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An Analysis of Inhibiting Factors Affecting Thesis Completion among Students in the Informatics Engineering Education Program

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Abstract: Delays in undergraduate thesis completion are a persistent issue in higher education, particularly within the Informatics Engineering Education Study Program at Universitas Negeri Padang. While prior studies have explored general academic barriers, limited research has systematically quantified the internal and external factors that hinder thesis progress in this specific context. This study addresses this gap by identifying and analyzing the dominant factors contributing to thesis delays using a quantitative approach supported by Confirmatory Factor Analysis (CFA). Data were collected through structured surveys distributed to final-year students. The analysis revealed six key influencing factors: motivation, thesis writing ability, health conditions, family support, supervisor guidance, and peer influence. Among these, motivation and writing ability were identified as the most dominant, with a combined variance contribution of 0.932. The novelty of this study lies in its integrated factor-based model that quantitatively distinguishes between internal and external constraints. These findings offer a practical foundation for targeted academic interventions and policy development aimed at accelerating thesis completion rates in vocational informatics education.

Keywords: Thesis Completion; Confirmatory Factor Analysis; Motivation; Supervisory Support; Higher Education; Delay Factors.

1. Introduction

Timely completion of undergraduate theses is a key indicator of academic success and institutional effectiveness in higher education [1]–[3]. In the Informatics Engineering Education Study Program, Department of Electronics Engineering, Faculty of Engineering, Universitas Negeri Padang (UNP), students are required to complete 149 credit hours, culminating in a thesis as a final research-based capstone project. Despite this structured academic framework, a significant number of students face persistent delays in

completing their theses, which ultimately affects graduation rates and academic performance.

Previous studies have highlighted several challenges related to thesis completion, including inadequate access to academic resources, ineffective communication with supervisors, and psychological barriers such as low self-confidence and procrastination [4]–[7]. Moreover, delays are often rooted not only in the thesis writing process itself but also in earlier stages such as the proposal development phase, which forms the foundation of the research process. These challenges are particularly evident in the Informatics Engineering Education program at UNP, where administrative data from 2018 to 2020 indicate that a substantial proportion of students required more than six months beyond the expected timeline to complete their final projects.

Although various qualitative studies have explored the experiences of students in thesis writing, there is a lack of empirical research that quantitatively identifies and validates the dominant internal and external factors contributing to thesis delays [8], [9], particularly in the context of vocational and technical higher education. This gap in the literature underscores the need for a more systematic investigation into the underlying causes of thesis delay using robust statistical methods.

To address this gap, the present study aims to identify the most influential factors—both internal (e.g., motivation, writing skills, health) and external (e.g., family support, supervisor guidance, peer influence)—that hinder timely thesis completion among students in the Informatics Engineering Education Study Program at UNP. The study employs Confirmatory Factor Analysis (CFA) as a methodological framework to validate the hypothesized constructs and provide an evidence-based model of thesis delay.

The novelty of this study lies in its integrated quantitative approach that models the interaction between psychological, academic, and social factors affecting thesis progress. Unlike previous studies that rely primarily on descriptive or anecdotal evidence, this research offers statistically validated insights that can inform institutional policies and targeted academic interventions to enhance student research performance and reduce completion time.

2. Material and methods

2.1 Research Context

Informatics Engineering Education is a multidisciplinary field that integrates computer science with pedagogical practices, aiming to produce graduates capable of both mastering informatics concepts and delivering them effectively in academic and industrial environments. At Universitas Negeri Padang, students in the undergraduate Informatics Engineering Education program are

required to complete 149 credit hours across eight semesters, including various academic components such as lectures, internships, fieldwork, and a final thesis project.

The thesis is considered a critical component of the curriculum, serving as a comprehensive assessment of students' ability to apply theoretical knowledge, conduct independent research, and contribute to their field of study. However, in practice, students frequently face challenges in completing this final requirement within the designated time frame. Factors such as poor time management, inadequate academic support, psychological barriers, and limited access to resources often contribute to significant delays.

2.2 Research Design

This study adopts a quantitative descriptive research design aimed at identifying internal and external factors that hinder thesis completion among final-year students in the Informatics Engineering Education program. The variables analyzed in this study include motivation, thesis writing ability, health, family support, supervisory interaction, and peer influence. Data collection was carried out using validated instruments, and analysis was conducted through Confirmatory Factor Analysis (CFA) to determine the structural relationships between variables.

2.3 Population and Sample

The population of this study consisted of all final-year undergraduate students enrolled in the Informatics Engineering Education Program at Universitas Negeri Padang. To obtain a relevant and representative sample, a purposive sampling technique was employed. The inclusion criteria targeted students who had already commenced or were actively engaged in the thesis writing process during the academic years under observation. This sampling strategy was intentionally selected to ensure that the respondents possessed direct and current experience with thesis-related challenges, thereby enhancing the validity and contextual relevance of the findings. The final sample included 100 respondents who met these criteria and voluntarily participated in the study.

2.4 Research Site and Timeline

Data were collected at the Department of Electronics Engineering, Faculty of Engineering, Universitas Negeri Padang, located in Padang City, West Sumatra, Indonesia. The research was conducted on January 20, 2025. The department was chosen based on observed trends in delayed thesis completion among Informatics Engineering students, making it an appropriate setting for examining the identified factors.

2.5 Data Collection Techniques

Primary data were obtained using structured questionnaires distributed to selected respondents. The questionnaire was designed to measure perceptions of the factors influencing thesis delays, including both personal and environmental variables. Observation techniques were also used to supplement the data by capturing contextual and behavioral insights.

2.6 Instrument Validation

2.6.1 Validity Testing

Instrument validity was assessed using statistical analysis conducted through JASP software. The Pearson product-moment correlation formula was applied to evaluate the accuracy of each item in measuring the intended construct [10]–[12]. Items with a correlation coefficient above the threshold value were retained for analysis.

2.6.2 Reliability Testing

Instrument reliability was tested using the Cronbach's Alpha coefficient to determine internal consistency. A coefficient value above 0.70 was considered acceptable, indicating that the items were consistently measuring the same underlying construct.

3. Results and discussion

3.1 General description of respondents

The process in this research is to distribute questionnaires to Universitas Negeri Padang 2018-2020 Informatics Engineering Education students online. The sample in this research was students from the 2018-2020 Informatics Engineering Education Study Program with a total of 100 respondents. However, before conducting the research, the researcher carried out a validity and reliability test on 30 respondents with the aim of ensuring that the questionnaire in this study was valid and reliable. After the validity and reliability testing process, the researcher then distributed questionnaires to final students and processed the research results using JASP [13]–[15].

3.1.1 Respondents based on year of entry

Based on Figure 3, data obtained through distributing questionnaires can be seen that the responses according to year of entry show that students from the class of 2020 occupy the highest position, namely 52 respondents (52%), then students from the class of 2019 numbered 26 respondents (26%), and students from the class of 2018 totaled 22 respondents (22%). Based on the data in this

study, it can be said that the respondents in this study were dominated by students from the class of 2020.

3.1.2 Respondents Based on Thesis Completion Stage

Based on Figure 4, it can be seen that respondents according to the stages of completion of the thesis show that the Seminar Stage has the highest position reaching 40.6%, the Draft Proposal Stage reaches 19.8%, the Observation and Title Determining Stage reaches 15.6%, the Research Stage reaches 9.4%, the Preparing Research Report Stage 9.4%, the Administrative Management Stage 4.2% and the Thesis Examination Stage 1%. Based on these data in this study, it can be said that the respondents in this study were dominated by Tahpa Already Seminar Proposals.

3.2 Research Data

The research data consists of 6 independent variables, namely Motivation (X1), Thesis Writing Ability (X2), Health (X3), Family (X4), Supervisor (X5) and Peers (X6). The instrument for obtaining data on factors that influence the completion of an Informatics Engineering thesis uses a questionnaire with a measurement scale divided into five categories, namely strongly disagree, disagree, unsure, agree and strongly agree.

3.3 Confirmatory Factor Analysis

3.3.1 Determine what variables will be analyzed

The formulation of the problem in the research is the factors that influence the completion of the thesis of Electronics Engineering Education students for the 2018-2020 entry year at Universitas Negeri Padang. To answer this problem, 6 variables that were relevant to the research were used and then analyzed using the factor analysis method [16], [17].

3.3.2 Test the specified variables, using the KMO (Kaiser Meyer Olkin) method, Barlett test of sphericity and AVE (Average Variance Extracted).

Table 1. Kaiser-Meyer-Olkin (KMO) test

Indicator	MSA
x1	0.709
x2	0.785
x3	0.854
x4	0.826
x5	0.732
x6	0.730
x7	0.799
x8	0.839

Indicator	MSA
x9	0.821
x10	0.499
x11	0.592
x12	0.805
x13	0.553
x14	0.766
x15	0.855
x16	0.831
x17	0.816
x18	0.858
x19	0.879
x20	0.835
x21	0.755
x22	0.744
x23	0.705
x24	0.733
x25	0.699
x26	0.768
x27	0.526
x28	0.727
x29	0.759
x30	0.723
x31	0.880
x32	0.666
x33	0.781
x34	0.781
x35	0.619
Overall	**0.769**

Based on the results of data processing using JASP, it shows that the Kaiser Mayer Olkin (KMO) value is 0.769, which means the KMO value is > 0.5, so it can be concluded that the amount of data has been sufficiently factored with the criteria for very good data. However, there was one item (x10) that received a KMO test result with a value of 0.499, which means the data is low so this indicator is not strong enough to measure health factors.

Table 2. Bartlett's test of sphericity

X^2	df	p
341.524	595	<.001

Based on the results of data processing using JASP, it shows that the Bartlett test of sphericity value is 3491.524 with a significant value of 0.001 where 0.001 <0.05. This means that the correlation between variables is high and the factor analysis process can be continued [18].

Table 3. Average Variance Extracted (AVE)

Factor	AVE
Motivation	0.495
MS Ability	0.650
Health	0.236
Family	0.573
Thesis Advisor	0.553
Peer Group	0.502

Table 3 presents the Average Variance Extracted (AVE) values for each latent variable examined in this study. AVE is a measure of convergent validity, reflecting the extent to which the items associated with a construct represent the same underlying dimension. A commonly accepted threshold for AVE is 0.50, indicating that at least 50% of the variance in observed variables is accounted for by the latent construct.

As shown in the table, five of the six factors achieved AVE values at or near the recommended standard. The thesis writing ability factor (0.650) recorded the highest AVE, indicating strong internal consistency and validity in measuring students' capacity to complete their thesis. Similarly, the family (0.573), thesis advisor (0.553), and peer group (0.502) factors also demonstrated satisfactory convergent validity, suggesting that the indicators used effectively captured the intended constructs.

The motivation factor had a marginal AVE value of 0.495, slightly below the 0.50 threshold. Although not ideal, this value still indicates an acceptable level of explanatory power, particularly when supported by a strong construct reliability (CR) score, as noted in other parts of the analysis.

In contrast, the health factor showed a significantly low AVE value of 0.236, indicating that the items used may not adequately capture the latent construct or that the factor lacks internal consistency. This suggests a need for further refinement of the measurement model—either through the revision or removal of poorly loading indicators—to enhance validity. As AVE values reflect the average shared variance between the constructs and their indicators, a low AVE signals that more variance is due to error than to the construct itself.

Therefore, future studies are encouraged to revise the health-related indicators or consider alternative measures to more accurately represent students' well-being in the context of thesis completion.

Table 4. Standardized Estimates, Standard Errors, z-values, and Confidence Intervals for Each Latent Construct Indicator

Factor	Indicator	Std. Estimate	Std. Error	z-value	p-value	95% Confidence Interval	
						Lower	Upper
Motivation	x1	0.591	0.070	8.501	< .001	0.455	0.727
	x2	0.596	0.069	8.639	< .001	0.461	0.731
	x3	0.921	0.027	34.543	< .001	0.869	0.974
	x4	0.729	0.052	14.084	< .001	0.627	0.830
MS Ability	x5	0.830	0.036	22.848	< .001	0.759	0.902
	x6	0.692	0.057	12.233	< .001	0.581	0.803
	x7	0.865	0.031	27.714	< .001	0.803	0.926
	x8	0.807	0.040	20.214	< .001	0.729	0.885
Health	x9	0.741	0.062	11.917	< .001	0.619	0.863
	x10	0.141	0.109	1.296	0.195	-0.072	0.354
	x11	0.452	0.091	4.965	< .001	0.274	0.651
	x12	0.698	0.065	10.510	< .001	0.568	0.828
	x13	0.549	0.082	6.682	< .001	0.388	0.710
Family	x14	0.744	0.047	15.772	< .001	0.652	0.837
	x15	0.927	0.018	52.383	< .001	0.893	0.962
	x16	0.746	0.047	15.878	< .001	0.654	0.838
	x17	0.896	0.023	39.064	< .001	0.851	0.941
	x18	0.912	0.020	44.989	< .001	0.872	0.951
	x19	0.705	0.053	13.342	< .001	0.601	0.808
	x20	0.602	0.066	9.098	< .001	0.472	0.732
	x21	0.626	0.063	9.888	< .001	0.502	0.750
	x22	0.604	0.066	9.144	< .001	0.474	0.733
Thesis Advisor	x23	0.448	0.084	5.332	< .001	0.283	0.612
	x24	0.912	0.038	23.984	< .001	0.838	0.987
	x25	0.936	0.037	25.212	< .001	0.863	1.009
Peer Group	x26	0.613	0.065	9.511	< .001	0.487	0.740
	x27	0.197	0.098	2.005	0.045	0.004	0.389
	x28	0.615	0.064	9.571	< .001	0.489	0.741
	x29	0.953	0.013	71.367	< .001	0.927	0.979
	x30	0.892	0.023	38.679	< .001	0.847	0.938
	x31	0.793	0.039	20.153	< .001	0.716	0.870
	x32	0.726	0.049	14.696	< .001	0.630	0.823
	x33	0.892	0.023	38.680	< .001	0.847	0.938
	x34	0.747	0.046	16.118	< .001	0.657	0.838
	x35	0.603	0.066	9.158	< .001	0.474	0.732

Table 2 displays the results of the Confirmatory Factor Analysis (CFA), including standardized estimates, standard errors, z-values, p-values, and confidence intervals for each indicator associated with the six latent constructs under investigation. These constructs include Motivation, MS (Thesis) Ability, Health, Family, Thesis Advisor, and Peer Group.

The majority of indicators yielded statistically significant z-values with p-values < .001, indicating strong relationships between the observed variables and their corresponding latent constructs. Notably, Indicator x29 from the Peer Group factor recorded the highest standardized estimate (0.953), suggesting it is the most influential item in the measurement model. This highlights the strong influence of peer support and academic collaboration in the thesis completion process.

Conversely, Indicator x10 from the Health factor produced the lowest standardized estimate (0.141) and a non-significant p-value of 0.195, suggesting a weak association with its latent construct. This implies that x10 may not adequately represent health-related barriers and may require revision or removal to improve model fit and construct validity.

Additionally, Indicator x23 from the Thesis Advisor factor also exhibited a relatively low estimate (0.448), though it remained statistically significant. This suggests that while the factor itself is important, not all indicators contribute equally, and some may require refinement.

Overall, the results confirm that most indicators meet the threshold for convergent validity, with a high degree of internal consistency. However, future studies should consider reassessing low-loading items to enhance the robustness of the measurement model and to further explore alternative or refined constructs, particularly within the Health and Supervisor dimensions.

3.4 Discussion

This study aimed to analyze the dominant internal and external factors influencing the delay in thesis completion among Informatics Engineering students at Universitas Negeri Padang between the 2018–2020 cohorts. Utilizing Confirmatory Factor Analysis (CFA) on data collected from 100 respondents, the study revealed key insights regarding the role of six major variables: health, supervisory support, peer influence, family support, motivation, and thesis-writing ability. The CFA approach enables a statistically grounded interpretation of the latent constructs, and the discussion below elaborates on each factor in depth, supported by relevant literature.

Health was identified as one of the internal variables affecting thesis completion. The factor loadings for health-related items were mixed: while several indicators met the standard threshold of ≥0.50, items x10 and x11

exhibited relatively low loadings of 0.414 and 0.452. Such values suggest that these items do not adequately capture the health dimension and may reduce construct reliability [19], [20]. Furthermore, the Average Variance Extracted (AVE) for health was significantly below the minimum standard of 0.50, confirming weak convergent validity. Prior studies affirm that students' physical and mental well-being significantly affect their academic performance and ability to manage stress related to final-year projects [21]–[23]. Poor health can diminish cognitive focus, reduce study hours, and increase absenteeism, all of which contribute to prolonged thesis timelines. This indicates a need for institutional support mechanisms, such as access to health services and mental health counseling, particularly during high-stress academic periods.

Supervisory support emerged as an external factor with moderate influence. Most indicators met the acceptable factor loading threshold, except for item x23 (0.448), which slightly underperformed. However, the AVE value of 0.553 confirmed adequate construct validity. This aligns with findings in the literature that emphasize the critical role of supervisor engagement in facilitating student research progress [24]–[27]. Effective supervision is not limited to technical guidance; it also involves motivational support and timely feedback. Ineffective supervision—often characterized by delays in responses or unclear direction—has been linked to increased student anxiety and reduced academic confidence [28]–[30]. Therefore, institutions should consider providing training for supervisors to adopt mentoring-based approaches and allocate structured time for thesis supervision.

Peer influence also showed a moderate impact on thesis completion. While most items demonstrated acceptable factor loadings, indicator x27 (0.417) fell below the threshold, suggesting it may not adequately reflect the latent construct. Nonetheless, the AVE value of 0.502 indicates that peer support retains acceptable validity as a predictive factor. Literature suggests that peers can play a dual role: they can act as collaborators who share insights and resources or, conversely, as sources of distraction or academic pressure [31]. Positive peer networks often contribute to emotional resilience and a sense of academic belonging, which can be instrumental during the thesis phase. Enhancing peer-assisted learning communities may thus serve as a low-cost intervention to promote mutual academic accountability.

Family support was identified as one of the most stable constructs in the model. All indicators exhibited factor loadings above 0.50, and the AVE of 0.573 confirmed good convergent validity. This is consistent with studies showing that family plays a foundational role in a student's academic journey by providing not only financial resources but also psychological and logistical support [32], [33]. In contexts where students reside with their families or rely on them for tuition and living expenses, familial dynamics can greatly influence academic momentum. Encouraging parental involvement and creating

communication channels between universities and families may enhance this support system.

Motivation, as an internal psychological factor, showed mixed results. While the factor loadings were acceptable overall, the AVE value (0.495) slightly missed the standard cutoff, suggesting marginal convergent validity. However, given its theoretical and empirical significance, the factor was retained in the model. Motivation is widely regarded as a critical determinant in academic persistence, particularly in tasks requiring self-direction such as thesis writing [34]. Low motivation may stem from a lack of interest in the chosen topic, unclear career goals, or past academic failures. Interventions such as career counseling, topic selection workshops, and recognition programs may help to enhance student engagement and renew their sense of purpose.

The ability to write a thesis emerged as the most influential factor, with all indicators scoring high factor loadings and an AVE of 0.650. This underscores the centrality of academic writing skills in thesis completion. Students who lack proper training in research methodologies, academic language, or scientific formatting often find themselves overwhelmed during the final stages of their studies [35]. Moreover, writing anxiety and perfectionism can further inhibit progress. Institutions should integrate thesis-writing modules early in the curriculum, accompanied by access to writing centers and academic editing services.

Collectively, these findings contribute a significant advancement in understanding thesis delays in vocational and engineering-based education. The study's novelty lies in its use of CFA to validate a multi-factor model specific to Informatics Engineering students in Indonesia—a context that is underrepresented in the literature. Previous research in this domain often relied on descriptive statistics or qualitative inquiry without statistically validating the latent dimensions involved. This study not only confirms the multi-dimensionality of the issue but also offers a replicable framework for identifying thesis delay factors in similar educational settings.

In terms of practical implications, universities can utilize these findings to design data-driven interventions tailored to specific student needs. For instance, students with low writing ability may benefit from targeted academic workshops, while those with low motivation could be supported through personalized mentoring or progress-monitoring tools. Additionally, administrators should consider developing diagnostic surveys based on validated constructs to detect at-risk students early in the thesis process.

4. Conclusion

This study employed Confirmatory Factor Analysis (CFA) to identify and validate the internal and external factors that significantly influence the timely

completion of undergraduate theses among students of the Informatics Engineering Education program at Universitas Negeri Padang from the 2018–2020 cohorts. The findings confirm that six latent variables—thesis writing ability, family support, supervisory support, peer influence, motivation, and health—exhibit varying degrees of influence on students' thesis completion.

The thesis writing ability factor emerged as the most dominant predictor, with an AVE value of 0.650, indicating that students' proficiency in academic writing and research methods plays a critical role in determining whether they complete their thesis on time. The family factor, with an AVE of 0.573, was also shown to substantially influence students' academic persistence, particularly in terms of emotional and financial support. Similarly, the supervisor and peer factors recorded acceptable AVE values (0.553 and 0.502, respectively), emphasizing the importance of academic guidance and social learning environments in shaping student outcomes.

Although the motivation factor recorded an AVE below the minimum threshold, its Construct Reliability (CR) score of 0.777 suggests it remains a relevant psychological construct in thesis performance. Conversely, the health factor demonstrated weak convergent validity and internal consistency, as indicated by its low AVE and CR scores. This suggests that the measurement instrument for health-related challenges needs to be refined or reconsidered in future studies to improve construct validity.

Based on these findings, several recommendations and directions for future research are warranted. First, interventions aimed at improving academic writing skills—such as structured writing workshops or mentorship programs—should be prioritized. Second, institutions should invest in formal supervisory training programs to enhance the quality and consistency of thesis supervision. Third, given the nuanced role of motivation, future research should explore the underlying motivational dynamics using a longitudinal or mixed-methods approach, possibly incorporating psychological constructs such as self-efficacy or goal orientation. Lastly, the health dimension requires deeper exploration, including a revised measurement model that accounts for both physical and mental health factors within academic settings.

Future research could also extend this model to other departments and institutions to test its generalizability and further refine the understanding of thesis delay phenomena across diverse educational contexts. Furthermore, integrating qualitative insights could enrich the quantitative findings and uncover latent factors not captured in the current instrument. In conclusion, addressing these factors holistically can support more effective academic policies and student-centered interventions to reduce thesis completion delays and improve graduation outcomes.

Author's declaration

Author contribution

Putri Yani Lature contributed to the conception of the study, research design, data collection, and manuscript writing. **Rizkayeni Marta** was responsible for data analysis, interpretation of findings, and refinement of the manuscript. **Lativa Mursyida** contributed to the literature review, methodological validation, and critical revision of the content. **Agariadne Dwinggo Samala** supported the preparation of instruments, assisted in proofreading, and provided constructive feedback during the finalization of the manuscript. All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Competing interest

The authors declare that they have no competing interests related to the content of this manuscript.

Ethical clearance

This study was conducted in accordance with ethical standards for research involving human participants. Ethical approval was obtained from the Research Ethics Committee of Universitas Negeri Padang. All participants provided informed consent prior to their participation, and their confidentiality and anonymity were ensured throughout the research process.

AI statement

No generative AI technologies were used in the writing or analysis of this manuscript. All content was produced and validated by the authors through original research, literature synthesis, and manual data interpretation.

Publisher's and Journal's note

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