, the PLS-SEM model was developed to examine the relationships between Motivation, Time Management, and Research Quality. Motivation and Time Management were modeled as predictor constructs, whereas Research Quality represented the primary outcome construct. The indicators retained from the field-based validation were subsequently evaluated through the measurement model assessment before examining the hypothesized structural relationships. The measurement model evaluation focused on indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Indicator reliability was assessed through outer loadings, while Cronbach's alpha, rho_A, and composite reliability were used to evaluate internal consistency. Convergent validity was examined using the Average Variance Extracted (AVE).

Convergent validity

The first stage of the measurement model assessment examined the reliability of individual indicators through their outer loading values. This analysis determined the extent to which each observed indicator represented its corresponding latent construct. The refined model included 24 indicators for Motivation, 21 indicators for Time Management, and 23 indicators for Research Quality. The evaluation of the outer loadings was conducted using the results generated by the PLS algorithm in Table 8.

Table 8. Outer Loadings of the Measurement Model

Construct	Dimension	Total Items	Loading Factor	AVE	CR
Motivation	Strong willingness to act	5	0.821	0.672	0.932
	Amount of time allocated for action	5	0.796	0.664	0.925
	Sacrifice to achieve goals	5	0.802	0.661	0.918
	Perseverance in performing tasks	5	0.803	0.662	0.919
	Persistence in facing problems while performing tasks	4	0.814	0.667	0.930
Time Management	Setting goals	5	0.811	0.637	0.913
	Establishing priorities	4	0.821	0.641	0.918
	Scheduling	4	0.850	0.654	0.923
	Minimizing distractions	4	0.792	0.631	0.910
	Delegating tasks	4	0.815	0.639	0.916
Research Quality	Data credibility and trustworthiness	6	0.851	0.659	0.916
	Methodological appropriateness	5	0.867	0.665	0.917
	Research integrity and ethics	5	0.813	0.636	0.913
	Timeliness	7	0.829	0.640	0.915

Source: SmartPLS output, processed by the authors.

The measurement model results demonstrate satisfactory convergent validity and internal consistency reliability across all dimensions of Motivation, Time Management, and Research Quality. All factor loadings exceeded the recommended threshold of 0.70, ranging from 0.792 to 0.867, indicating that the retained indicators adequately represented their respective dimensions. The Average Variance Extracted (AVE) values ranged from 0.631 to 0.672, exceeding the minimum criterion of 0.50 and confirming that each dimension explained more than half of the variance in its indicators. Composite Reliability (CR)

values ranged from 0.910 to 0.932, substantially exceeding the recommended threshold of 0.70 and demonstrating strong internal consistency.

For Motivation, factor loadings ranged from 0.796 to 0.821, with AVE values between 0.661 and 0.672 and CR values between 0.918 and 0.932. These results indicate that all five dimensions—strong willingness to act, amount of time allocated for action, sacrifice to achieve goals, perseverance in performing tasks, and persistence in facing problems while performing tasks—were reliably represented by their respective indicators. For Time Management, factor loadings ranged from 0.792 to 0.850, while AVE and CR values ranged from 0.631 to 0.654 and 0.910 to 0.923, respectively. The Scheduling dimension demonstrated the highest factor loading (0.850) and AVE (0.654), suggesting particularly strong indicator representation. Although Minimizing Distractions produced the lowest loading (0.792) and AVE (0.631) within this construct, both values remained well above the recommended thresholds. For Research Quality, all dimensions also demonstrated satisfactory measurement properties. Factor loadings ranged from 0.813 to 0.867, AVE values ranged from 0.636 to 0.665, and CR values ranged from 0.913 to 0.917. Methodological Appropriateness exhibited the highest factor loading (0.867) and AVE (0.665), indicating strong representation of this dimension within the Research Quality construct. Data Credibility and Trustworthiness, Research Integrity and Ethics, and Timeliness also demonstrated adequate factor loadings, AVE, and composite reliability.

Taken together, the results provide strong evidence of convergent validity and internal consistency reliability for the measurement model. Since all factor loadings exceeded 0.70, all AVE values exceeded 0.50, and all CR values were above 0.70, no dimension exhibited evidence of inadequate measurement quality. The retained indicators can therefore be considered appropriate for subsequent assessment of the structural model.

Structural Model Assessment

After establishing the reliability and validity of the measurement model, the structural model was evaluated to examine the relationships between Motivation, Time Management, and Research Quality. The assessment included collinearity diagnostics, explanatory power, effect sizes, predictive relevance, and the statistical significance of the hypothesized relationships.

The collinearity assessment was conducted to determine whether the predictor constructs demonstrated excessive overlap that could distort the estimation of structural relationships. The VIF values for Motivation and Time Management were 2.9 and 2.7, respectively. The results indicate whether the two predictor constructs could be simultaneously included in the structural model without substantial multicollinearity concerns. Following this assessment, the analysis proceeded to evaluate the explanatory power of the model.

Coefficient of Determination

The joint explanatory contribution of Motivation and Time Management was evaluated through the coefficient of determination (R^2) of Research Quality.

Table 9. Coefficient of Determination

Endogenous Construct	R^2	Adjusted R^2	Interpretation
Research Quality	0.653	65.3%	Moderate

Source: SmartPLS output, processed by the authors.

The coefficient of determination results indicate that the proposed model explains a substantial proportion of the variance in Research Quality. The R^2 value for Research Quality was 0.653, indicating that 65.3% of the variance in students' research quality can be jointly explained by the predictor constructs, namely Student Independence and Time Management. The remaining 34.7% of the variance is attributable to other factors that are not included in the proposed model. Based on the commonly used interpretation of R^2 values in PLS-SEM, an R^2 of 0.653 represents a moderate level of explanatory power. This finding suggests that the proposed model has meaningful predictive explanatory capacity for Research Quality during the thesis or final-project stage. In substantive terms, the results indicate that students' capacity to independently manage their research activities and their ability to organize and regulate their time collectively account for a considerable proportion of differences in research quality. Nevertheless, the R^2 value does not indicate the statistical significance or relative importance of each predictor. Therefore, the individual effects of Student Independence and Time Management should be further evaluated using path coefficients, t-statistics, p-values, and effect-size (f^2) estimates.

Effect Size Assessment

The individual contribution of each exogenous construct to Research Quality was subsequently assessed using the effect size (f^2).

Table 10. Effect Size of the Structural Relationships

Structural Relationship	f^2	Effect Size
Motivation → Research Quality	0.48	Medium
Time Management → Research Quality	0.45	Medium

Source: SmartPLS output, processed by the authors.

The effect-size analysis provides evidence that both predictors make substantial contributions to Research Quality. The f^2 value for the relationship between Motivation and Research Quality was 0.48, exceeding the commonly applied threshold of 0.35 for a large effect. This finding indicates that Motivation contributes substantially to the explained variance in Research Quality and represents an

important predictor within the structural model. Similarly, the effect size of Time Management on Research Quality was 0.45, which also exceeds the 0.35 threshold and therefore represents a large effect. This result indicates that students' ability to organize, prioritize, schedule, and regulate their use of time makes a substantial contribution to explaining Research Quality. Comparatively, Motivation demonstrated a slightly larger effect size ($f^2 = 0.48$) than Time Management ($f^2 = 0.45$). However, the difference was relatively small, suggesting that both constructs make similarly strong substantive contributions to Research Quality. Taken together, the findings indicate that both motivational capacity and time-management behaviour are not merely statistically relevant predictors but also have considerable practical importance in explaining variation in students' research quality.

Predictive Relevance

The predictive relevance of the structural model was assessed using the Q^2 value.

Table 11. Predictive Relevance Assessment

Endogenous Construct	Q^2	Predictive Relevance
Research Quality	0.32	Yes

Source: SmartPLS output, processed by the authors.

The predictive relevance assessment indicates that the structural model has predictive relevance for Research Quality. The Q^2 value obtained for Research Quality was 0.32, which is greater than zero. This result confirms that the model possesses out-of-sample predictive relevance for the endogenous construct. Thus, the proposed predictors, namely Student Independence and Time Management, provide meaningful predictive information for Research Quality beyond their explanatory contribution reflected by the R^2 value. Overall, the findings indicate that the structural model demonstrates both explanatory capacity and predictive relevance for students' Research Quality.

Hypothesis Testing Results

The hypotheses were tested using the bootstrapping procedure in SmartPLS. The evaluation was based on the path coefficient (β), standard deviation, t-statistics, and p-values. The study examined two principal hypotheses concerning the direct effects of Motivation and Time Management on Research Quality. Hypothesis testing was conducted using the bootstrapping method to obtain t-statistic and p-value results. A hypothesis was accepted if the t-statistic exceeded 1.96 or the p-value was less than 0.05 at a 5% significance level. The results of the hypothesis testing are presented in Table 12.

Table 12. Results of Hypothesis Testing

Structural Relationship	Original Sample	Sample Mean	Standard Deviation	t-statistic	p-value	Decision
Motivation → Research Quality	0.538	0.542	0.084	12.285	0.000	Supported
Time Management → Research Quality	0.574	0.588	0.079	12.481	0.000	Supported

Source: SmartPLS bootstrapping output, processed by the authors.

The structural model was evaluated to examine the effects of Motivation and Time Management on Research Quality. As presented in Table X, both hypothesized relationships were positive and statistically significant. Motivation had a positive effect on Research Quality ($\beta = 0.538$, $t = 12.285$, $p < 0.001$), indicating that higher levels of student motivation were associated with higher research quality. This finding suggests that students with stronger motivation are more likely to demonstrate persistence, sustained effort, and commitment throughout the research process, thereby supporting the production of higher-quality research outcomes. Accordingly, the hypothesis proposing a positive relationship between Motivation and Research Quality was supported. Similarly, Time Management demonstrated a positive and statistically significant effect on Research Quality ($\beta = 0.574$, $t = 12.481$, $p < 0.001$). This result indicates that students who manage their time more effectively tend to produce higher-quality research. Effective time management may facilitate systematic planning, prioritization of research activities, adherence to deadlines, and sufficient allocation of time for data collection, analysis, writing, and revision. Thus, the hypothesis predicting a positive relationship between Time Management and Research Quality was also supported. A comparison of the standardized path coefficients shows that Time Management ($\beta = 0.574$) exhibited a slightly higher coefficient than Motivation ($\beta = 0.538$). This pattern suggests that time management may have a somewhat greater contribution to Research Quality within the proposed model. However, the difference between the two coefficients is relatively small ($\Delta\beta = 0.036$), and therefore should not be interpreted as evidence that Time Management has a statistically stronger effect than Motivation without a formal comparison of the path coefficients.

The findings provide strong empirical evidence that students' Motivation and Time Management are important determinants of Research Quality. The measurement and structural model results collectively indicate that the proposed framework is psychometrically robust and substantively meaningful. Of the 75 initial indicators developed to measure Motivation, Time Management, and Research Quality, 68 indicators were retained following exploratory factor analysis (EFA), resulting in an overall retention rate of 90.7%. The high proportion of retained indicators suggests that the initial conceptualization was generally well aligned with the empirical context, while the removal of seven indicators demonstrates the importance of empirical purification in ensuring that the final measurement model is both theoretically representative and statistically appropriate. The particularly high retention rates for Motivation (96.0%) and Research Quality (92.0%) indicate relatively stable empirical representations of these constructs, whereas the somewhat lower retention rate for Time Management (84.0%) may reflect the more behaviourally heterogeneous nature of time-management practices. Students may be effective in setting

goals and scheduling activities while experiencing greater difficulty in controlling distractions or delegating tasks. Thus, the empirical purification of the instrument does not necessarily indicate conceptual weakness; rather, it suggests that time-management behaviours may be more context-sensitive than motivational orientations and perceptions of research quality.

The factor structure further reinforces the multidimensional nature of the three constructs. Motivation was represented through strong willingness to act, amount of time allocated for action, willingness to sacrifice to achieve goals, perseverance in performing tasks, and persistence in facing problems. These dimensions are particularly relevant to student research because thesis and final-project activities require sustained engagement over an extended period and frequently involve uncertainty, methodological difficulties, revisions, and delayed rewards. Motivation in this context is therefore not simply a student's desire to perform well but a sustained psychological commitment that enables continued effort when research activities become difficult. This interpretation is consistent with Howard et al. (2021), who synthesized evidence from 344 samples involving more than 223,000 students and found systematic relationships between different forms of motivation and student performance, persistence, and well-being. In particular, autonomous forms of motivation were positively associated with adaptive academic outcomes. Bureau et al. (2022), through a meta-analysis of 144 studies involving more than 79,000 students, similarly demonstrated that self-determined motivation is associated with academic persistence and achievement and is influenced by the satisfaction of students' psychological needs for autonomy, competence, and relatedness. These findings provide an important theoretical basis for interpreting the present result because research activities require students to sustain engagement even when immediate external rewards are limited.

Time Management was operationalized through goal setting, establishing priorities, scheduling, minimizing distractions, and delegating tasks. This multidimensional structure reflects the behavioural mechanisms through which students organize limited temporal resources to accomplish multiple interdependent research activities. Such a conceptualization corresponds closely with self-regulated learning theory, which positions planning, monitoring, and regulation of behaviour as essential components of effective academic functioning. Evidence from previous meta-analytic research supports this interpretation. Aeon et al. (2021) found that time management is positively associated with performance, academic achievement, and well-being, while more recent evidence from Liu, Ma, and Jia (2026), based on 31 studies involving 13,506 college students, demonstrated a positive association between time management and college students' learning outcomes. However, the present study extends this literature by moving beyond general learning outcomes and examining Research Quality as a more complex academic outcome. This distinction is important because producing a high-quality research project involves not only completing academic tasks but also coordinating literature review, methodological design, data collection, analysis, interpretation, writing, ethical compliance, and revision over an extended period.

The operationalization of Research Quality also constitutes an important conceptual feature of the present study. Rather than treating research quality as a unidimensional indicator of academic

performance, the construct incorporates data credibility and trustworthiness, methodological appropriateness, research integrity and ethics, and timeliness. This multidimensional conceptualization recognizes that high-quality research must satisfy epistemic, methodological, ethical, and temporal requirements simultaneously. A study may employ an appropriate statistical technique but still demonstrate weak quality if its data are unreliable, its research process violates ethical principles, or its scholarly foundation is outdated. The present conceptualization therefore broadens the understanding of student research quality by positioning it as an integrated outcome of how students generate, evaluate, manage, and communicate knowledge.

The measurement model provides strong support for this conceptualization. All outer loadings exceeded the recommended threshold of 0.70, ranging from 0.792 to 0.867, while average variance extracted (AVE) values ranged from 0.631 to 0.672 and composite reliability values ranged from 0.910 to 0.932. These results demonstrate strong indicator reliability, convergent validity, and internal consistency across the constructs. Within Time Management, Scheduling demonstrated the highest loading (0.850), suggesting that the temporal structuring of research activities is particularly central to students' time-management practices. Within Research Quality, Methodological Appropriateness had the highest loading (0.867), indicating that methodological coherence represents a particularly salient component of perceived research quality. Nevertheless, the strong loadings across the remaining dimensions indicate that research quality cannot be reduced to methodology alone. The construct is better understood as a multidimensional quality standard encompassing credible evidence, methodological rigour, ethical integrity, and temporal relevance.

The structural results provide further support for the proposed theoretical model. Motivation demonstrated a positive and statistically significant relationship with Research Quality ($\beta = 0.538$, $t = 12.285$, $p < 0.001$), accompanied by a large effect size ($f^2 = 0.48$). This finding indicates that students who possess stronger motivational orientations tend to demonstrate higher levels of research quality and that the contribution of Motivation is substantively meaningful rather than merely statistically significant. The mechanism underlying this relationship can be explained by the prolonged and demanding nature of research. Students must repeatedly search for literature, refine research questions, develop instruments, collect and analyse data, interpret findings, write arguments, respond to feedback, and revise their work. These activities often involve setbacks, ambiguity, and intellectual frustration. Motivation therefore functions as a psychological resource that sustains effort and persistence across the research process.

The motivational dimensions identified in this study provide a more nuanced explanation of this relationship. Strong willingness to act initiates research engagement, whereas perseverance and persistence maintain engagement when difficulties arise. The willingness to sacrifice reflects students' ability to prioritize research objectives over competing activities, while the allocation of time reflects the behavioural expression of motivational commitment. These dimensions suggest that the relationship between Motivation and Research Quality is likely to operate through sustained engagement rather than through short-term academic enthusiasm. This interpretation is consistent with Self-Determination

Theory, which emphasizes that autonomous motivation is associated with persistence and adaptive academic functioning. Howard et al. (2021) and Bureau et al. (2022) provide broad empirical support for this proposition. The present findings extend that evidence by demonstrating that motivation is associated not only with conventional academic achievement or persistence but with the quality of student research as a multidimensional scholarly product.

Time Management exhibited an equally substantial relationship with Research Quality ($\beta = 0.574$, $t = 12.481$, $p < 0.001$), with a large effect size ($f^2 = 0.45$). This result indicates that students' ability to regulate and organize their time is strongly associated with their ability to produce high-quality research. Research projects are inherently sequential and cumulative: inadequate time allocated to literature review can weaken theoretical development; rushed instrument development can compromise data quality; insufficient time for analysis can increase the risk of inappropriate interpretation; and limited time for writing and revision can reduce clarity and coherence. Time Management therefore contributes to Research Quality not simply by increasing the amount of time students spend working but by enabling them to distribute time strategically across activities that have different levels of importance and urgency.

The strong loading of Scheduling reinforces this interpretation. Goal setting identifies desired outcomes, prioritization determines which activities should receive attention, and scheduling translates these objectives into concrete temporal commitments. Minimizing distractions protects periods of concentrated research activity, while delegation may help students manage activities that do not require exclusive individual attention. These mechanisms are consistent with the resource-management dimension of self-regulated learning. Aeon et al. (2021) and Liu, Ma & Jia (2026) provide empirical evidence that time management is positively related to academic outcomes. The present study extends this evidence by showing that the relevance of time management is not limited to whether students achieve higher grades or learning outcomes; rather, temporal self-regulation is also strongly associated with the quality of their research outputs.

The simultaneous effects of Motivation and Time Management constitute one of the principal theoretical contributions of the study. Their substantial and relatively comparable path coefficients indicate that these variables should be understood as complementary rather than competing explanations of Research Quality. Motivation provides the psychological energy required to initiate and sustain research engagement, whereas Time Management provides the behavioural structure through which that engagement is translated into organized action. Put differently, Motivation explains why students continue to engage with difficult research activities, while Time Management helps explain how that engagement is organized over time. This psychological–behavioural complementarity provides a more comprehensive explanation of Research Quality than models focusing exclusively on either motivational or behavioural factors.

This integrated perspective represents an important novelty of the present study. Previous studies have predominantly examined Motivation and Time Management separately in relation to academic

achievement, learning outcomes, persistence, or general academic performance. Meta-analytic evidence has established positive associations between student motivation and academic outcomes and between time management and academic performance. However, considerably less attention has been given to the combined contribution of these two student-level self-regulatory factors to the quality of research itself. More importantly, Research Quality has rarely been conceptualized in this context as a multidimensional construct incorporating data credibility and trustworthiness, methodological appropriateness, research integrity and ethics, and timeliness. The present study therefore shifts the analytical focus from “how well students perform academically” to “how well students produce research.” This shift is theoretically significant because research production requires a higher degree of autonomy, prolonged effort, temporal coordination, methodological judgement, and ethical responsibility than many conventional academic tasks.

The novelty is further strengthened by the integration of EFA and PLS-SEM. EFA was used to empirically refine the indicators and identify the underlying dimensions, while PLS-SEM was subsequently used to examine the relationships between the validated constructs. This sequential approach provides both measurement refinement and explanatory modelling. Consequently, the study does not merely report correlations between motivation, time management, and research quality; it proposes and empirically evaluates a multidimensional structural framework explaining Research Quality through psychological and behavioural determinants. The model’s R^2 value of 0.653 indicates that Motivation and Time Management jointly explain 65.3% of the variance in Research Quality. Such explanatory capacity strengthens the argument that student-level self-regulation represents a substantial component of research-quality formation, although it should not be interpreted as implying that the remaining factors are unimportant.

The results also reveal an important nuance regarding the relative contribution of the predictors. Time Management produced a slightly higher standardized coefficient than Motivation (0.574 versus 0.538), with a difference of 0.036. This finding may indicate that the organization and allocation of time are particularly important when students undertake complex and relatively autonomous research projects. Nevertheless, the difference should not be interpreted as evidence that Time Management has a statistically stronger effect than Motivation because a formal comparison of the two path coefficients was not reported. The appropriate conclusion is that both predictors make strong and broadly comparable contributions to Research Quality, with Time Management showing a marginally higher estimated coefficient in the present sample. Future research could formally test whether these coefficients differ significantly.

The predictive relevance of the model provides additional support for its empirical usefulness. The Q^2 value of 0.32 for Research Quality indicates predictive relevance because it exceeds zero. When considered together with $R^2 = 0.653$, the results suggest that the model possesses substantial explanatory capacity and meaningful predictive relevance. Nevertheless, Q^2 should not be interpreted as equivalent to strong out-of-sample predictive accuracy. Contemporary PLS-SEM research emphasizes the importance of distinguishing explanatory power from genuine predictive performance. Future studies

should therefore employ procedures such as PLSpredict or holdout-sample validation to determine whether the proposed framework can accurately predict Research Quality in new samples.

The findings have several theoretical implications. First, they support the extension of Self-Determination Theory and self-regulated learning perspectives into the domain of student research quality. Motivation should not be treated merely as a precursor of participation or academic achievement; it may function as an important psychological mechanism underlying the sustained effort required for research production. Second, the findings reinforce the argument that time management is not simply a productivity technique but a component of academic self-regulation that can shape the quality of complex intellectual work. Third, the findings suggest that Research Quality should be conceptualized as a multidimensional outcome influenced not only by methodological knowledge but also by students' psychological commitment and behavioural regulation. This provides a more holistic framework for understanding why students with similar levels of methodological knowledge may nevertheless produce research of different quality.

The practical implications are equally important for universities, supervisors, and research-methodology educators. Universities should avoid treating research-quality improvement solely as a methodological training problem. Training in research design, statistics, academic writing, and research ethics remains essential, but these competencies should be accompanied by explicit development of motivational and self-regulatory capacities. Research-readiness programs could incorporate goal-setting exercises, milestone planning, priority management, scheduling, distraction control, progress monitoring, reflective practice, and strategies for maintaining persistence when research problems emerge. Such interventions are consistent with evidence from self-regulated learning research indicating that students can benefit from structured support in developing resource-management and motivational strategies.

For academic supervisors, the findings imply that supervision should incorporate both methodological and self-regulatory support. Supervisors can help students divide large research projects into realistic milestones, establish deadlines for specific research stages, monitor progress, and identify potential delays before they become critical. At the same time, supervisors can foster motivation through constructive feedback, recognition of progress, autonomy-supportive guidance, and opportunities for students to make meaningful decisions regarding their research. Such practices may be particularly important because students frequently experience research as an autonomous activity with substantial uncertainty. An effective supervisory environment should therefore provide sufficient structure without undermining students' ownership of the research process.

At the institutional level, the findings suggest the value of developing an integrated research self-regulation framework. Such a framework could combine methodological competence, research ethics, academic writing, motivation, time management, and research monitoring within a single research-development program. Digital platforms could support this framework through research calendars, milestone tracking, literature-management systems, progress dashboards, and automated reminders. However, these technologies should be viewed as scaffolds rather than substitutes for students' internal

regulatory capacities. The ultimate objective should be to cultivate students who can independently plan, monitor, evaluate, and improve their research processes.

Despite the strength of the findings, several limitations should be acknowledged. First, although Motivation and Time Management explain 65.3% of the variance in Research Quality, 34.7% remains attributable to other factors. Research Quality is inherently complex and may also depend on research self-efficacy, methodological competence, academic writing ability, supervisor support, feedback quality, digital research literacy, research anxiety, access to scholarly databases, institutional research culture, and disciplinary characteristics. The omission of these variables means that the current model should not be interpreted as a comprehensive explanation of all determinants of Research Quality. Second, if the study employs a cross-sectional design, the relationships identified should be interpreted as associations rather than definitive causal effects. It is theoretically plausible that Motivation and Time Management influence Research Quality, but the reverse relationship may also occur. Students who successfully produce high-quality research may subsequently develop stronger motivation and more effective time-management strategies. Longitudinal research would therefore be necessary to establish temporal ordering and provide stronger evidence regarding causality. Third, the use of self-reported measures may introduce common-method bias and social-desirability effects. Students may overestimate their motivation, time-management effectiveness, or research quality. Future research could strengthen validity by combining questionnaire data with objective indicators such as submission punctuality, revision frequency, supervisor assessments, research-output rubrics, citation quality, methodological-error rates, or independently evaluated research manuscripts. Multi-source assessment would provide a stronger test of whether the psychological and behavioural characteristics reported by students correspond to objectively assessed research quality. Fourth, the current model does not examine potentially important mediating or moderating mechanisms. Research self-efficacy may mediate the relationship between Motivation and Research Quality because motivated students may be more likely to develop confidence in their ability to conduct research, which subsequently improves research performance. Supervisor support may moderate the relationship between Motivation or Time Management and Research Quality by strengthening students' ability to translate individual resources into effective research behaviour. Similarly, academic level, research experience, discipline, or stage of thesis completion may influence the strength of these relationships. Testing these mechanisms would provide a more sophisticated explanation of how and under what conditions Motivation and Time Management contribute to Research Quality.

These limitations lead directly to several recommendations for future research. Future studies should first employ longitudinal or prospective designs to examine whether changes in Motivation and Time Management precede improvements in Research Quality. Second, researchers should extend the current structural model by incorporating research self-efficacy, supervisor support, methodological competence, academic writing ability, and institutional research climate. Third, mediation and moderation analyses should be conducted to identify the mechanisms and contextual conditions through which Motivation and Time Management influence Research Quality. Fourth, future studies should use multi-source and objective indicators of Research Quality to reduce dependence on self-

reported evaluations. Fifth, cross-disciplinary and cross-institutional studies are recommended to determine whether the proposed relationships remain stable across different academic fields, institutional environments, and stages of student research. Finally, future PLS-SEM research should complement Q^2 with PLSpredict or other out-of-sample procedures to establish whether the model has practical predictive utility beyond the sample in which it was developed.

The findings demonstrate that Research Quality is strongly associated with both Motivation and Time Management. The measurement results establish that the constructs possess satisfactory empirical quality, while the structural results demonstrate substantial explanatory capacity, large effect sizes, statistically significant relationships, and predictive relevance. The principal contribution of the study is therefore not simply that both hypotheses are supported, but that it demonstrates the importance of viewing high-quality student research as the outcome of interacting psychological and behavioural self-regulation processes. Motivation provides the persistence and commitment required to remain engaged with demanding research tasks, whereas Time Management provides the structure required to translate that commitment into systematic and sustained research practices. By positioning these factors as complementary determinants of a multidimensional Research Quality construct, the study extends previous research that has largely focused on motivation and time management as predictors of general academic achievement. The resulting framework offers a theoretically grounded and empirically supported basis for universities to move beyond a purely methodological approach to research training toward a more holistic model in which students are simultaneously equipped with the knowledge, motivation, and self-regulatory capacity necessary to produce credible, methodologically appropriate, ethically responsible, and timely research.

CONCLUSION

This study demonstrates that motivation and time management are significant and substantively important predictors of university students' research quality during the thesis or final-project stage. The measurement results indicate that the developed research instrument has satisfactory empirical quality. Following Exploratory Factor Analysis, 68 of the 75 initial indicators were retained, resulting in an overall retention rate of 90.7%. The subsequent PLS-SEM measurement model demonstrated adequate indicator reliability, convergent validity, and internal consistency, with all factor loadings exceeding 0.70, AVE values above 0.50, and composite reliability values substantially exceeding 0.70. The structural model provides strong empirical support for the proposed relationships. Motivation positively and significantly affects research quality ($\beta = 0.538$, $t = 12.285$, $p < 0.001$), with a large effect size ($f^2 = 0.48$). Similarly, time management positively and significantly affects research quality ($\beta = 0.574$, $t = 12.481$, $p < 0.001$), also with a large effect size ($f^2 = 0.45$). The model further shows that motivation and time management jointly explain 65.3% of the variance in research quality ($R^2 = 0.653$), while the Q^2 value of 0.32 indicates predictive relevance. Although time management produced a slightly higher path coefficient than motivation, the difference is small ($\Delta\beta = 0.036$) and should not be interpreted as evidence of a statistically stronger effect without a formal coefficient comparison. The principal contribution of this study is the integration of psychological motivation and behavioural time

management into a unified framework for explaining multidimensional research quality. Research quality is positioned not merely as academic achievement or thesis completion, but as an outcome encompassing data credibility and trustworthiness, methodological appropriateness, research integrity and ethics, and timeliness. Therefore, universities should not approach improvement of student research quality exclusively through methodological training. Research-readiness and thesis-support programmes should also strengthen students' motivation, goal setting, prioritisation, scheduling, distraction control, progress monitoring, and persistence. Supervisors can further support this process by combining methodological guidance with structured milestones, constructive feedback, autonomy-supportive supervision, and regular progress monitoring. However, the findings should be interpreted within the study's limitations. The model leaves 34.7% of research-quality variance unexplained, while the cross-sectional and self-reported nature of the data limits causal interpretation and may introduce common-method bias. Future studies should employ longitudinal designs, objective or multi-source measures of research quality, and additional variables such as research self-efficacy, methodological competence, academic writing ability, supervisor support, and institutional research climate

Declarations

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Author Contribution

The Authors contributions to this work are as follows: DAK handled conceptualization, data curation, software, formal analysis, and writing the original draft; RP contributed to formal analysis, funding acquisition, and visualization; DAK and RP was responsible for funding acquisition, validation, and writing (review and editing); RP conducted the investigation, developed the methodology, and provided supervision; and DAK and RP on writing (review and editing) research methodology and writing the original draft. Correspondence regarding this work should be directed to corresponding authors; DAK at the Jambi University, Jambi, Indonesia, email: dwiagus.k@unja.ac.id; ORCID: https://orcid.org/0000-0002-0130-2436 and RP at the Jambi University, Jambi, Indonesia, email: rahmat260997@gmail.com; ORCID: https://orcid.org/0000-0003-1648-0291.

Clinical trial number:

Not applicable.

Ethical Approval

This study on “The Role of Motivation and Time Management as Psychological and Behavioral Determinants of Student Research Quality” was facilitated in strict accordance with the ethical principles outlined in the Declaration of Helsinki. The study protocol was reviewed and approved by the Ethics Committee of Jambi University Academic Ethics Review Board. Ethical approval for this study was granted on March 20, 2026, with the approval number 9613.6/IKM.05.01/2026. All procedures involving human participants were conducted in compliance with the approved ethical guidelines, and every effort was made to ensure the protection of participants’ rights, privacy, and well-being throughout the research process.

Consent to Participate

Written informed consent was obtained from all participants before their participation in the study. Participation was voluntary, and all participants were informed about the purpose and procedures of the research. The confidentiality and anonymity of the participants were maintained throughout the study. The informed consent process was conducted in accordance with the principles of the Declaration of Helsinki.

Consent to Publish

Not applicable. This manuscript does not contain identifiable personal data or images of any participants.

Competing Interest

The authors declare no competing interests.

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Figures

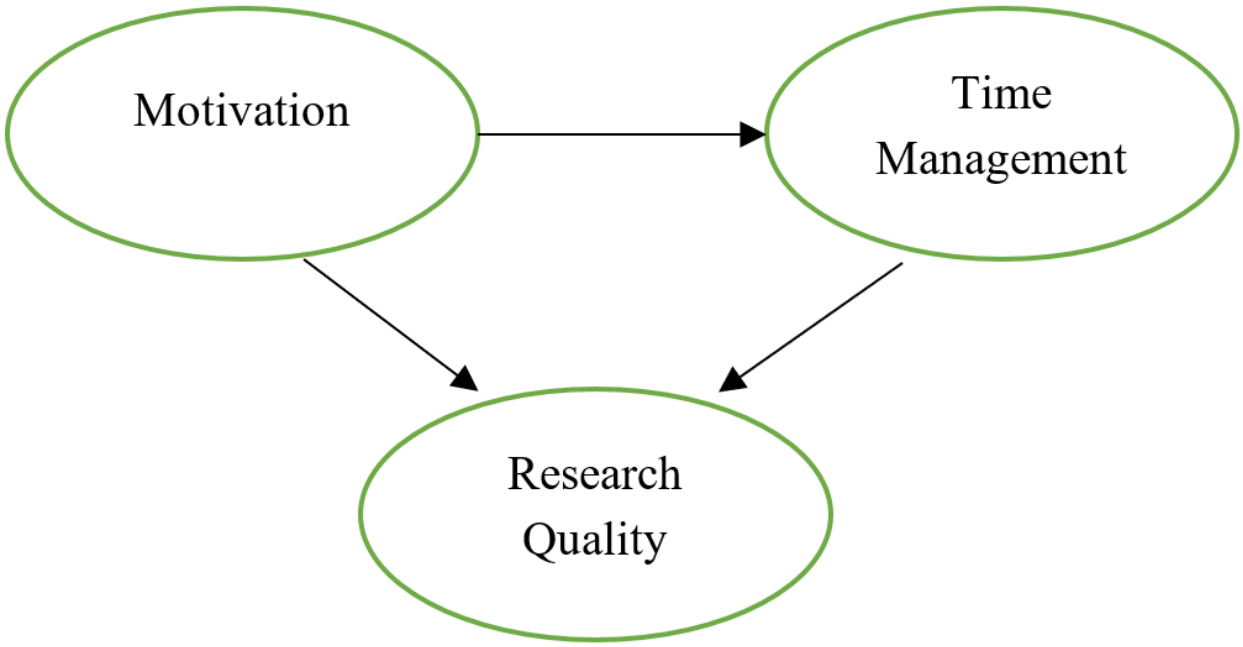


Figure 1

PLS-SEM Measurement and Structural Model

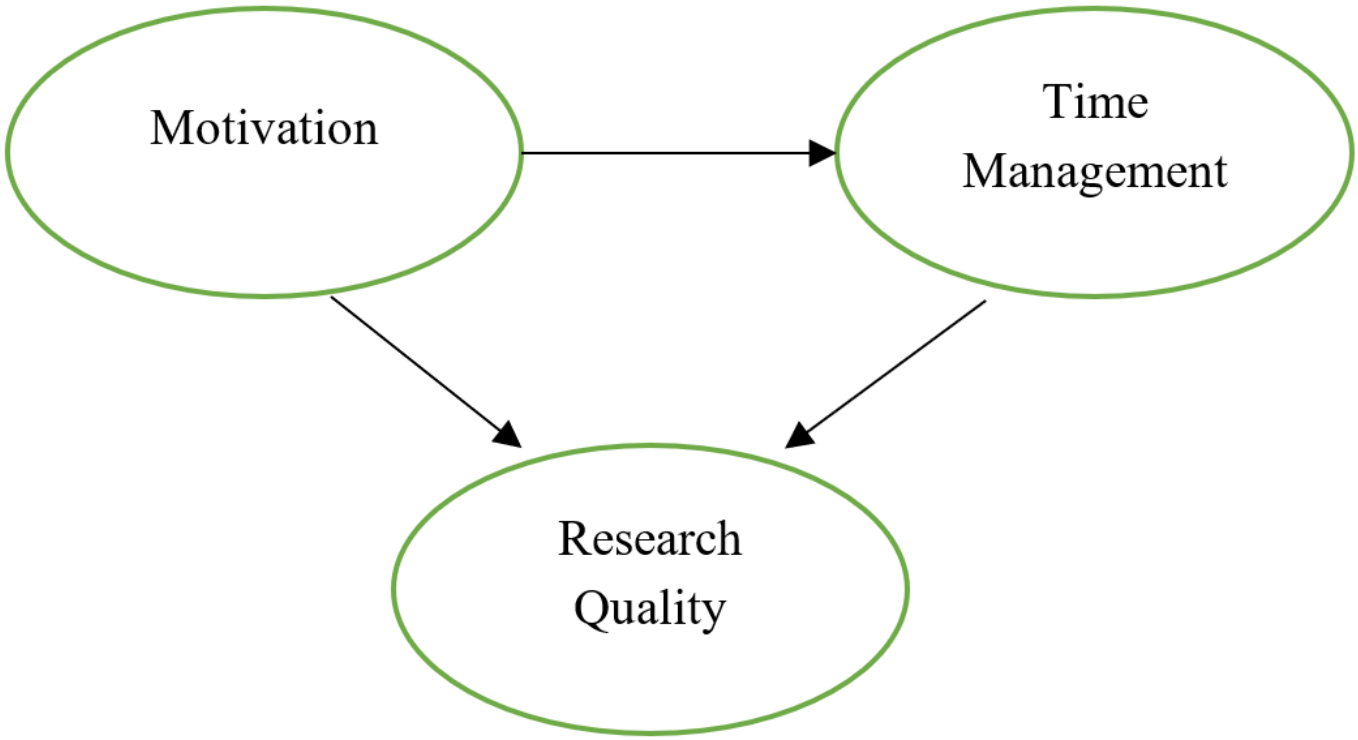


Figure 2

Final Structural Model