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Strengthening Future Maritime Transportation Management Through Cognitive Flexibility and Entrepreneurial Mindset Among Generation Z Maritime Students

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ABSTRACT

This study analyzes how digital self-efficacy and social media algorithms influence the development of cognitive flexibility and entrepreneurial mindset among Generation Z maritime students, while identifying policy strategies to integrate these factors into maritime education. Using a quantitative approach with survey data from 209 active students analyzed through Partial Least Square-Structural Equation Modeling (PLS-SEM), the results reveal that digital self-efficacy and social media algorithms significantly influence entrepreneurial mindset and directly affect cognitive flexibility. However, cognitive flexibility does not serve as a mediator between the two independent variables and entrepreneurial mindset. These findings indicate that confidence in digital abilities and exposure to algorithm-driven content are key determinants shaping entrepreneurial thinking among maritime students, whereas the rigid and discipline-oriented nature of maritime education limits the development of adaptive and reflective cognitive skills. The study provides theoretical and practical contributions to understanding the psychological and digital dynamics influencing entrepreneurial readiness in the maritime field. Policy implications highlight the need for maritime higher education institutions and government agencies to strategically leverage social media algorithms and enhance digital self-efficacy through curriculum reform, experiential learning, and digital incubation programs. Aligning these initiatives with Indonesia's national maritime vision (Visi Poros Maritim Dunia) can foster a new generation of maritime graduates who are not only digitally competent and innovative but also capable of becoming job creators rather than job seekers, contributing to sustainable maritime economic transformation.

Keywords: digital self efficacy, social media algorithm, cognitive flexibility, entrepreneurial mindset

INTRODUCTION

An entrepreneurial mindset is the psychological and cognitive foundation that transforms a person from a job seeker to a job creator. It has been found that an entrepreneurial mindset is related to deep cognitive processes and active involvement in entrepreneurial activities (Cui et al., 2021). Personal background and environment influence entrepreneurial mindset and attitudes (Davis et al., 2016), These two factors demonstrate a causal relationship between attitudes and entrepreneurial mindset (Jena, 2020). Entrepreneurial mindset is an important indicator, especially for Generation Z students pursuing studies in the maritime field. This generation is expected to be able to respond to global challenges such as the effectiveness of digitalization strategies in driving rapid digital transformation and disruptive innovation (Kraus et al., 2023), as well as maritime logistics digitalization, port automation, and maritime sector sustainability (Pınar Özdemir, 2023; Selasdini, 2024). In the Indonesian context, the development of an entrepreneurial mindset among maritime students is not merely an academic concern but a national policy priority. Indonesia's long-term maritime vision "*Poros Maritim Dunia*" (Global Maritime Axis)—and the National Medium-Term Development Plan (RPJMN 2025–2029) emphasize the urgent need to produce maritime graduates who are not only job seekers but also job creators capable of fostering innovation, sustainability, and competitiveness in the blue economy. Despite Indonesia's vast maritime potential, the number of maritime graduates engaged in entrepreneurial ventures remains very low, indicating a weak linkage between higher education and maritime industry innovation. Strengthening students' entrepreneurial orientation is therefore essential to support maritime transport management, enhance local value creation, and align human capital development with national maritime policies.

The maritime campus implements a highly disciplined education system and a strict command structure, similar to military culture. Students are accustomed to obeying rules, following instructions hierarchically, and thinking according to procedures. Systematic efforts are needed to encourage a transformation in mindset through the integration

of entrepreneurship into the education curriculum (X. Liu et al., 2019), business incubation support, and industry collaboration. They must be able to address global challenges such as sustainability, digitalization, automation, and international regulations to drive innovation and economic growth in the technology sector (Pacher & Glinik, 2024), ultimately helping higher education institutions foster an entrepreneurial mindset, (Khalil et al., 2024a; Oulhou & Ibourk, 2023). Therefore, strengthening an innovative, adaptive, and creative entrepreneurial mindset is crucial for producing graduates who are both job-ready and capable of creating business innovations in the maritime sector, necessitating a deep understanding of the digital and psychological dynamics that shape such a mindset. However, entrepreneurship outcomes among maritime graduates remain significantly low. According to tracer studies from several maritime universities and vocational academies, less than 5% of graduates pursue self-employment or establish maritime-related startups, with the majority seeking employment in government or shipping companies. This trend highlights a structural gap between maritime education and national entrepreneurship goals. The Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) has launched initiatives such as the Merdeka Belajar Kampus Merdeka (MBKM) program and the Vocational Education Revitalization Policy to strengthen entrepreneurial competencies and industry collaboration, yet implementation within maritime higher education institutions remains limited. Strengthening entrepreneurship education in maritime campuses is therefore aligned with these national reforms and is essential to ensure that maritime human resources can contribute to Indonesia's maritime transport management, port logistics innovation, and sustainable blue economy development.

In the digital context, social media has become the primary space for identity formation, information seeking, and business opportunity exploration for Generation Z (Burlea-Schiopoiu & Popovici, 2024; Pradhipta & Akbar, 2024). Social media algorithms are crucial in today's digital world as they dynamically present curated information based on users' interests. This will influence students' mindset; how they think, process ideas, and make decisions to gain business inspiration. Digital business has become a new trend in the global maritime industry: from digital logistics platforms, IoT-based ship tracking, to maritime equipment e-commerce (Thi et al., 2023). I ndonesian students need to be prepared to read and respond to these global trends. Gen-Z individuals who build professional networks outside their industries tend to be more innovative and proactive in exploring new business opportunities (Olalekan & Adeleye, 2024). As part of the digital generation, maritime students are significantly influenced by information consumed through social media. In this context, it is important to examine the role of social media algorithms as part of the digital environment that contributes to the formation of students' entrepreneurial mindset. This indicates the need for universities and government to strategically leverage social media algorithms for entrepreneurship learning and innovation. By integrating digital platforms into entrepreneurship curricula, higher education institutions can not only enhance students' exposure to real-world business dynamics but also align with Indonesia's digital transformation roadmap under the National Medium-Term Development Plan (RPJMN) and the Digital Economy Framework 2030. Such integration would support the development of data-driven entrepreneurship ecosystems in maritime education, enabling students to translate online engagement into creative and sustainable business innovations relevant to maritime logistics, fisheries technology, and port management.

However, studying a large amount of data will be more meaningful when combined with personal abilities such as digital self-efficacy and cognitive flexibility. Digital self-efficacy is a crucial prerequisite for identifying and capitalizing on opportunities in the entrepreneurial world, defined as the belief in one's ability to use digital technology (Arifin et al., 2023; Mortazavi, 2022), serving as an important psychological asset in digital entrepreneurship. Students with high levels of digital self-efficacy have greater confidence in starting technology-based businesses. However, they struggle to adapt business concepts to changes if they lack cognitive flexibility, or the ability to think openly and adaptively. Digital skills and innovative entrepreneurial thinking are connected by cognitive flexibility. This study proposes a conceptual model linking digital self-efficacy and social media algorithms as predictors of entrepreneurial mindset and cognitive flexibility as a mediating variable .

This model addresses the need to understand the relationship between digital elements, the social media environment, and internal psychological mechanisms that influence the entrepreneurial mindset of Gen Z maritime students . The relevance of this study becomes even more significant when viewed within Indonesia's maritime transport

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context. As an archipelagic nation with more than 17,000 islands, over 90 percent of domestic logistics and trade activities depend on maritime transport (BPS, 2024). However, despite the strategic importance of this sector, the contribution of maritime-based entrepreneurship to the national economy remains relatively low, with less than 5 percent of maritime graduates pursuing self-employment or business creation (Kemenhub, 2023). The World Bank (2022) also notes that Indonesia's maritime logistics performance index still lags behind regional peers, reflecting the need for innovation and entrepreneurial dynamism to enhance port efficiency, vessel operations, and digital maritime services. Therefore, developing a strong entrepreneurial mindset among maritime students is not only an academic necessity but also a strategic step to strengthen the nation's maritime transport management and competitiveness. By fostering digital entrepreneurship literacy and leveraging emerging technologies—such as IoT-based fleet management, digital freight forwarding, and e-logistics platforms—future maritime professionals can contribute to transforming Indonesia's maritime transport system into a more efficient, sustainable, and innovation-driven sector.

This study fills a gap in previous research that has focused solely on technical lessons or training (Hasdiansa & Sitti Hasbiah, 2024; Khalil et al., 2024a),) but has overlooked the highly relevant digital-cognitive aspects of today. With cognitive flexibility as a mediating variable, the purpose of this study is to analyze and explain the influence of digital self-efficacy and social media algorithms on the entrepreneurial mindset of Generation Z students in maritime higher education in the Sumatra region. The results of this study are expected to be useful both practically and theoretically in developing digital-based entrepreneurship learning strategies that will foster an entrepreneurial mindset among maritime students and improve our understanding of the psychological-cognitive model of digital entrepreneurship among young people in strategic industries such as maritime.

Strengthening the entrepreneurial mindset among maritime students plays a critical role in Indonesia's maritime transport management reform. As the world's largest archipelagic nation, Indonesia's long-term development vision, "Poros Maritim Dunia," emphasizes human resource development as the foundation for maritime competitiveness. The National Medium-Term Development Plan (RPJMN 2025–2029) highlights the urgency of transforming maritime education to produce digitally literate, innovation-driven graduates capable of enhancing logistics efficiency, port operations, and sustainable transportation management. However, data from Statistics Indonesia (BPS, 2024) show that less than 5% of maritime higher education graduates become entrepreneurs or start digital-based ventures, indicating weak linkage between education and innovation ecosystems.

This gap calls for a policy-level intervention that integrates entrepreneurship, digital technology, and maritime management education. The Ministry of Transportation and the Ministry of Marine Affairs and Fisheries have emphasized the need for collaboration with higher education institutions to strengthen maritime entrepreneurship through digital innovation programs and port digitalization projects (KKP, 2023; Kemenhub, 2024). In this regard, understanding the interplay between digital self-efficacy, social media algorithms, and entrepreneurial mindset is not only theoretically important but also strategically relevant for maritime policy. This insight will enable universities and policymakers to leverage social media as a learning and innovation tool, promoting creative, resilient, and technology-oriented young entrepreneurs who can contribute to the national maritime economy. Methodologically, this study adopts a quantitative research design, using a structured survey conducted between March and July 2024 among maritime higher education students across Sumatra. Data was analyzed using Structural Equation Modeling (SEM) to examine direct and mediating relationships among variables. Beyond academic contribution, the study aims to generate policy-oriented recommendations for strengthening digital entrepreneurship education and reforming maritime human resource development, thus supporting Indonesia's broader maritime transport management strategy.

Research Instruments, Sampling Design, and Validation Procedures

This study evaluated four variables: The entrepreneurial mindset variable was measured using an instrument developed and adapted from previous research. (Shaver et al., 2019) and digital self-efficacy (Ulfert-Blank & Schmidt, 2022), for example, referring to studies related to entrepreneurship and digital psychology. Social media algorithms are measured using indicators adapted from the latest studies on the influence of algorithms on social media user behavior. (Taylor & Choi, 2022), while cognitive flexibility was measured using a scale adopted from the cognitive psychology literature (Martin & Rubin, 1995; Zagaria et al., 2024).

Data for analysis were collected through questionnaire surveys. This study used measurement scales from previous studies. Appendix 1 contains a complete list of all items used in our study. In total, from 19 indicators, 92 questions were created and assessed using a five-point Likert scale, with one point indicating "strongly disagree" and five points indicating "strongly agree." Age, gender, education level, study program, and university were all requested from participants. The following table shows the measurement indicators from Table 1. This study is a quantitative research aimed at identifying the influence of social media algorithms and digital self-concept on the entrepreneurial mindset of Generation Z students in the maritime field, considering the mediating effect of cognitive flexibility. The research data was obtained from primary data collected through a questionnaire survey. The instruments were modified according to the contextual needs of the research and took into account local cultural dynamics, so that they could provide a valid and applicable picture of the phenomena studied in Indonesia.

The sampling and data collection process in this study involved sixth- and eighth-semester students enrolled in three maritime universities under the Transportation Human Resources Development Agency located in Sumatra. Employing a descriptive research design and a non-probability purposive sampling technique (Berg & Lune, 2017), respondents were selected based on specific criteria to ensure relevance to the research objectives: (a) they belong to Generation Z (born between 1997 and 2012), (b) are active users of social media, and (c) are in their final semester and have completed an Entrepreneurship course. Following the sampling guideline proposed by Hair et al., (2019), which recommends a minimum of five to ten respondents per indicator in the variable model, a total of 209 students who met the inclusion criteria were selected. Data were collected through structured questionnaires and analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to examine the direct and mediating effects of social media algorithms and digital self-efficacy on the entrepreneurial mindset through cognitive flexibility. Prior to hypothesis testing, data validity and reliability were assessed using statistical analysis to ensure measurement accuracy. To address potential *common method bias* (CMB), a concern in survey-based research where data for exogenous and endogenous constructs are

Table 1. Measurements.

No.	Variable	Dimension	Source	Measurement Scale
1	Entrepreneurial Mindset	1. Confidence 2. Diligence 3. Entrepreneurial Desire 4. Innovativeness 5. Leadership 6. Motives 7. Permanence 8. Resilience 9. Self-control	Kelly G. Shaver (2019)	Likert Scale 1–5
2	Social Media Algorithms	1. Perceived Algorithm Responsiveness (PAR) 2. Perceived Algorithm Insensitivity (PAI)	Taylor & Choi (2023)	Likert Scale 1–5
3	Digital Self-Efficacy	1. Information and data literacy (iSE) 2. Problem-solving with digital tech 3. Digital content creation (dSE) 4. Communication and collaboration 5. Safety (sSE)	Ulfert-Blank et al. (2022)	Likert Scale 1–5
4	Cognitive Flexibility	1. Awareness of Alternatives 2. Willingness to be Flexible 3. Self-efficacy in being flexible	Martin & Rubin (1995); Zagaria et al., (2024)	Likert Scale 1–5

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obtained from the same respondents at the same time (Memon et al., 2023), the Full Collinearity Test was conducted following Kock (2015). Results showed that all Variance Inflation Factor (VIF) values were below the recommended threshold of 3.3, confirming that the dataset was free from significant common method bias and thus suitable for further inferential analysis.

Table 2. Full Collinearity Test (Variance Inflation Factor/VIF).

	VIF
CF -> EM	1.607
DSE -> CF	1.622
DSE -> EM	1.793
SMA -> CF	1.622
SMA -> EM	1.827

A trial run was conducted before distributing the final questionnaire to evaluate the clarity of the statements. The reliability of each indicator was assessed, and 59 participants were tested. The purpose of the trial run was to test both the reliability of the measurement scale for each construct and the effectiveness of the questionnaire as a communication tool between researchers and respondents. (Fazli et al., 2021). The test results showed Cronbach's Alpha values of 0.879 for cognitive flexibility, 0.929 for digital self-efficacy, 0.956 for entrepreneurial mindset, and 0.848 for social media algorithms. Therefore, all metrics were retained in the official survey. Overall, the trial showed that respondents understood the questionnaire questions, indicating that the questions were clear and correctly understood. Both the questionnaire format and the amount of time required to complete it were adequate and reasonable.

H5 : Cognitive Flexibility has a positive and significant effect on the Entrepreneurial Mindset of Gen Z maritime students.

H6 : Cognitive flexibility mediates the influence of digital self-efficacy on the entrepreneurial mindset of Gen Z maritime students.

H7 : Cognitive Flexibility mediates the influence of Digital Self-Efficacy and Social Media Algorithms on the Entrepreneurial Mindset of Gen Z maritime students.

Figure 1 presents the hypothesized framework of the study.

THEORITICAL FOUNDATION: Social Cognitive Theory and Entrepreneurial Mindset Formation

Social Cognitive Theory emphasizes that the formation of an individual's mindset is influenced by the reciprocal interaction between personal factors, behavior, and the social environment (Bandura, 2004). In the digital context, self-efficacy is key, as students who believe in their ability to use technology are more likely to explore entrepreneurial opportunities (Duong et al., 2024; Sijabat, 2024). Cognitive flexibility, which is the ability to think adaptively and be open to various perspectives, is important for creatively interpreting digital information and anticipating changes (Martins & Gonçalves, 2022; et al. Spiro, 1988).

Meanwhile, digital self-efficacy fosters students' confidence in utilizing social media as a

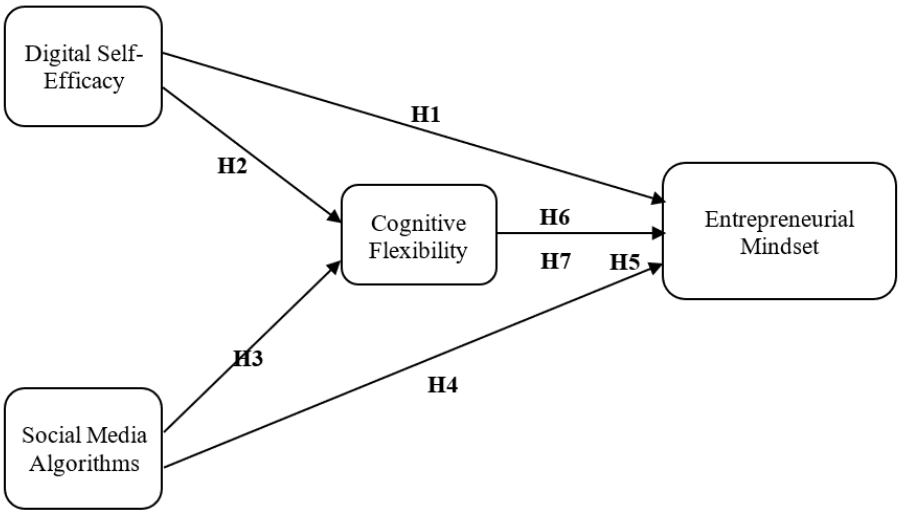

Figure 1. Theoretical Framework Developed
Source: Author(s) creation

source of business inspiration and entrepreneurial identity formation (Egele et al., 2025). In this context, Gen Z students who grew up in the digital age exhibit distinctive learning patterns and self-perceptions, making it important to examine digital and psychological factors in supporting the development of their entrepreneurial mindset (Christina & Widjojo, 2023; Luc, 2020). Students with high digital skills still need cognitive flexibility to connect digital efficacy with innovative entrepreneurial thinking. Consequently, understanding how digital and psychological factors shape entrepreneurial mindsets is crucial, especially in maritime higher education, which still focuses on technical aspects.

Because entrepreneurial mindset greatly influences whether an entrepreneur succeeds or fails, this mindset is the main focus of entrepreneurship education. (Belousova et al., 2020; Wardana et al., 2020). Entrepreneurial mindset reflects the way of thinking, feeling, and acting proactively toward opportunities, risks, and innovations that drive individuals to create value through innovative solutions amid uncertainty (Jiatong, Murad, Bajun, et al., 2021; Khalil et al., 2024b; Pinto et al., 2024; Wardana et al., 2020), formed by a combination of planning ability and the courage to act in order to create business opportunities (Bernardus & Aji, 2023) and involving cognitive, affective, and behavioral dimensions such as creativity, resilience, opportunity orientation, and flexibility of thinking. Therefore, entrepreneurial mindset is a representation of cognitive and affective abilities to deal with the complexities of the business world. This mindset serves as a strategic foundation for building flexible and solution-oriented entrepreneurial competencies. As a result, understanding and strengthening entrepreneurial mindset must be the main focus of modern entrepreneurship education.

The extent to which a person believes in their ability to manage and handle certain tasks, such as entrepreneurship, is called self-efficacy (Bandura, 1978). Self-efficacy has been proven to be an important factor influencing individual success in various fields, including entrepreneurial business performance (Khan et al., 2021; Suminah & Anantanyu, 2020). Individuals with positive personal attitudes tend to have high entrepreneurial intentions because they feel capable of contributing and innovating in the digital space (Iskandar et al., 2024).

Several studies further emphasize that self-confidence in using digital technology can encourage individuals to dare to try and start a business (de Aguirre et al., 2021; Dheer & Lenartowicz, 2019), Digital self-efficacy not only encompasses technical skills in operating technology, but also how an individual builds and manages their identity and social role in the digital world as part of an entrepreneurial mindset (Feher, 2021; Ruan et al., 2020) as well as projecting their identity in the digital world (Rowland & Estevens, 2024) and an individual's self-confidence in their ability to use digital technology (Paredes-Aguirre et al., 2024). This includes how to use it, activate social roles, and their entrepreneurial potential.

This argument is supported by a study (Ganefri, 2019), that active digital literacy strengthens digital self-efficacy and has a positive impact on entrepreneurial mindset. Although a large number of studies show that digital self-efficacy is very important for entrepreneurship, further research is needed to understand how and in what ways it affects Gen Z students, who grew up in the technological era.

H1 : Digital self-efficacy has a positive and significant effect on the entrepreneurial mindset of Gen Z maritime students.

H2 : Digital self-efficacy has a positive and significant effect on cognitive flexibility among Gen Z maritime students.

The Influence of Social Media Algorithms In Shaping Entrepreneurial Thingking

The role of social algorithms, such as social media algorithms that regulate the digital content viewed by users, has not been widely researched in relation to the formation of entrepreneurial mindsets. Social media has become an important tool for communication and marketing used by entrepreneurs around the world. (Fraccastoro et al., 2021), and has the potential to equip students to become entrepreneurs by opening up opportunities, networks, and creative inspiration in building businesses. Studies show that social media algorithms can shape students' exposure to entrepreneurial content and influence their views on business opportunities. (Emmanuel et al., 2022), encouraging them to become entrepreneurs. Furthermore, global trends show that social media and entrepreneurship have grown globally, with significant increases, including growing contributions from countries in Asia. (Yang & Sulaiman, 2023).

Therefore, this study is relevant and significant because it provides a deeper understanding of how digital self-confidence, cognitive flexibility,

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and social media algorithms contribute to the formation of entrepreneurial mindsets among young people, particularly Gen Z in maritime campus environments. The findings from this study are expected to serve as a meaningful foundation for designing digital entrepreneurship education that not only emphasizes technical skills but also strengthens psychological, adaptive, and digital awareness aspects in addressing challenges and business opportunities in the digital age.

H3 : Social media algorithms have a positive and significant effect on the cognitive flexibility of Gen Z maritime students.

H4 : Social media algorithms have a positive and significant effect on the entrepreneurial mindset of Gen Z maritime students.

Cognitive Flexibility As An Adaptive Capability And Mediating Variable

Internal factors such as cognitive flexibility also play an important role in shaping a healthy entrepreneurial mindset. Cognitive flexibility refers to a person's ability to adjust their mindset, evaluate new strategies, and find other ways to deal with the dynamics of challenges and opportunities in business (Jiatong, Murad, Li, et al., 2021a). In the context of entrepreneurship, cognitive flexibility is key to developing an adaptive and innovative entrepreneurial mindset. An entrepreneurial mindset reflects attitudes and perspectives that support risk-taking, creativity, and proactivity in running a business (Bi & Collins, 2022). A study shows that cognitive flexibility not only directly influences entrepreneurial mindset, but also acts as a mediator linking psychological and environmental factors to that mindset. (Yu et al., 2023). In other words, individuals with high cognitive flexibility tend to be better able to internalize and develop a strong entrepreneurial mindset, thereby improving their ability to recognize and pursue new business opportunities. (Jiatong, Murad, Li, et al., 2021b) emphasizes that individuals with high cognitive flexibility are more likely to pursue careers in entrepreneurship.

Research shows that the role of cognitive flexibility as a mediator is very important in the context of entrepreneurship training, where increased cognitive flexibility strengthens the relationship between learning experiences and entrepreneurial mindsets. (Yu et al., 2023). Furthermore, cognitive flexibility also plays a role in encouraging creativity and innovative behavior that supports the success of new ventures. (Dheer & Lenartowicz, 2019; Lyu et al., 2023). Therefore, cognitive flexibility is a key mechanism that enables individuals to develop adaptive and competitive entrepreneurial mindsets in this dynamic economic era. These findings underscore the importance of integrating training that enhances cognitive flexibility into entrepreneurship programs so that entrepreneurial mindsets can grow optimally.

Empirical Findings: Validity, Reliability, and Structural Model Results

Table 3 shows in detail that the values for the constructs of Cognitive Flexibility (0.813), Digital Self-Efficacy (0.823), Entrepreneurial Mindset (0.810), and Social Media Algorithm Awareness (0.823) are all greater than their correlations with other constructs in the model. These findings indicate that each construct in the model has good discriminant validity, meaning that each construct is better able to explain its indicator variables compared to other constructs. Based on the Fornell-Larcker criteria analysis, the correlation values between latent variables are smaller than the square root of AVE for each construct. Therefore, it can be concluded that the measurement model in this study meets the discriminant validity criteria according to the Fornell-Larcker approach, making it suitable for further structural analysis.

Figure 2 shows that all indicators have loading factors above 0.7, indicating good convergent validity and that the research instrument has measured the construct consistently and accurately. The path estimation results show that digital self-efficacy has a significant effect on cognitive flexibility (0.326) and entrepreneurial mindset (0.548). On the other hand, social media algorithms also have a significant influence on cognitive flexibility (0.357) and entrepreneurial mindset (0.316). This means that confidence in digital abilities and exposure to social media algorithms can help entrepreneurs think more flexibly. Meanwhile, the mediation path between cognitive flexibility and entrepreneurial mindset is 0.099. Cognitive flexibility acts as a partial mediator that strengthens the indirect influence of digital self-efficacy and social media algorithms on entrepreneurial mindset. The relatively small coefficient value indicates that while cognitive flexibility supports the formation of entrepreneurial mindset, the primary influence still comes from the direct paths of the two independent variables.

Furthermore, cognitive flexibility was also found to have a positive effect on entrepreneurial mindset with a coefficient of 0.099. Although the

value is smaller than other direct paths, this shows the partial mediating role of cognitive flexibility in strengthening the relationship between the independent variable and entrepreneurial mindset. Therefore, entrepreneurial mindset is directly influenced by both digital self-efficacy and social media algorithms. This shows the partial mediation role of cognitive flexibility in explaining part of the influence of independent variables on entrepreneurial mindset.

Based on Table 3, the loading factor values of all items are > 0.70. Therefore, it can be concluded that all items are valid convergent.

Table 4 shows that composite reliability values are considered adequate if they exceed 0.7. Based on the SmartPLS output presented in Table 4, it can be seen that all constructs have composite reliability values above 0.7. This indicates that all constructs in the estimation model have met the feasibility standards and show good internal consistency.

Table 5 shows the Adjusted R-square value for the cognitive flexibility construct of 0.372 indicates that 37.2% of the variation in cognitive flexibility can be explained by digital self-efficacy and social media algorithms, with a small difference from the pure R-square (0.378), indicating a stable model free from overfitting. Meanwhile, the Adjusted R-square value for the entrepreneurial mindset construct is 0.715, indicating that 71.5% of the variation in entrepreneurial mindset is explained by the combination of digital self-efficacy, social media algorithms, and cognitive flexibility. The very small difference from R-square (0.720) reinforces that this model is accurate, relevant, and reliable in explaining the influence of the three constructs on the formation of entrepreneurial mindset.

Table 3. Fornell-Larcker Criterion.

	COG.FLEX	DIG.SLF.EFC	ENT.MDST	SCL.MD.ALG
COG.FLEX	0.813			
DIG.SLF EFF	0.547	0.823		
ENT.MDST	0.576	0.798	0.810	
SCL.MD.ALG	0.559	0.619	0.711	0.823

Table 4. Outer Loading.

	Cognitif Flexibility	Digital Self Efficacy	Entrepreneurial Mindset	Social Media Algorithm
CF1	0.750			
CF2	0.866			
CF3	0.818			
DSE1		0.823		
DSE2		0.860		
DSE3		0.802		
DSE4		0.787		
DSE5		0.840		
EM1			0.751	
EM2			0.831	
EM3			0.840	
EM4			0.892	
EM5			0.852	
EM6			0.802	
EM7			0.707	
EM8			0.782	
EM9			0.815	
SMA1				0.842
SMA2				0.802

Table 5. R-Square.

	R-square	R-square adjusted
Cognitif Flexibility	0.378	0.372
Entrepreneurial Mindset	0.720	0.715

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Table 6 shows that the effect size of digital self-efficacy on cognitive flexibility is 0.105, which is classified as small to moderate, indicating that it makes a significant contribution to explaining cognitive flexibility. Conversely, the effect of social media algorithms on cognitive flexibility has an effect size of 0.126, which is also classified as small to moderate, but slightly stronger than digital self-efficacy. This indicates that algorithms may play a more dynamic role in shaping how students adapt their thinking, as they continuously expose individuals to curated information and diverse perspectives, thereby enhancing their capacity for flexible and adaptive cognition.

Furthermore, the influence of Digital Self-Efficacy on Entrepreneurial Mindset has a very large effect size of 0.598, indicating that confidence in digital technology is a very strong predictor of entrepreneurial mindset. Meanwhile, the influence of Social Media Algorithms on Entrepreneurial Mindset has a moderate effect value of 0.195, indicating a fairly large influence but not as strong as that shown by Digital Self-Efficacy. Then, when compared to the direct influence of the two main independent variables, the influence of cognitive flexibility on entrepreneurial mindset is greater. The effect size of cognitive flexibility on entrepreneurial mindset is 0.022, which shows that although cognitive flexibility functions as a mediator, its direct influence on entrepreneurial mindset is relatively small.

Hypothesis Test

To test the direct effect hypothesis, the t-statistic generated by the inner model is examined. The research hypothesis can be accepted if the t-statistic is greater than 1.96. Table 7 shows the results of the direct effect hypothesis test. In PLS research, simulations are used to test hypothetical relationships. In this study, the bootstrap method was applied to the sample to reduce unusual research data problems.

Based on the results of the hypothesis test shown in Table 7 (Inner Model), it can be seen that all direct relationships between independent variables and mediating and dependent variables show significant results, except for the relationship between cognitive flexibility and entrepreneurial mindset. The direct effect coefficient of digital self-efficacy on cognitive flexibility is 0.326, with a t-statistic of 4.192 and a p-value of 0.000, indicating a significant positive effect. Similarly, digital self-efficacy on entrepreneurial mindset has a fairly high coefficient of 0.548, with a t-statistic of 8.896 and a p-value of 0.000, indicating that individuals' confidence in using digital technology directly increases entrepreneurial mindset very significantly.

Table 6. Effect Size.

	Cognitif Flexibility	Digital Self Efficacy	Entrepreneurial Mindset	Social Media Algorithm
Cognitif Flexibility			0.022	
Digital Self Efficacy	0.105		0.598	
Entrepreneurial Mindset				
Social Media Algorithm	0.126		0.195	

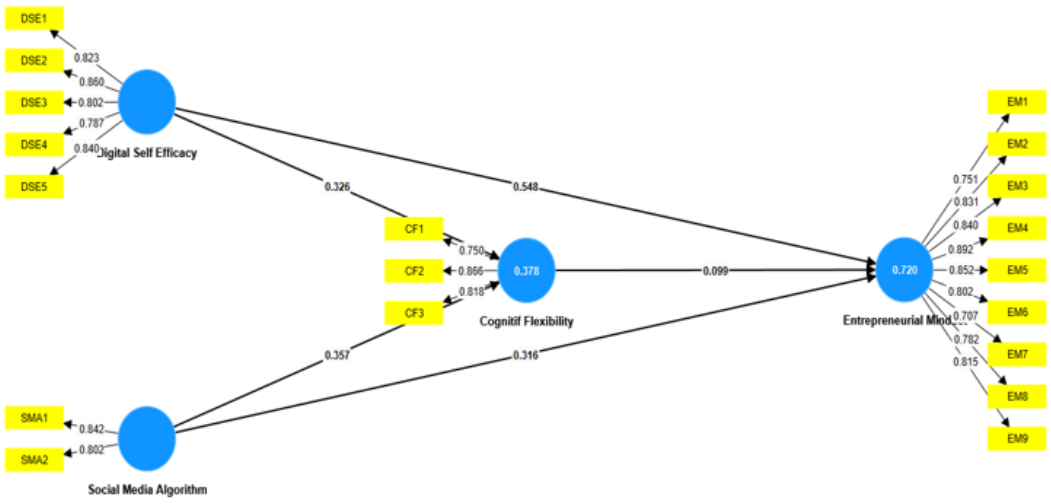

Figure 2. Research Model.

Table 7. Inner Model.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
CF -> EM	0.099	0.098	0.051	1.932	0.053
DSE -> CF	0.326	0.328	0.078	4.192	0.000
DSE -> EM	0.548	0.549	0.062	8.896	0.000
SMA -> CF	0.357	0.361	0.081	4.422	0.000
SMA -> EM	0.316	0.317	0.063	5.014	0.000

Table 8. Indirect Effect.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
DSE -> CF -> EM	0.032	0.033	0.020	1.604	0.109
SMA -> CF -> EM	0.035	0.035	0.020	1.779	0.075

Additionally, social media algorithms have a significant influence on cognitive flexibility with a coefficient of 0.357, a t-statistic of 4.422, and a p-value of 0.000. Furthermore, social media algorithms also have a significant influence on entrepreneurial thinking with a coefficient of 0.316, a t-statistic of 5.014, and a p-value of 0.000. These results suggest that exposure to social media content regulated by algorithms may influence adaptive thinking and entrepreneurial tendencies in individuals. However, the direct influence of cognitive flexibility on entrepreneurial mindset is not statistically significant, with a coefficient of 0.099, a t-statistic of 1.932, and a p-value of 0.053, which is slightly above the significance threshold of 0.05. This suggests that cognitive flexibility is not strong enough to directly influence entrepreneurial mindset, despite the positive direction of the relationship.

However, the results of the indirect influence or mediation test, also known as indirect influence, also show insignificant results. With a coefficient value of 0.032, a t-statistic of 1.604, and a p-value of 0.109, the mediation path of digital self-efficacy → cognitive flexibility → entrepreneurial mindset shows that the mediation effect is not significant at the 95% confidence level. Additionally, the path of social media algorithms → cognitive flexibility → entrepreneurial mindset has a coefficient value of 0.035, a t-statistic of 1.779, and a p-value of 0.075. Although the p-value is close to 0.05, the findings still do not meet the required significance criteria to indicate that a strong mediating effect has occurred.

Interpretation: Why Maritime Education Context Matters

This study found that entrepreneurial mindset is influenced by two components: confidence in using digital technology (digital self-efficacy) and the ability to present relevant content through social media algorithms. Both have been proven to enhance students' flexible thinking abilities, also known as cognitive flexibility. However, there is no significant direct influence on entrepreneurial mindset from flexible thinking abilities, and the mediating role is also not statistically proven. Therefore, it can be concluded that the primary influence on the development of students' entrepreneurial mindset stems more directly from digital factors rather than through the role of cognitive adaptation.

These results are consistent with Social Cognitive Theory. (Bandura, 1978), which states that a person's abilities influence how they behave, including how they make entrepreneurial decisions. High self-confidence in digital self-efficacy encourages people to take the initiative in seeking business opportunities. Previous studies, (Darmanto et al., 2023) which emphasizes the importance of digital efficacy for entrepreneurial intent and studies by (A. Y. Liu & Lin, 2025) which shows that social media algorithms can shape entrepreneurial perceptions and individual decisions to start a business in the social sphere. However, the findings (Dheer & Lenartowicz, 2019) which emphasizes the importance of flexible thinking in innovative processes and entrepreneurship, contradicts the significance of flexible thinking as a mediator.

This study has limitations in terms of the scope of respondents, which only involves students from three maritime universities in the Sumatra region. This limits the generalization of the results to students from other fields of study or from regions with different cultural characteristics and education systems. Students at maritime universities have educational characteristics that emphasize discipline, order, and compliance with procedures. Such a learning environment makes them more accustomed to structural thinking than reflective-adaptive thinking. This is one reason why

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flexible thinking does not emerge as a dominant factor in shaping entrepreneurial thinking. Instead, exposure to digital technology and social media is closer to their daily lives, thereby exerting a direct influence on their interest and readiness to engage in entrepreneurship. Although theoretically cognitive flexibility is positioned as a mediator that bridges the influence of digital self-confidence and social media algorithms on entrepreneurial mindsets, we found that the results of this study indicate that the mediation role is not significant in the context of maritime higher education students.

This finding indicates the existence of boundary conditions affecting the effectiveness of cognitive mediation in higher education characterized by a strict disciplinary culture and command-based system. As assumed in general theory, cognitive flexibility does not play a role because the highly structured and instruction-based learning environment tends to limit the development of reflective and adaptive thinking patterns (Saputra et al., 2022; R. J. Spiro et al., 2009). Further research is recommended to develop a more comprehensive model by adding psychological variables such as creative problem-solving, opportunity recognition, and resilience to bridge the influence of technology on entrepreneurship. Studies could also be expanded to non-maritime institutions or non-technical fields and use qualitative or mixed methods to delve deeper into digital experiences and the formation of entrepreneurial thinking in highly disciplined higher education contexts such as maritime studies.

POLICY IMPLICATIONS

This study concludes that the entrepreneurial mindset of maritime students in Indonesia, particularly those from the Sumatra region, is significantly shaped by digital self-efficacy and social media algorithm exposure, while cognitive flexibility plays a limited and statistically insignificant mediating role. These findings provide empirical evidence that the formation of entrepreneurial thinking in maritime higher education is predominantly driven by digital exposure and confidence in technology use, rather than by reflective or adaptive cognition. From a theoretical standpoint, this study contributes to the refinement of Social Cognitive Theory (Bandura, 1978) by demonstrating that in structured, discipline-based educational environments such as maritime institutions the direct influence of digital environmental and personal efficacy factors is more dominant than cognitive mediation. The study also identifies contextual boundary conditions for SCT, where the rigidity of hierarchical pedagogy and command-based learning systems can constrain cognitive flexibility development. In the broader context of Indonesia's maritime transformation, these findings underscore the need to cultivate maritime graduates who are not only technically competent but also entrepreneurial and digitally adaptive. Strengthening digital confidence and harnessing social media as a learning ecosystem are critical pathways for producing *job creators* who can innovate within Indonesia's maritime logistics, marine technology, and blue economy sectors.

Policy Recommendation

The findings of this study have strategic implications for advancing entrepreneurship policies in maritime higher education. Maritime higher education institutions play a central role as curriculum innovators. They need to reform learning structures by integrating digital entrepreneurship education that extends beyond theoretical business knowledge toward applied digital literacy, data analytics, and the strategic use of social media platforms as entrepreneurial tools. Through programs such as Kampus Merdeka and the Digital Talent Scholarship, universities under the coordination of the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) and the Ministry of Communication and Informatics (Kominfo) can strengthen students' *digital self-efficacy* by implementing experiential learning initiatives like startup incubators, online business simulations, and maritime innovation laboratories. At the same time, the government, in collaboration with universities and private social media platforms, should actively leverage social media algorithms for entrepreneurship learning. This requires transforming algorithmic personalization into an educational tool that curates entrepreneurial success stories, showcases maritime technology innovations, and highlights emerging digital business trends. By doing so, social media evolves from a space of passive consumption into an ecosystem of creativity, innovation, and entrepreneurship.

Given the traditionally command-based and hierarchical nature of maritime institutions, academic leaders and policy designers must gradually introduce problem-based and project-based learning approaches to cultivate adaptive and reflective thinking among students without undermining the discipline that defines maritime education. This pedagogical shift would nurture cognitive flexibility, enabling students to innovate within structured environments and navigate uncertainty with creativity and confidence. Ultimately, these reforms must align with Indonesia's Visi Poros Maritim

Dunia and the Rencana Induk Pembangunan Kepelabuhanan dan SDM Maritim Nasional, which emphasize innovation, entrepreneurship, and digital transformation as strategic levers for maritime development. By fostering a generation of digitally confident, innovative, and entrepreneurial maritime graduates, the Ministry of Marine Affairs and Fisheries (KKP), Kemendikbudristek, and higher education institutions can jointly strengthen Indonesia's maritime economy and enhance its global competitiveness ensuring that future maritime professionals become not only job seekers, but job creators driving sustainable ocean-based growth.

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AUTHORS CONTRIBUTION STATEMENT

We hereby state that regarding the contribution of each author in the creation of the paper, the contributing authors are Juliandri Hasnur the main contributor and Langandriansyah Dwi Yatnoas as contributor members.

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