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The Mediating Role of Outcome Based Education Implementation in the Relationship Between Time Management and Research Outcome Quality Among Final Year University Students

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Research Article

Keywords: Time Management, Outcome-Based Education, Quality of Research Outcomes, Final Project, Students

Posted Date: November 23rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11047283/v1

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Additional Declarations: No competing interests reported.

Abstract

This study aims to analyze the influence of time management on the quality of students' research outcomes and to examine the mediating role of Outcome-Based Education (OBE) implementation. A quantitative approach with an explanatory survey design was employed, involving students currently completing their undergraduate or master's theses in Mathematics and Natural Science Education study programs. Data were collected via questionnaires and analyzed using Partial Least Squares Structural Equation Modeling. The results indicate that time management has a positive and significant effect on OBE implementation ($\beta = 0.405$; $t = 8.44$; $p < 0.001$), while OBE implementation has a positive and significant effect on research outcome quality ($\beta = 0.347$; $t = 6.36$; $p < 0.001$). Conversely, time management does not have a significant direct effect on research outcome quality ($\beta = -0.082$; $t = 1.49$; $p = 0.136$). However, the indirect effect of time management on research outcome quality through OBE implementation is significant ($\beta = 0.141$; $t = 5.22$; $p < 0.001$), demonstrating the presence of indirect mediation. The study's novelty lies in the development of a model that integrates time management as an individual factor and OBE implementation as an educational system mechanism to explain the quality of students' research outcomes. The study's implications underscore the importance of strengthening outcome-based final project supervision so that students' time management can be directed toward a more structured research process that yields high-quality outcomes.

INTRODUCTION

Higher education bears the responsibility of producing not only graduates equipped with knowledge and skills but also individuals capable of generating knowledge through high-quality research activities. In the context of higher education, the ability to conduct research represents a form of academic competence demonstrating a student's capacity to identify problems, establish a theoretical foundation, select appropriate methods, analyze data, and draw scientifically sound conclusions (Bapanova et al., 2025; Kondakci et al., 2026; Whitton et al., 2022). The quality of students' research outcomes thus serves as a key indicator for assessing the success of the learning process, as it reflects the attainment of various competencies developed during their education (Li & Rohayati, 2024; Q. Luo et al., 2023; Mikulich-Gilbertson et al., 2026; Y. Wang et al., 2025). However, achieving high-quality research is determined not only by the mastery of knowledge and methodological skills but also by the student's ability to manage the research process systematically and sustainably (Alqhtani, 2025; Matos et al., 2023). This situation makes individual factors and the learning environment two aspects that need to be considered when explaining the variation in the quality of students' research outcomes.

These challenges are particularly significant for final-year students who must complete research to meet academic graduation requirements. The research process at this stage involves a series of interconnected activities, ranging from problem identification, literature review, proposal preparation, and instrument development to data collection and analysis, as well as the drafting and revision of the research report (Alsalami, 2022; Thomas et al., 2026; Topping et al., 2025). The complexity of each stage requires students to allocate their time effectively so that every activity can be completed according to

targets without compromising the quality of the research process or its outcomes (Nabila & Abdulmajid, 2026; Pérez-Juárez et al., 2023; Rafiq et al., 2022). An inability to manage these various academic demands can lead to delays in completing tasks and conducting research, as well as limited time for analysis and revision, ultimately potentially compromising the quality of the research findings (Fu et al., 2025; S. Kumar et al., 2026; Peykani et al., 2026). Therefore, students' time management skills constitute a crucial factor that needs to be examined in order to understand how high-quality research outcomes can be achieved.

Time management refers to an individual's ability to plan, organize, prioritize, and control the use of time to effectively achieve specific goals. In the research process, time management enables students to set research targets, determine activity priorities, create work schedules, allocate time for each stage, monitor progress, and avoid delays that could hinder the completion of the research (Calonia et al., 2023; L. Luo et al., 2026; Valente et al., 2024). Theoretically, students with good time management skills have a greater opportunity to dedicate sufficient time to academic activities requiring precision—such as literature reviews, instrument development, data collection, analysis, result interpretation, and report refinement (Liu et al., 2026; Naveena & White, 2026; Trentepohl et al., 2022). Thus, effective time management is not only linked to the ability to complete research on schedule but also has the potential to provide students with greater scope to enhance the depth and precision of their research findings (Fu et al., 2025; Hou et al., 2025; Mosanya et al., 2022). However, the influence of time management on research quality is not always straightforward, as a student's success in managing their time can also be affected by the learning environment and the educational system implemented by the higher education institution

One higher education approach relevant to this issue is Outcome-Based Education, which establishes learning outcomes as the foundation for designing, implementing, and evaluating the educational process. The implementation of Outcome-Based Education emphasizes alignment among learning outcomes, learning activities, assessments, feedback, and the competencies students are expected to possess by the end of the educational process (Alhazmi, 2025; Mahalingam, 2025; Vetrithangam et al., 2026). In the context of student research, an orientation towards learning outcomes can provide clearer direction regarding the research competencies to be achieved, while simultaneously encouraging students to link various academic activities with expected results (Ali, 2024; Li & Rohayati, 2024; Maria et al., 2023). An outcome-oriented learning environment can also help students understand academic targets, organize learning activities, utilize feedback, and develop the competencies needed to produce high-quality research (Qin & Chen, 2026; Sadtyadi & Paramita, 2026; Xu et al., 2024). Thus, the implementation of Outcome-Based Education is not only relevant as a curriculum approach but also holds the potential to serve as an educational mechanism linking students' time management skills with the quality of their research outcomes.

The relationship suggests that time management may not directly influence research quality in its entirety; rather, it operates through student engagement within an outcome-oriented educational environment. Students capable of managing their time effectively tend to demonstrate greater

proficiency in meeting learning targets, adhering to academic schedules, completing assignments on time, utilizing feedback, and aligning their activities with established objectives (Trentepohl et al., 2022; Wolters et al., 2025). When this behavior occurs in the implementation of Outcome-Based Education which emphasizes harmony between the learning process and outcomes, the ability to manage time can be translated into achieving more focused research competencies (Guggari et al., 2023; Mahalingam, 2025; Rizaldi et al., 2025). Furthermore, the attainment of these competencies can support students in producing research of higher quality in terms of problem formulation, theoretical grounding, methodological precision, quality of analysis, discussion, novelty, and scientific contribution (Agustian, 2024; Deroncele-Acosta et al., 2024; Sulistyani et al., 2025). Therefore, the implementation of Outcome-Based Education can be conceptually positioned as a mediating variable that explains how time management contributes to the quality of students' research outcomes.

Although the relationship between time management and students' academic success has been the subject of extensive research, there remains room to broaden the understanding of time management's contribution to the quality of research outcomes—particularly among final-year students currently conducting their research (Almulla et al., 2025; Marji et al., 2026; Zahra et al., 2026). Research on Outcome-Based Education also frequently positions the approach as a strategy to enhance learning outcomes, competencies, or academic performance, whereas its role as a mechanism bridging individual student factors with the quality of research outcomes has not been extensively examined (Alwakid et al., 2025; Mahrishi et al., 2025; Prastiwi et al., 2026). Furthermore, studies integrating students' time management skills, the implementation of Outcome-Based Education (OBE), and the quality of research outcomes into a single structural model remain relatively limited. These limitations highlight an empirical gap in understanding the relationships among these three constructs, a conceptual gap in explaining the role of OBE implementation as a mediating mechanism, and a methodological gap in simultaneously testing these direct and indirect relationships using a structural modeling approach. Consequently, there is a need for research that not only examines whether time management is associated with research outcome quality but also explains how OBE implementation serves as a mechanism bridging this relationship.

Addressing these gaps, this study offers a new perspective by positioning OBE implementation as a mediating variable in the relationship between time management and research outcome quality among final-year students. This approach makes a theoretical contribution by integrating individual student factors and educational environmental factors into a single model to explain the formation of research outcome quality (Nikou & Luukkonen, 2024; Zafeer et al., 2024). This study also holds practical significance, as enhancing the quality of student research has become increasingly important; higher education institutions are now required to produce graduates who possess research competencies, critical thinking skills, and the ability to generate knowledge aligned with learning outcomes. Understanding these mechanisms can provide a foundation for study programs and institutions to strengthen student time management while enhancing the implementation of Outcome-Based Education through the setting of research targets, progress monitoring, the provision of feedback, and the alignment of research activities with learning outcomes (Mahrishi et al., 2025; Mishra & Singh, 2025;

Soliha et al., 2026). Therefore, this study aims to analyze the effect of time management on research outcome quality and to examine whether the implementation of outcome-based education mediates this relationship among final-year students.

RESEARCH METHODS

Research Type and Design

This study employs a quantitative approach with an explanatory design aimed at explaining the relationship between time management, the implementation of Outcome-Based Education (OBE), and the quality of students' research outcomes. A quantitative approach was selected because the research data were obtained in the form of numerical scores via structured questionnaires and analyzed statistically to examine the relationships between the variables (Almusaed et al., 2025; Ibrahim & Hussein, 2024; Rafianda & Desyandri, 2026). This study employs a mediation model with Time Management as the exogenous variable (X), OBE Implementation as the mediator variable (M), and Research Outcome Quality as the endogenous variable (Y). The research model examines the direct effect of Time Management on Research Outcome Quality, as well as the indirect effect of Time Management on Research Outcome Quality through OBE Implementation. The analysis of the relationships between variables was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM).

Conceptually, the research model is formulated as shown in the figure below:

Research Population and Sample

The population for this study consists of students currently working on their undergraduate or master's theses within the Mathematics and Natural Science Education study programs at the Faculty of Teacher Training and Education and the Postgraduate Program of the University of Jambi. The study population comprises seven programs: Chemistry Education, Physics Education, Biology Education, Mathematics Education, Master’s in Chemistry Education, Master’s in Mathematics Education, and Master’s in Science Education. Based on data regarding students currently completing their final projects, the total population size is 2,004 students.

Table 1
Distribution of the Study Population

Study program	Population Size
Chemistry Education	269
Physics Education	112
Biology Education	591
Mathematics Education	406
Master's in Chemistry Education	119
Master's in Mathematics Education	187
Master's in Science Education	320
Amount	2.004

The sample size was determined using Slovin's formula with a 5% margin of error. Based on the calculations, the minimum sample size required was 334 students. To ensure proportional representation across study programs, the final sample size was set at 336 students. Sampling was conducted using a stratified random sampling technique, with study programs serving as the strata (Ahmad et al., 2023; Cohen, 2025; Obenza et al., 2025). This technique was employed because the study population consisted of several study program groups with varying numbers of members. Within each stratum, students meeting the research criteria were selected randomly, ensuring that every eligible student had a chance to become a respondent.

Table 2
Distribution of Research Samples

Study program	Sample Size
Chemistry Education	80
Physics Education	48
Biology Education	119
Mathematics Education	34
Master's in Chemistry Education	14
Master's in Mathematics Education	5
Master's in Science Education	36
Amount	336

The respondent criteria for this study include: (1) active undergraduate or master's students currently working on their thesis or dissertation; (2) those who have completed their research proposal and

obtained supervisor approval; (3) individuals with experience in research and/or scholarly activities; (4) those who consult with their academic supervisors during the process of completing their final project; and (5) individuals willing to participate as respondents and fully complete the questionnaire. These criteria serve to ensure that respondents possess relevant experience regarding time management, the implementation of Outcomes-Based Education, and the execution of their final research project (Elshaikh et al., 2023; Galdonez, 2025; J. Kumar et al., 2023).

Data Collection Instruments and Techniques

Research data were collected using a closed-ended questionnaire comprising three instruments: Time Management (X), Implementation of Outcome-Based Education (M), and Quality of Research Outcomes (Y). The Time Management instrument was used to measure students' ability to manage their time while completing their final projects. Based on the instrument, the Time Management construct consists of five indicators: setting goals, establishing priorities, creating schedules, minimizing distractions, and delegating tasks. The instrument comprises 25 statements, with five items per indicator. These statements cover students' abilities to set short- and long-term goals, determine research priorities, schedule activities, avoid distractions, and seek assistance or delegate specific tasks to facilitate the completion of their final projects (Ban & Sario T, 2026; Benstowe & Chinyere OBIANWU, 2023; Carchman & Cheng, 2025). The specifications for the time management instrument used in this study are presented in Table 3.

Table 3
Time Management Instrument Grid

Variable	Indicator	Measurement Focus	Item Number	Amount
Time Management	Formulating objectives	Establishing goals, targets, and a completion plan for the final project	1–5	5
	Setting priorities	Determining research activities based on importance and urgency	6–10	5
	Creating a schedule	Planning and allocating time for research activities	11–15	5
	Minimizing distractions	Managing various distractions that hinder the research	16–20	5
	Delegating tasks	Seeking assistance or delegating specific tasks to support the research	21–25	5
Total				25

The Outcome-Based Education implementation instrument was developed based on the theoretical framework of Outcome-Based Education found in research literature. This theory positions clear and

measurable learning outcomes as the primary focus of the educational process and emphasizes backward design, student engagement, expanded learning opportunities, and constructive alignment among learning outcomes, learning activities, and assessment (Barthakur et al., 2022; Lewis & Bader, 2026; Rosmawati et al., 2024). Furthermore, the implementation of Outcome-Based Education encompasses the mapping of learning objectives, outcome-oriented instructional design, the development of relevant competencies, continuous evaluation, flexibility and adaptability, as well as stakeholder engagement.

Based on this framework, the instrument for implementing Outcome-Based Education in this study was developed into nine indicators relevant to students' experiences during their education and the completion of their final projects: achievement orientation, backward design, constructive alignment, student engagement, competency development, continuous evaluation and feedback, expanded learning opportunities, flexibility and adaptability, and stakeholder engagement. As this instrument was developed specifically for this study, the number and composition of its items are regarded as a preliminary draft that requires expert validation and empirical testing before being established as the final instrument (Kosinski et al., 2024; Suryandari & Kim, 2026; Yan et al., 2026). The initial framework for the outcome-based education implementation instrument used in this study is presented in Table 4.

Table 4
Initial Blueprint of the Outcome-Based Education Implementation Instrument

Variable	Indicator	Measurement Focus	Item Number	Amount
Implementation of Outcome-Based Education	Outcome orientation	Clarity and measurability of learning outcomes	1–4	4
	Backward design	Instructional design based on established outcomes	5–8	4
	Constructive alignment	Alignment of outcomes, learning activities, and assessment	9–12	4
	Student engagement	Active student engagement in achieving learning outcomes	13–16	4
	Competence development	Development of knowledge, thinking skills, research capabilities, and problem-solving abilities	17–20	4
	Continuous evaluation and feedback	Progress monitoring, evaluation, and feedback for improvement	21–24	4
	Expanded learning opportunities	Opportunities to gain diverse learning and research experiences	25–28	4
	Flexibility and adaptability	Adaptation of the learning process to student needs and developments in the field	29–32	4
	Stakeholder engagement	Roles of lecturers, supervisors, the study program, and relevant parties in achieving outcomes	33–36	4
Total				36

The Research Outcome Quality Instrument is used to assess the quality of student research during the undergraduate or graduate thesis completion process. The instrument comprises 65 items covering aspects such as the problem statement, primary theories or sources, theoretical synthesis, hypotheses, population, sampling techniques, research instruments, instrument specifications (blueprints), validity and reliability, reliability coefficients, data analysis, conclusions, and recommendations. The instrument reflects research quality across conceptual, methodological, and analytical dimensions, as well as the reporting of research findings (Cruchinho et al., 2024; Jarden et al., 2023; Wulandari et al., 2026). The specifications for the research quality instrument used in this study are presented in Table 5.

Table 5
Instrument Grid for Research Outcome Quality

Variable	Aspect	Item Number	Amount
Quality of Research Results	Problem statement	1–5	5
	Key theory or primary source	6–10	5
	Theoretical synthesis	11–15	5
	Hypothesis	16–20	5
	Population	21–25	5
	Sampling technique	26–30	5
	Research instrument	31–35	5
	Instrument grid/blueprint	36–40	5
	Validity and reliability	41–45	5
	Reliability coefficient	46–50	5
	Data analysis	51–55	5
	Conclusion	56–60	5
	Recommendations	61–65	5
Total			65

Data Analysis Techniques

The research data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The PLS-SEM analysis was conducted in two main stages: evaluation of the measurement model and evaluation of the structural model (*structural model*) (Bajpai & Misra, 2022; Magno et al., 2024; Masyhuri & Ilham, 2026). Measurement model evaluation is used to assess the validity and reliability of constructs formed by indicators, whereas structural model evaluation is used to test the relationships and influences between research variables.

An evaluation of the measurement model was conducted to assess the quality of the indicators in representing the constructs of Time Management, OBE Implementation, and Quality of Research Outcomes. The evaluation encompassed outer loadings, Cronbach's alpha, composite reliability, Average Variance Extracted (AVE), and the Heterotrait-Monotrait ratio (HTMT) (Fatulloh & Pranoto, 2025; Rhayha & Alaoui Ismaili, 2024; Rosli et al., 2024). Outer loading values are used to assess the contribution of each indicator to the construct, whereas Cronbach's alpha and composite reliability are used to assess the construct's internal consistency. Convergent validity is evaluated via AVE values, while discriminant validity is evaluated using HTMT (Dirgiatmo, 2023; Murtadho & Sukir, 2025; Rosli et al., 2024).

Evaluation of the structural model is conducted after the measurement model meets the criteria for validity and reliability. This evaluation includes an assessment of collinearity via VIF values, path coefficients, the coefficient of determination (R^2), effect size (f^2), and the model's predictive capability (Q^2) (Lasmanah & Hermawati, 2026; Mohamud et al., 2026; Pahn et al., 2025). Significance testing of the relationships between variables was conducted using a bootstrapping procedure to obtain path coefficients, t-statistics, and p-values. The analysis results were used to examine the effect of Time Management on OBE Implementation, the effect of OBE Implementation on the Quality of Research Outcomes, and the direct effect of Time Management on the Quality of Research Outcomes.

Mediation effect testing was conducted to determine the role of OBE implementation in mediating the relationship between time management and the quality of research outcomes. The testing utilized the bootstrapping procedure within PLS-SEM, examining the indirect effect value, t-statistic, and p-value. The magnitude of the indirect effect was calculated using the following formula:

Indirect effect = $\beta_1 \times \beta_2$ ... (1)

The mediation effect is considered significant if the p-value is less than 0.05 and the bootstrap confidence interval does not include zero. The test results are used to determine whether OBE implementation acts as a mediator in the relationship between time management and the quality of research outcomes.

Research Procedure

The research was conducted through several systematic stages. The first stage involved problem identification and a literature review, aimed at identifying issues regarding students' time management skills and the quality of research outcomes, as well as examining theories supporting the relationships between Time Management, OBE Implementation, and Research Outcome Quality (Khudhur et al., 2025; Liu et al., 2026; Sadeghi et al., 2024). The second stage focused on developing the conceptual model and hypotheses, specifically positioning Time Management as the exogenous variable, OBE Implementation as the mediator, and Research Outcome Quality as the endogenous variable. The third stage entailed instrument development and validation, comprising the creation of an instrument grid, the adaptation of existing instruments, the development of an OBE instrument based on theory, content validation by experts, and instrument pilot testing. The fourth stage involved determining the population and sample and collecting data; this included selecting respondents based on research criteria, establishing a proportional sample across seven study programs, randomly selecting respondents, and distributing questionnaires to 336 students (Hossan et al., 2023; Mitawati et al., 2025; Raifman et al., 2022). The fifth stage covered data processing and analysis, including checking data completeness, evaluating measurement and structural models, testing direct and indirect effects using bootstrapping, and interpreting results to address the research hypotheses. In summary, the research procedure consisted of:

RESULTS AND DISCUSSION

Descriptive Statistics of Research Variables

A descriptive analysis was conducted to obtain an overview of respondent response trends across the three research constructs. The descriptive results indicate that Time Management shows a relatively high score trend, suggesting that students generally possess the ability to set goals, establish priorities, create schedules, manage distractions, and handle assistance during the completion of their final projects. The implementation of Outcome-Based Education also demonstrates a positive trend, particularly regarding outcome orientation, student engagement, competency development, and continuous evaluation. Research Output Quality shows relatively high scores in terms of methodology and the presentation of research findings. Overall, these descriptive findings indicate that the three constructs exhibit sufficient variation for analysis using PLS-SEM.

Table 6
Descriptive Statistics of Research Variables

Variables	Number of Items	Mean	SD	Minimum	Maximum
Time Management	25	3,84	0,38	1,92	5,00
Implementation of Outcome-Based Education	36	3,70	0,39	2,61	4,78
Quality of Research Outcomes	65	4,11	0,51	2,94	5,00

Measurement Model Evaluation

The measurement model evaluation was conducted to ensure that the indicators used validly and reliably represented the research constructs. The evaluation encompassed outer loadings, Cronbach's alpha, composite reliability, and Average Variance Extracted (AVE). Indicators with outer loadings meeting the acceptance threshold were retained in the model, while those failing to meet the criteria were evaluated based on their theoretical and statistical contributions. The evaluation results demonstrated that the research constructs possessed good internal consistency. Furthermore, the composite reliability values for all constructs exceeded the required minimum thresholds, confirming their reliability for use in structural model testing.

Table 7
Results of Reliability and Convergent Validity

Construct	Cronbach's Alpha	Composite Reliability	AVE	Decision
Time Management	0,891	0,910	0,623	Valid and reliable
OBE Implementation	0,980	0,981	0,586	Valid and reliable
Quality of Research Outcomes	0,985	0,985	0,508	Valid and reliable

The results in Table 7 indicate that the Cronbach's alpha and composite reliability values for all constructs exceed 0.70. The AVE values also meet the minimum threshold of 0.50; thus, all three constructs satisfy the criteria for reliability and convergent validity. These findings demonstrate that the indicators employed exhibit adequate consistency in measuring their respective constructs. Consequently, the measurement model can proceed to the evaluation of discriminant validity and the structural model.

Discriminant validity was evaluated using the Heterotrait-Monotrait ratio (HTMT). This test was conducted to confirm that the constructs of Time Management, Outcome-Based Education Implementation, and Research Output Quality are empirically distinct. The test results show that the HTMT values between constructs fall below the established thresholds. Therefore, each construct demonstrates adequate discriminant capability and shows no issues regarding construct overlap.

Table 8
HTMT results

Construct Relationships	HTMT	Decision
Time Management – Implementation of Outcome-Based Education	0,31	Fulfil
Time Management – Quality of Research Outcomes	0,18	Fulfil
Implementation of OBE – Quality of Research Outcomes	0,42	Fulfil

Structural Model Evaluation

Once the measurement model met the validity and reliability criteria, the analysis proceeded to the evaluation of the structural model. This evaluation was conducted to assess the model's ability to explain the relationships among Time Management, the Implementation of Outcome-Based Education, and the Quality of Research Outcomes. The analysis encompassed tests for collinearity, the coefficient of determination, effect size, predictive capability, and the significance of path coefficients. The test results indicated that the structural model did not exhibit significant collinearity issues. Subsequently, bootstrapping was employed to determine the significance of the relationships between the variables.

The R^2 value was used to assess the extent to which exogenous variables explain the variation in endogenous variables. The analysis revealed that Time Management explains 3.8% of the variation in the Implementation of Outcome-Based Education. Furthermore, Time Management and the Implementation of Outcome-Based Education collectively explain approximately 6.5% of the variation in the Quality of Research Outcomes. These figures indicate that the quality of students' research outcomes is also influenced by factors outside the scope of the research model. Nevertheless, the model provides empirical insights into the role of the Implementation of Outcome-Based Education as a mechanism linking Time Management to the Quality of Research Outcomes.

Table 9
R^2 Values

Endogenous Variable	R^2	Interpretation
OBE Implementation	0,038	Low variation
Quality of Research Outcomes	0,065	Low variation

Structural Model and Hypothesis Testing Results

Structural model testing was conducted using a bootstrapping procedure to determine the significance of the relationships between variables in the research model. The test results illustrate the relationships among Time Management, Outcome-Based Education Implementation, and Research Outcome Quality, as shown in Fig. 3.

Based on Fig. 3, Time Management has a positive and significant effect on the Implementation of Outcome-Based Education, with a path coefficient of 0.196. The Implementation of Outcome-Based Education, in turn, has a positive and significant effect on the Quality of Research Outcomes, with a path coefficient of 0.253. Meanwhile, the direct effect of Time Management on the Quality of Research Outcomes is not significant, with a path coefficient of 0.009. These results indicate that the relationship between Time Management and the Quality of Research Outcomes needs to be viewed through the mediating role of the Implementation of Outcome-Based Education.

Hypothesis Testing

Hypothesis testing was conducted using a bootstrapping procedure to obtain path coefficients, t-statistics, and p-values. Relationships between variables were considered significant if the p-value was less than 0.05. The results indicate that Time Management has a positive and significant effect on the implementation of Outcome-Based Education. The implementation of Outcome-Based Education also demonstrates a positive and significant effect on the quality of research outcomes. Meanwhile, the direct effect of Time Management on the quality of research outcomes was found to be insignificant once the implementation of Outcome-Based Education was included in the model.

Table 10
Hypothesis Testing Results

Hypothesis	Relationships	β	t-statistic	p-value	Decision
H1	Time Management → Implementation of Outcome-Based Education	0,196	3,64	< 0,001	Accepted
H2	Implementation of Outcome-Based Education → Quality of Research Outcomes	0,253	4,68	< 0,001	Accepted
H3	Time Management → Quality of Research Outcomes	0,009	0,17	0,865	Rejected

The results of the H1 test indicate that Time Management has a positive effect on the implementation of Outcome-Based Education. A path coefficient of 0.196, a t-statistic of 3.64, and a p-value < 0.001 demonstrate that the better a student's time management skills, the more positive the implementation of Outcome-Based Education principles is perceived to be during the final project completion process. The H2 test reveals that the implementation of Outcome-Based Education has a positive and significant effect on the quality of research outcomes. A path coefficient of 0.253, a t-statistic of 4.68, and a p-value < 0.001 indicate that better implementation of Outcome-Based Education is associated with improved quality in students' research outcomes. In contrast to the previous two relationships, H3 does not show a significant direct effect. A path coefficient of 0.009, a t-statistic of 0.17, and a p-value of 0.865 indicate that Time Management does not directly influence the quality of research outcomes when the implementation of Outcome-Based Education is included in the model.

Testing the Mediation Effect

Mediation analysis was conducted to determine whether the implementation of Outcome-Based Education serves as the mechanism explaining the relationship between time management and the quality of research outcomes. The indirect effect was calculated by multiplying the path coefficients for the relationships between time management and the implementation of Outcome-Based Education, and between the implementation of Outcome-Based Education and the quality of research outcomes. The analysis yielded an indirect effect of 0.050. Bootstrapping results indicated that this indirect effect was significant, with a t-statistic of 2.87 and a p-value of 0.004. Thus, the implementation of Outcome-Based Education was shown to act as a mediator in the relationship between time management and the quality of research outcomes.

Table 11
Results of Mediation Effect Testing

Mediation Pathway	Indirect Effect	t-statistic	p-value	Decision
Time Management → Implementation of Outcome-Based Education → Quality of Research Outcomes	0,050	2,87	0,004	Significant

These results indicate that the influence of time management on the quality of research outcomes occurs primarily through the implementation of Outcome-Based Education. This finding is reinforced by the lack of a significant direct effect of time management on the quality of research outcomes. Thus, the implementation of Outcome-Based Education acts as a full mediator in the relationship between time management and the quality of research outcomes.

The findings of this study indicate that the relationship between students' time management and the quality of research outcomes cannot be understood merely as a direct link between time-management skills and the resulting research product. In the context of completing a final project, time serves as a resource that enables students to organize the stages of their research; however, the utilization of this time needs to be guided by an outcome-oriented learning system (Afif & Bouyahia, 2026; Hanoum et al., 2024; Haritas & Harini, 2025). This perspective positions Outcome-Based Education as a mechanism linking students' time-management behaviors with the academic processes that yield research outcomes. Conceptually, Outcome-Based Education emphasizes clarity regarding outcomes, the alignment of learning activities with those outcomes, and assessments capable of demonstrating the attainment of learning results. These principles are relevant to the completion of final projects, as student research is fundamentally a process requiring the integration of objectives, procedures, evaluation, and academic output.

The role of Outcome-Based Education in this context can be explained through the concept of constructive alignment—the alignment among intended learning outcomes, learning activities, and assessment processes. Students who manage their time effectively have a greater opportunity to systematically allocate time to research activities; however, this benefit becomes more meaningful when those activities are guided by clear outcome objectives (Chin et al., 2024; Sukackė et al., 2022). Thus, time management is not merely about how quickly students complete their assignments, but also about how time is utilized to meet established standards of competence and research quality (Andiani & Suroso, 2025; Trentepohl et al., 2022; K. Wang et al., 2026). Literature on constructive alignment indicates that alignment among objectives, activities, and assessments can support student learning experiences and outcomes; thus, this approach provides a theoretical basis for understanding the indirect relationships identified in this study.

These findings also demonstrate that implementing Outcome-Based Education during the final project stage must be understood as a systemic process, rather than merely an administrative curriculum change. When research outcomes are clearly defined, students have a more concrete reference point for prioritizing activities throughout the research process. Furthermore, aligning outcomes, research activities, supervision, and evaluation enables students to transform available time into academic activities that meaningfully contribute to achieving research goals (Bhardwaj et al., 2025; Megiyono et al., 2024; Miao et al., 2025). This perspective is in line with the development of Outcome-Based Education in higher education which places mapping of learning outcomes, learning processes, assessments and continuous improvement as an important part of the quality assurance system. Thus, the quality of student research is not only a consequence of individual student characteristics, but is also influenced

by the extent to which the academic environment provides structures that help students direct their research process (Kurniawan et al., 2025; Pérez-Jorge et al., 2025; Zhang & Xu, 2025).

These research findings are particularly relevant to higher education in Indonesia, as the implementation of Outcome-Based Education continues to face practical challenges. Research on the implementation of Outcome-Based Education in Indonesian higher education indicates that understanding of the concept is not always comprehensive, and difficulties persist in formulating clear learning outcomes, selecting appropriate teaching strategies, developing assessments, and managing academic workloads (Herbawani et al., 2025; Mufanti et al., 2024; Pamungkas et al., 2026). This situation indicates that the mere existence of an Outcome-Based Education policy at the institutional level does not automatically guarantee that students experience an educational process truly oriented toward learning outcomes. In the context of final projects, this issue is particularly critical, as students are required to translate academic outcomes into concrete research decisions—ranging from problem formulation to the development of research outputs. Consequently, the findings of this study broaden the understanding of Outcome-Based Education by positioning it not merely as a curriculum development framework, but as a mechanism capable of bridging the management of the student learning process and the quality of research outputs.

The primary novelty of this study lies in the development of a perspective that links time management, the implementation of Outcome-Based Education, and the quality of students' research outputs within a single structural model. While research on Outcome-Based Education has predominantly focused on learning outcomes, curriculum alignment, instructional strategies, assessment, or learning efficiency, the role of Outcome-Based Education as a mechanism explaining the relationship between students' time management behaviors and the quality of their research outputs has received relatively little attention (Manchev et al., 2026; Saidu & Mamun, 2026; Yin & Chen, 2026). Recent studies indicate that research on Outcome-Based Education is shifting toward examining the mediating mechanisms and psychological processes that explain how its components lead to specific learning outcomes. This study expands upon that perspective by shifting the focus from general learning achievements to the quality of research outcomes as complex academic outputs (Pallant et al., 2026; Rodríguez & Kyriakides, 2022; Wongpromrat et al., 2025). Thus, the research's contribution lies not only in examining the relationships between variables but also in demonstrating that the effectiveness of students' time management must interact with the design and implementation of outcome-oriented educational systems.

Another aspect of novelty lies in the research context: students currently in the phase of completing their undergraduate or graduate theses in the fields of Mathematics and Natural Science Education. This stage differs significantly from coursework-based learning, as students must manage the research process relatively independently, justify methodological decisions, interact with supervisors, and produce academic outputs that meet scientific standards (Cardwell et al., 2024; Fang & Avvari, 2026; Shirsat & Lee, 2025). Therefore, applying the principles of Outcome-Based Education to the final project context can bridge the gap between a study program's learning outcomes and the actual performance of students in conducting research. This perspective reinforces the idea that Outcome-Based Education

should not stop at curriculum mapping but must be reflected in students' academic experiences and activities, extending all the way to educational outcomes (Aprianingsih & Ramanda, 2026; Friatin et al., 2026; Sariada et al., 2026). This study thus offers a conceptual model that can be used to understand how achievement orientation translates into the process of completing a final project.

Practically, the findings of this research provide implications for study program managers and faculties to strengthen the integration of Outcome-Based Education principles in the management of final assignments. It is not enough for a study program to simply determine graduate learning outcomes, but needs to translate them into more operational outcomes in the student research process (Dwi Jayanti et al., 2026; Goss, 2022; Vilalta-Perdomo et al., 2022). This achievement can serve as a basis for structuring research stages, progress indicators, guidance mechanisms, and criteria for evaluating research quality. Such an approach enables students to understand the relationship between the activities performed, the time allocated, and the outcomes to be achieved at each stage of the research. Strengthening this system also aligns with the Outcome-Based Education quality assurance approach, which positions outcome measurement and continuous improvement as integral parts of higher education management (Asamoah et al., 2025; Izzulhaq et al., 2026; Yusup, 2025).

The implications for academic supervisors are also significant, as the supervision of final projects can shift from a model solely focused on document completion to an outcome-based approach. Supervisors can assist students in setting measurable research targets, prioritizing tasks, identifying delays, and providing feedback based on established outcomes (AbuSa’aleek & Alharbi, 2025; Bahtilla, 2024; Karmila & Ajlouni, 2026). This pattern can make students' time management more focused, as they possess not only a schedule but also indicators of success for each stage of the research. In this context, Outcome-Based Education can serve as a coordination framework among students, supervisors, the study program, and the assessment system (Alhikma et al., 2025; Kushari & Septiadi, 2022; Mahalingam, 2025). Such an approach is important because research on Outcome-Based Education in Indonesia also indicates that leadership commitment and institutional support are crucial factors in the successful implementation of Outcome-Based Education.

From the students' perspective, this study highlights the importance of viewing time management as part of a strategy to ensure quality, rather than merely a means to accelerate the completion of their final projects. Students need to allocate their time based on the importance of research activities and their contribution to achieving established goals. Such strategies may include setting research targets, prioritizing tasks, scheduling consultations, managing distractions, and periodically evaluating progress (Adidharma & Chung, 2023; Discarga et al., 2026; Hoang & Tsholofelo, 2026). When this practice is situated within an academic environment characterized by a clear focus on outcomes, students gain a more robust framework for linking daily activities to long-term research goals. Ultimately, the expected impact is not only to accelerate the completion of final projects but also to enhance the direction and consistency of the process, leading to high-quality research outputs.

Despite offering conceptual and practical contributions, this study has several limitations that should be considered when interpreting the findings. First, the quantitative research design, involving data collection at a single point in time, limits the ability to explain changes in the relationships between variables throughout the final project completion process. While the identified relationships reveal patterns of association among constructs, they do not fully elucidate how time management and the implementation of Outcome-Based Education evolved from the beginning to the end of the students' research process. Second, as the constructs were measured based on student perceptions, the potential for perceptual bias and the tendency to provide socially desirable responses must be taken into account (Chen et al., 2025; Er et al., 2025). Third, the research context—focusing on students in the fields of Mathematics and Natural Science Education at a single institution—limits the generalizability of the findings to other academic disciplines and institutions.

These limitations also point the way for future research. Future studies could employ a longitudinal design to track students from the proposal development stage through to the completion and publication of their research, allowing for a more dynamic observation of the mechanisms underlying the relationships between variables. Subsequent research might also combine perceptual data with objective indicators—such as the time taken to complete the final project, the number of revisions, adherence to schedules at each stage, the quality of the resulting articles, or publication success (Manikas et al., 2023; Zhu & Lv, 2023). Furthermore, the model could be expanded to include additional factors—such as the quality of supervision, motivation, learner autonomy, academic climate, institutional support, and research competence—to provide a more comprehensive explanation of the quality of student research outcomes. Comparative studies across different fields of study, academic levels, and higher education institutions are also essential to determine whether the mediation mechanisms associated with Outcome-Based Education exhibit consistent patterns across diverse higher education contexts.

Overall, this study demonstrates that improving the quality of student research outcomes requires an approach that integrates both individual and educational system factors. While time management provides a crucial foundation for students to organize the research completion process, its effectiveness hinges on an outcome-oriented mindset that gives direction to how that time is utilized. Outcome-Based Education serves as a strategic element by providing a framework that links academic goals, activities, evaluations, and outputs into a coherent process (Mahalingam, 2025; Vinluan & Bantugan, 2025). This perspective offers a basis for higher education institutions to develop final project systems that are more focused, measurable, and quality-driven, rather than merely centered on administrative completion. Thus, the contribution of this research lies in highlighting the importance of integrating student time management with the implementation of Outcome-Based Education to establish a more effective process for producing high-quality research.

CONCLUSION

This study concludes that the relationship between students' time management and the quality of research outcomes is best understood through the role of Outcome-Based Education (OBE) implementation rather than as a direct relationship. Time management provides a crucial foundation for students to organize research activities, set priorities, and maintain the continuity of the thesis or dissertation completion process. However, the benefits of time management for research quality become more significant when students operate within an educational system that clearly links learning outcomes, research activities, assessment, and academic feedback. The implementation of OBE serves as a vital mechanism that transforms students' time management skills into a more focused and outcome-oriented research process. These findings indicate that enhancing the quality of student research outcomes requires integrating students' self-management skills with outcome-oriented instructional design.

The study's primary contribution lies in developing an integrated perspective that links time management, OBE implementation, and the quality of student research outcomes within a single structural model. It expands the discourse on OBE—traditionally associated with curriculum design and learning outcomes—by demonstrating its relevance to the quality of student research outputs. In practical terms, higher education institutions and academic programs need to strengthen outcome-based supervision systems for final projects by establishing clear research stages, aligning supervision activities with learning outcomes, and providing continuous feedback. For students, time management should be directed not only toward accelerating project completion but also toward ensuring that every research activity contributes to the targeted research outcomes and quality. Future research should employ longitudinal designs, involve a broader range of institutions, and utilize objective indicators of research quality—such as completion time, methodological rigor, publication outputs, and research impact—to gain a more robust understanding of the mechanisms underlying the relationships between these variables.

Declarations

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

CONTRIBUTIONS OF INDIVIDUAL AUTHORS

Dwi Agus Kurniawan: Conceptualization, methodology, data collection, data analysis, and manuscript preparation. Miftahul Zannah Azzahra: Literature review, data interpretation, manuscript review and editing, and supervision. Both authors contributed to the revision of the manuscript and approved the final version for publication.

RESEARCH FUNDING

This research did not receive funding.

CLINICAL TRIAL NUMBER

Not applicable.

ETHICAL APPROVAL

This study was exempted from formal ethics committee/institutional review board (IRB) review by the Graduate School of Universitas Jambi, in accordance with the applicable institutional research guidelines of Universitas Jambi, as documented in Institutional Permission Letter Number 9613.6/IKM.05.01/2026. The exemption was granted because the study involved minimal-risk educational research and did not involve medical interventions, vulnerable populations, or the collection of sensitive personal data. All procedures involving human participants in this study were conducted in accordance with the relevant institutional guidelines and regulations and the principles of the Declaration of Helsinki.

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.

Author Contribution

CONTRIBUTIONS OF INDIVIDUAL AUTHORSDwi Agus Kurniawan: Conceptualization, methodology, data collection, data analysis, and manuscript preparation. Miftahul Zannah Azzahra: Literature review, data interpretation, manuscript review and editing, and supervision. Both authors contributed to the revision of the manuscript and approved the final version for publication.

Acknowledgement

The authors gratefully acknowledge the support and contributions of all individuals and institutions who contributed to the completion of this research. Special appreciation is extended to the participating

institution and research participants for their cooperation, valuable assistance, and contributions throughout the research process.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to privacy and confidentiality considerations but are available from the corresponding author upon reasonable request.

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Figures

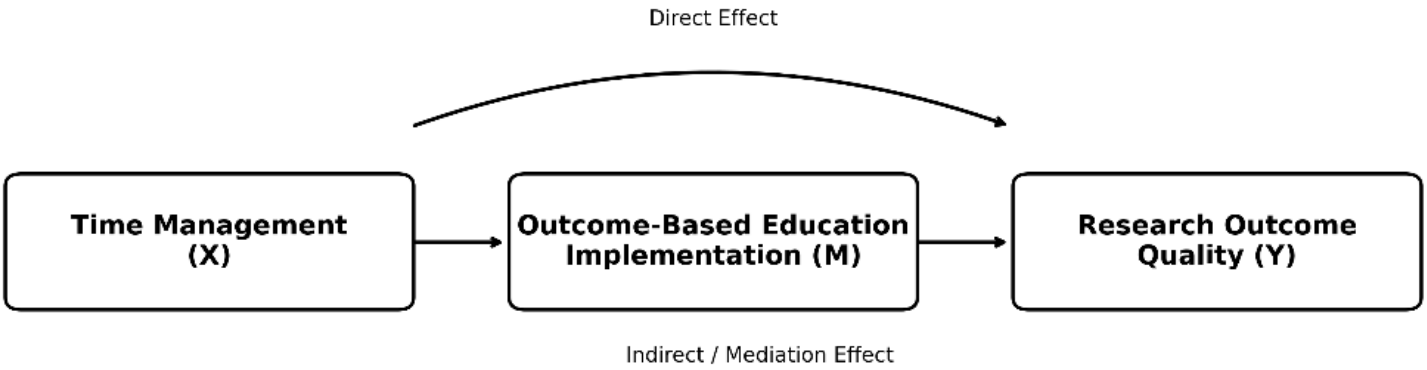


Figure 1

Research Model

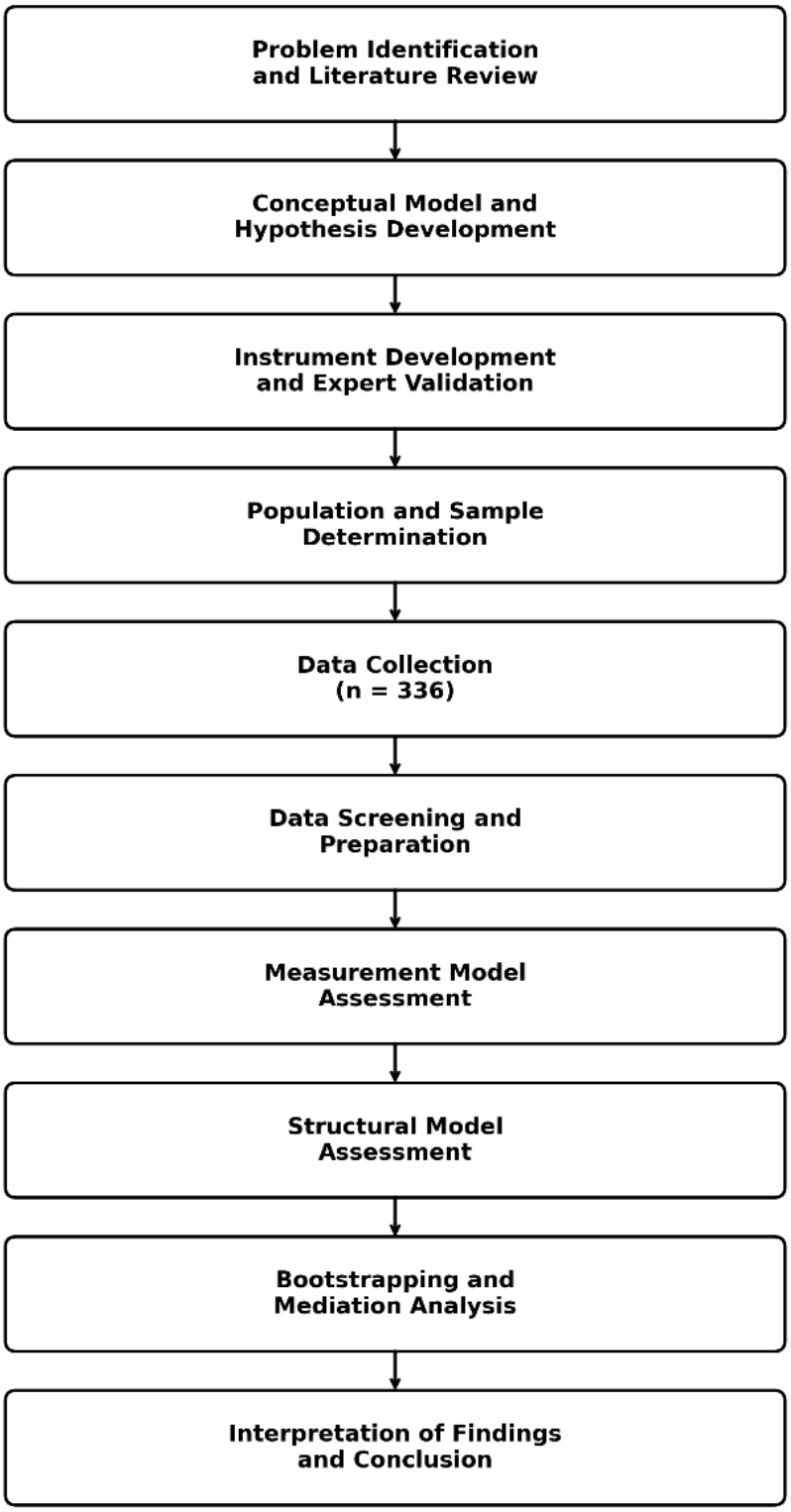


Figure 2

Research Procedure

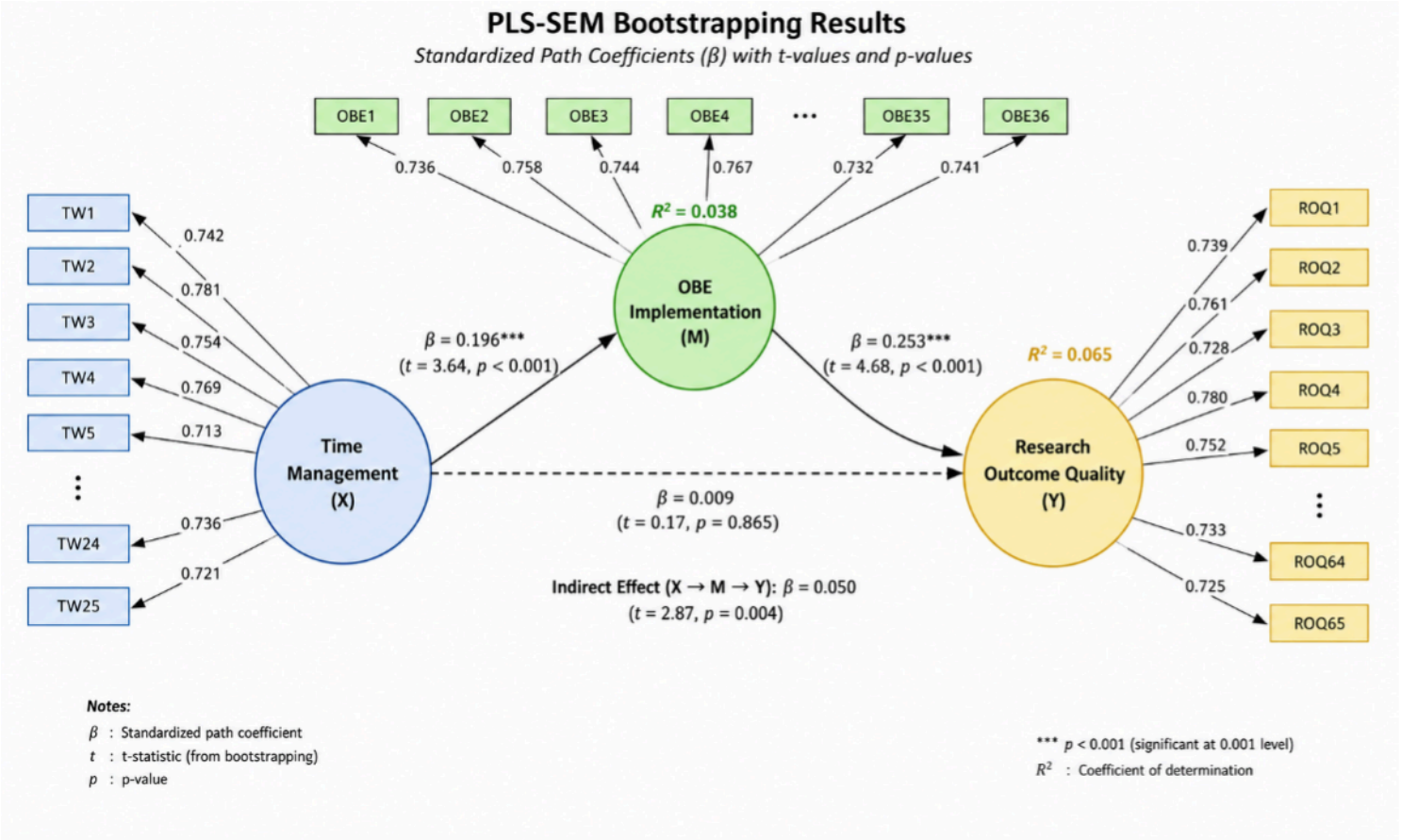


Figure 3

PLS-SEM Bootstrapping Results