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Advancing the Financial Inclusion and Organizational Efficiency: The Role of Digitalization, Technology and Sustainability

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PREFACE

In recent years, the intersection of technology, finance, sustainability, and organizational behavior has become increasingly important, particularly in emerging economies like Indonesia. As the country faces rapid digital transformation, evolving financial landscapes, and growing environmental concerns, the need for innovative solutions and a deeper understanding of these interconnected fields has never been more urgent.

This book brings together a diverse range of perspectives that explore the role of digital financial literacy, fintech innovations, organizational dynamics, and sustainable practices in shaping the future of Indonesia. With contributions from scholars and experts, this volume presents both theoretical insights and practical applications that address pressing challenges and opportunities in these areas.

The chapters in this book delve into various aspects of financial inclusion, the impact of digital technologies on financial well-being, and the role of fintech in fostering sustainable practices. In particular, topics such as the use of decision trees in mitigating risks in the oil and gas industry, the role of social and psychological factors in enhancing organizational behavior, and sustainable food waste recycling in support of a circular economy are discussed in depth. These chapters highlight the diverse ways in which technology, finance, and sustainability can converge to create meaningful change in both corporate and societal contexts.

One of the key themes explored throughout this book is the importance of digital financial literacy in empowering individuals and organizations to navigate the complexities of the modern financial ecosystem. With the rise of fintech, the role of financial education and inclusion has become more critical, particularly for younger generations who are increasingly engaged with digital platforms. By focusing on the experiences of students, professionals, and businesses in Indonesia, this book offers valuable insights into how these innovations can improve financial well-being, enhance operational efficiency, and support long-term resilience.

As the world continues to face significant environmental and economic challenges, it is crucial to rethink traditional approaches and embrace innovative strategies that drive positive change. The contributions in this book reflect the interdisciplinary nature of these challenges, offering a comprehensive exploration of the ways in which technology, finance, and sustainability intersect to shape the future.

We hope that this collection of research will inspire further inquiry, inform policy decisions, and foster collaboration among stakeholders in Indonesia and beyond. The authors' diverse perspectives and expertise provide a rich resource for understanding the complex dynamics of our rapidly evolving world and the pivotal role that technology and sustainability will play in shaping the future.

Prof. (Dr.) Sunaina Sardana
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Bursa, Türkiye – December 2024

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CHAPTER 1

Neutron Tomography Technology for EOR Surfactant Flooding Performance Analysis as a Future Challenge in Indonesia

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ABSTRACT

Enhanced Oil Recovery (EOR) is one of the methods currently being pursued to increase oil recovery from wells that still have reserves with production potential. Crude oil that cannot yet be produced may be trapped within the reservoir. The EOR method functions to alter the fluid properties within the reservoir without changing the formation of the rocks. One of the chemical fluids used is a surfactant, which serves to lower the interfacial tension (IFT) between the oil and water fluids, related to the wettability system in the reservoir. In this study, two types of surfactants were used: fir wood-derived SLS surfactant and palm oil-derived MES surfactant. The surfactant mechanism is observed from the recovery factor (RF) results after surfactant injection. The RF value is obtained by comparing the amount of oil recovered to the total amount of oil remaining in the core. The study results showed that oil recovery with the injection of SLS fir wood surfactant achieved a 0.4% increase, while the palm oil MES surfactant achieved a 20% increase. The core that had been injected with surfactant was then analyzed using Neutron Tomography, which indicated the position of the fluid types within the core. The results of neutron tomography showed the distribution of fluids within the core. In the injection of SLS fir wood surfactant, the distribution of SLS fir wood surfactant was less compared to that of MES palm oil, resulting in a greater reduction

in IFT with the MES palm oil surfactant. As a result of this condition, the palm oil MES surfactant mechanism was more optimal in lowering IFT, making the trapped oil easier to mobilize, thus achieving a higher RF with the MES surfactant. From this study, it can be concluded that neutron tomography, which records the fluid distribution within the rock core, can indicate the extent of the surfactant injection area, and this correlates with the calculation of the Recovery Factor.

Keywords: Core flooding, Enhanced oil recovery (EOR), Palm oil methyl ester sulfonate (MES) surfactants, Recovery factor (RF), SLS fir wood surfactant, Surfactant flooding.

1. INTRODUCTION

Enhanced Oil Recovery (EOR) is a method used to maximize production from declining reservoirs, with one of the commonly employed techniques being chemical flooding. Surfactants, or surface-active agents, are chemical compounds with an amphiphilic structure, allowing them to reduce the interfacial tension between two immiscible phases, such as oil and water, thereby enabling the trapped oil in rock pores to be more easily displaced (Setiati & Jasmine, 2023; Sheng, 2011). This study focuses on the use of palm oil-based Methyl Ester Sulfonate (MES) surfactants and fir wood-derived Sodium Lignosulfonate (SLS), which have the potential to enhance the efficiency of chemical injection. The advantages of palm oil MES and fir wood SLS surfactants include their environmentally friendly nature, biodegradability, and cost-effectiveness, making them an attractive alternative to synthetic surfactants. The objective of this research is to determine the characteristics of fir wood SLS and palm oil MES surfactants, including emulsion formation (Phase Behavior), interfacial tension (IFT), core flooding, and neutron tomography.

2. LITERATURE REVIEW

Phase Behavior Testing is a method used to study the interaction and changes of a fluid, particularly surfactants, when influenced by certain conditions such as temperature and pressure. Surfactants, with their amphiphilic structure, function to reduce the interfacial tension between oil and water, thereby enabling the trapped oil in rock pores to be more easily displaced. In this process, understanding the formation of microemulsions is crucial, which can be categorized as Winsor type I, II, or III, depending on the composition and solution conditions. Winsor type III microemulsion, for instance, shows the greatest potential in enhancing oil recovery factor as it can create a homogeneous mixed phase between oil and water. Moreover, salinity and surfactant concentration also affect the stability and solubility of the solution, which in turn influences the recovery factor outcome.

The Interfacial Tension (IFT) test plays a crucial role in enhancing the efficiency of Enhanced Oil Recovery (EOR) by reducing the interfacial tension between oil and water (Aditya *et al.,* 2023; Kesit *et al.,* 2024). Surfactants function by adsorbing at the interface between the two phases, thus lowering IFT and facilitating the displacement of oil trapped in rock pores. This reduction in IFT not only improves oil mobility but also alters the reservoir's wettability to become more hydrophilic, which aids in increasing the recovery factor (Kumar & Mandal, 2018; Setiati *et al.,* 2018). Various factors, including surfactant concentration, solution salinity, and hydrocarbon composition, can influence the IFT values, making the

correct surfactant selection crucial to achieving an optimal recovery factor (Khouw *et al.*, 2021; Setiati *et al.*, 2018; Nuraini *et al.*, 2024).

Core Flooding testing is an evaluation method used to assess the effectiveness of fluid injection in enhancing the Recovery Factor. This test aims to simulate reservoir conditions at a laboratory scale by flowing fluids, such as brine and surfactants, through a rock core. It provides insight into how the injected fluids interact with the rock and oil within the reservoir at the laboratory scale, as well as the effectiveness of fluid injection in mobilizing the remaining oil trapped in the rock pores. During the core flooding test, the rock sample is saturated with water and oil, and then a surfactant solution is injected to evaluate the increase in recovery factor (RF).

Neutron tomography testing is a technique designed to provide a detailed three-dimensional view of fluid distribution and phase changes occurring within a reservoir. This method utilizes neutron beams to penetrate materials, enabling accurate visualization of various fluids, such as oil, water, and gas, within the rock pores (Alessandro Tengattini *et al.,* 2021). Neutron tomography is widely used in the nuclear industry, particularly in science and engineering, to investigate the internal structure and mechanical characteristics of materials. Its measurement technique relies on neutrons sourced from nuclear reactors or synchrotrons, offering distinct advantages for studying low atomic number elements, such as hydrogen and carbon (Schwarz, 2005; Dayakar P & Felix, 2015; Michael F, 2007). The earliest research combining porous rock samples and neutron imaging was conducted by Frikkie De Beer and F. Middleton (F. C. de Beer & Middleton, 2006; Frikkie C. De Beer *et al.,* 2004). Although their analysis did not specifically focus on reservoir rock samples, it sparked interest in applying neutron tomography to the oil and gas industry. By the end of 2019, a collaboration between nuclear analysts and an Indonesian university resulted in an in-depth investigation of Berea sandstone samples. The university team developed a surfactant formula and explored the quantitative and qualitative effects of surfactants in the EOR process (Naga Venkata Pavan, 2022) through neutron imaging. Subsequent preliminary analysis included porosity measurements (Akbar *et al.*, 2021) and visualization of Berea sandstone samples (R. Setiati *et al.,* 2021). The first step of porosity measurement using neutron tomography has also been published.

The advantage of neutron tomography lies in its ability to penetrate materials without damaging the sample, enabling non-destructive analysis that is highly valuable for understanding fluid flow (Murison *et al.,* 2015).

3. RESEARCH METHOD

This research began with the preparation of brine, palm oil-based MES surfactant, and spruce wood-based SLS surfactant at various salinity levels. The brine salinity used for palm oil MES was 10,000 ppm, and for spruce wood SLS, it was 8,000 ppm. The surfactant concentration variations used were the same, at 2%, along with light crude oil (Wibowo *et al.,* n.d.). The phase behavior test involved adding oil into pipette tubes containing the surfactant solution, which were then placed in an oven at 60°C for intervals of 0 and 336 hours. The IFT test was conducted using a spinning drop tensiometer by adjusting the temperature and rotation speed. Samples were inserted into the device, ensuring that the oil was positioned at the center of the capillary tube for optimal results.

The core flooding test was conducted by first saturating the core sample with brine, followed by oil saturation at 60°C and 100 psi pressure. This step ensures that the core is filled with brine and oil, replicating reservoir conditions at a laboratory scale. Afterward, brine was injected, followed by surfactant injection, and the process concluded with a post-flush using brine at the same temperature and pressure. Lastly, neutron tomography testing, which utilizes neutron interaction to analyze the internal structure of the core, was used to examine the areas swept by surfactant within the reservoir. The oil content in the Berea sandstone was investigated and visualized non-destructively. Initially, the sample was immersed in a brine solution, and imaging was conducted using neutron tomography. The second step involved injecting oil into the core, followed by water injection and measuring the oil distribution within the core using neutron tomography. The surfactant was then injected, and the process was recorded again with neutron tomography in the final step. The result was a 3D image of the oil within the sample, showing the oil distribution before and after the surfactant injection. The measurement process began with neutron scanning of the core, followed by data collection through sample rotation from 0° to 180° to obtain two-dimensional images from various angles. This data was then reconstructed into a three-dimensional model that shows the surfactant flow within the reservoir (Al-Shatty *et al.,* 2022; Ren´e Karim Hassanein, 2006).

4. RESULT AND DISCUSSION

The phase behavior or solution stability test was conducted by mixing 2 ml of light crude oil with 2 ml of surfactant using a pipette tube. The tube containing the mixture was then placed in an oven at a temperature of 60°C. The test lasted for two weeks, with periodic visual observations to monitor emulsion formation at predetermined time intervals. The results of this phase behavior test are presented in Table 1.

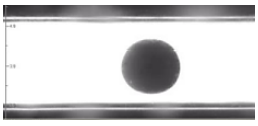
Table 1. Result of phase behavior test on light crude oil

Surfactant Composition	Phase	Volume at Observation Time (hours)		Total Emulsion (%)	Types of mulsions Phase
		0	336		
Salinity 10.000 ppm 2 % Palm oil MES Surfactant	Oil	0.6	1.42	27.75%	mid
	Emulsion	2.9	1.11		
	Surfactant	0.5	1.47		
Salinity 8000 ppm 2 % Surfactant SLS Fir Wood	Oil	1.15	1.97	1.25%	mid
	Emulsion	1.6	0.55		
	Surfactant	1.25	1.98		

Based on the results of the phase behavior test displayed in Table 1, there is a noticeable difference in total emulsion formation between the two types of surfactants. The palm oil-based MES surfactant produced a total emulsion of 27.75% at a concentration of 2%, while the fir wood-derived SLS surfactant yielded only 1.25% at the same concentration. Nevertheless, both surfactants fall into the middle-phase emulsion category, or Winsor III classification, allowing for subsequent testing, specifically interfacial tension (IFT) measurement.

The IFT testing was conducted using a spinning drop tensiometer. The results of the IFT test showed an inverse relationship with the total emulsion values obtained in the phase behavior test. The palm oil-based MES surfactant exhibited an IFT value of 0.287 dyne/cm, while the fir wood SLS surfactant had an IFT value of 7.210 dyne/cm (Table 2). This indicates that the IFT value of palm oil MES surfactant is lower than that of fir wood SLS surfactant. Consequently, this suggests that palm oil MES surfactant is more effective at reducing IFT, thus possessing a greater potential for enhancing oil recovery compared to fir wood SLS surfactant.

Table 2. Result of interfacial tension test

No	SAMPLE	IFT, dyne/cm	Picture
1	Salinity 10.000 ppm 2 % Palm oil MES Surfactant	0.287	
2	Salinity 8000 ppm 2 % Surfactant SLS Fir Wood	7.210	

The core flooding test was conducted in three stages: initial brine injection, followed by surfactant injection, and concluding with a post-flush to maximize surfactant effectiveness. The palm oil-based MES surfactant demonstrated a recovery factor (RF) of 17.86%, whereas

the spruce wood-derived SLS surfactant only achieved an RF of 0.41% (Figure 1).

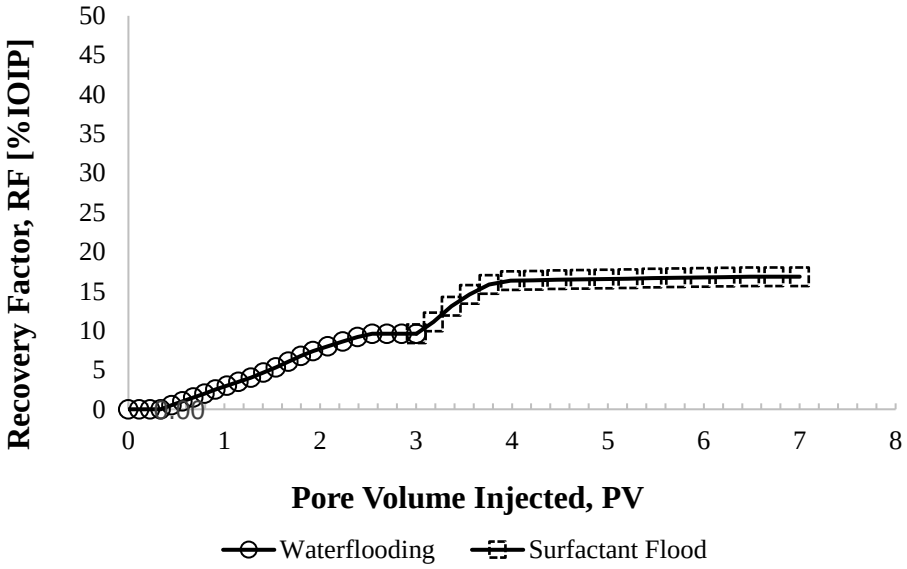


Figure 1. Result of core flooding using palm oil MES surfactant

The results from this core flooding test indicate that the IFT values correlate positively with the recovery factor outcomes, with the palm oil MES surfactant yielding a significantly higher recovery factor compared to the fir wood SLS surfactant (Figure 2). This suggests that the palm oil MES surfactant is more effective in enhancing the recovery factor than the fir wood SLS surfactant.

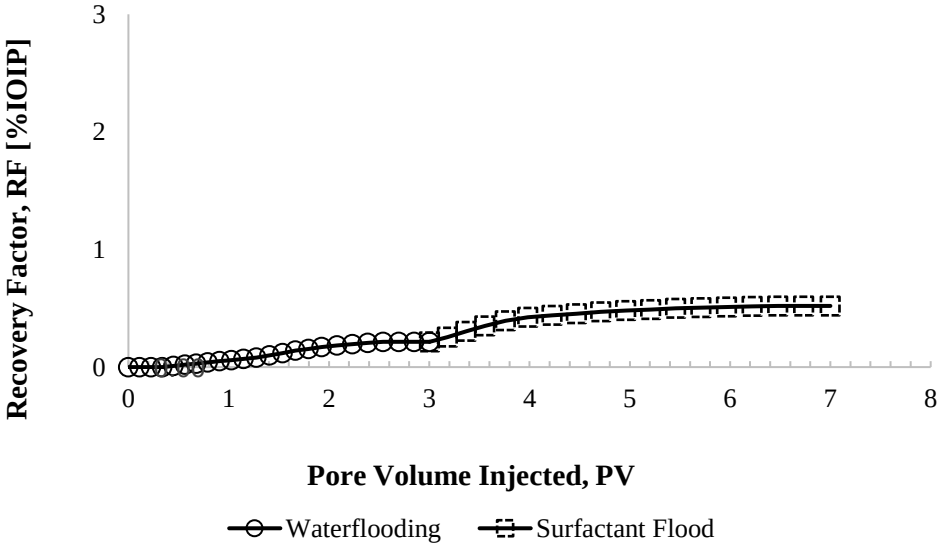


Figure 2. Result of core flooding using fir wood SLS surfactant

In the neutron tomography test, surfactants used were 2% palm oil-based MES surfactant and 2% spruce wood-derived SLS surfactant (Figure 3). In the first step, neutron tomography was employed to analyze the distribution of porosity and volume within the rock core. The results indicated that the pores or porosity were consistently distributed in the central region of the rock core (Dierick, 2004). However, high porosity does not always guarantee good permeability. Uniform porosity only indicates the presence of void spaces within the rock, but it does not necessarily ensure optimal fluid flow.

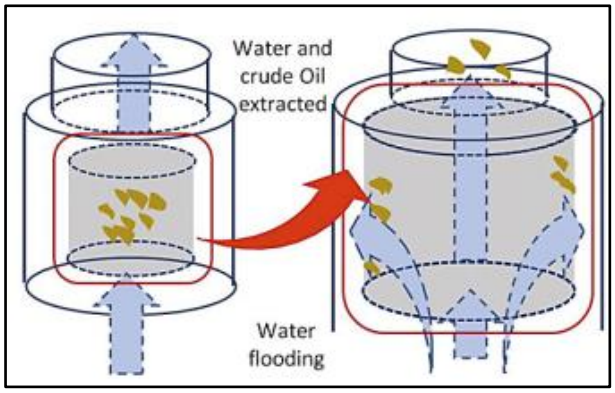


Figure 3. The results of neutron tomography after water flooding (Setiati *et al*., 2023)

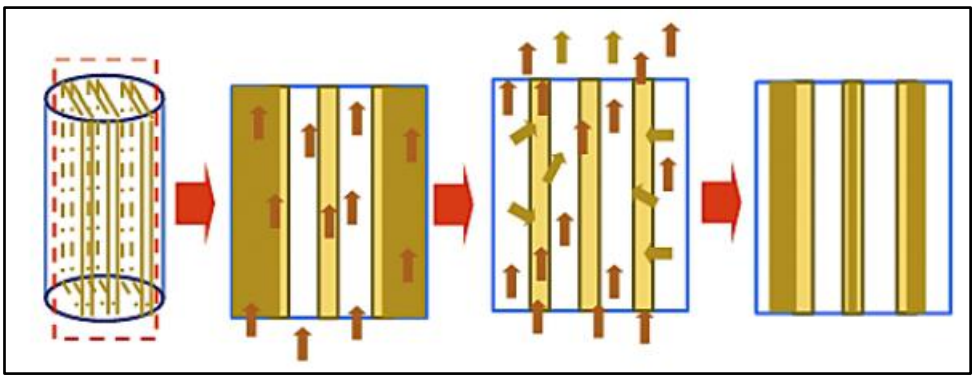


Figure 4. The results of neutron tomography after surfactant flooding (Setiati *et al.*, 2023)

The surfactant injection resulted in a recovery factor of 17.86%; however, there remained a Residual Oil Saturation (SOR) of 82.14%, with most of the oil being pushed to the edges of the rock during water flooding prior to the surfactant flooding (Figure 4). This indicates that, despite the improvement in recovery, the accumulation of oil at the edges of the rock limits sweep efficiency. Therefore, further research is needed to address the uneven oil distribution and enhance the overall performance of Enhanced Oil Recovery (EOR).

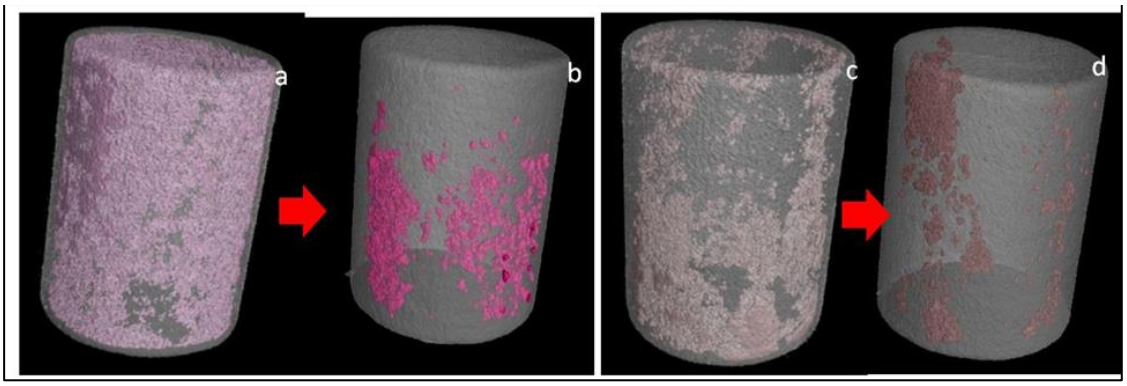


Figure 5. 3D visualization of oil content inside the C5 and C6 at core samples (Setiati *et al.,* 2023)

Figure 5 illustrates that neutron tomography effectively measures the residual crude oil content in the sandstone samples, necessitating multiple repetitions to validate the observations. The visualization displays C5 during the second stage after water injection with a salinity of 40,000 ppm (a) and after surfactant injection with a salinity (b). Additionally, the visualization for C6 after water injection (c) and after surfactant injection (d) is shown in the third step. The experiments reaffirm that using water with the lowest salinity provides significant advantages in extracting oil from Berea core samples. This was validated through neutron tomography measurements conducted after 14 days in the third step, followed by the storage of samples in a specially designed container with adjustable temperature and humidity. It was found that sample C5 contained less crude oil compared to C6, with estimated oil recovery rates of approximately ±84.65% for C5 versus ±68% for C6. These results are aligned with previous reviews indicating that lower salinity can reduce capillarity and diminish oil trapping within the reservoir rock. The reduction in capillarity facilitates increased oil mobility and subsequent extraction.

5. CONCLUSION AND RECOMMENDATION

The results of the phase behavior test using palm oil-based MES surfactant and spruce wood-derived SLS surfactant at a temperature of 60°C and a concentration of 2% with a light crude oil sample showed that the palm oil MES surfactant produced a total emulsion of 27.75%, while the fir wood SLS surfactant only yielded 1.25%. This indicates that the total emulsion generated by the palm oil MES surfactant is significantly higher and falls into the middle-phase emulsion category. In the interfacial tension (IFT) test, the palm oil MES surfactant exhibited an IFT value of 0.287 dyne/cm, while the fir wood SLS surfactant produced an IFT value of 7.210 dyne/cm. From these results, it can be observed that a larger middle-phase emulsion correlates with a lower IFT value. A lower IFT indicates better results, as the tension between two

immiscible fluids, such as water and oil, decreases, allowing for enhanced recovery efficiency. The core flood test was conducted to validate the previous experiments, specifically to determine the recovery factor results after using the palm oil MES surfactant and the fir wood SLS surfactant. The recovery factor for palm oil MES was 17.86%, while the recovery factor for fir wood SLS was only 0.41%. This validation indicates that the formation of middle-phase emulsion and the IFT test significantly influence the recovery factor, leading to the conclusion that the palm oil MES surfactant enhances the recovery factor more effectively than the fir wood SLS surfactant.

Neutron tomography successfully measured the oil content in the sandstone samples; however, for result reliability, it is recommended to conduct multiple repetitions. The 3D neutron tomography imaging revealed that during the second experimental step, most of the oil content gathered at the periphery. However, in the third step, crude oil tended to return to the central pathway (near the center of the rock sample). Previous reviews identified the presence of channel pores in the middle of the sandstone, explaining why, during the water flooding process, approximately 40-50% of the oil flowed out from the channel pores. As a result, the primary oil flow within the sandstone sample is located centrally.

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CHAPTER 2

The Effect of Self Efficacy, Job Embeddedness, Happiness at Work on Organizational Citizenship Behavior

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ABSTRACT

This study aimed to analyze the effect of self efficacy, job embeddedness and happiness at work on organizational citizenship behavior. The research conducted was descriptive quantitative research by distributing questionnaires. This study uses the hypothesis testing method. Hypothesis testing uses the Structural Equation Model (SEM) with AMOS 22 software. The data in this study were collected from 310 employees of Banking in Region Jakarta, by using purposive sampling. The results of hypothesis testing in the study showed that there are effects of self efficacy, job embededdness, happiness at work on organizational citizenship behavior. From the results of this study it is hoped that it can provide input for company managers so that they can pay attention to their employees by providing good support and providing motivation and guiding employees to improve employees citizenship behavior.
Keywords: Happiness at Work, Job Embeddedness, Organizational Citizenship Behavior, Self Efficacy.

1. INTRODUCTION

In the current world's progress entering the industrial revolution 5.0, human resources (HR) need to increase individual skills that make them not only work repetitively, but can think strategically in improving their performance (Ministry of Finance of the Republic of Indonesia, 2023). Efforts to improve vocational education and training are important for the government which targets Indonesia to be equivalent to developed countries with per capita income increasing to USD 23,199 with preparation and acceleration of industrial development, especially preparing young talents to produce optimal productivity (Ministry of Industry of the Republic of Indonesia, 2022). Young talent as an internal factor that has a vital position for corporations to achieve their goals. Companies need to unite the perceptions of employees and company management in order to achieve company goals, including by forming a good employee mentality, coordinating appropriately regarding work with colleagues, considering the important role of HR in helping to achieve achievements (Taufiq and Tanuwijaya, 2023). Human resources who contribute to becoming employees who can carry out their work effectively are able to increase OCB in companies that can improve the welfare of their employees (Agustina *et al.,* 2020).

Good OCB from an employee will greatly assist the company or institution in achieving the company's vision, mission and goals. The company believes that good OCB can improve employee performance. In fact, not all employees have good OCB in the workplace (Fatoni et al., 2018). While good OCB from an employee can increase the company's competitive advantage (Emilisa *et al.,* 2018).

Emilisa *et al.,* (2018) describe OCB as an individual's choice and initiative in behaving towards an organization that can increase organizational effectiveness. In this regard, variables such as self-efficacy, job embeddedness and happiness at work are independent variables in the research, because the variables observed in this study are the basic capacities of an individual, triggering self-motivation and the will to fight and show good performance in the workplace (Peterson *et al.,* 2011).

Self-efficacy was chosen as an independent variable because in previous studies it was considered to have an impact on organizational citizenship behavior. This is because self-efficacy itself appears as a framework in explaining the relationship between individual characteristics, beliefs and the performance of tasks carried out (Tayal *et al.,* 2022). Furthermore, job embeddedness as another independent variable that is considered to have a significant impact on organizational citizenship behavior which shows the freedom of action of an employee (Lee *et al.,* 2014). Associated with individuals who have positive beliefs and attachment to work, this can encourage employee awareness to work harder (Ullah *et al.,* 2021). Meanwhile, happiness at work as the third independent variable is considered to play a role in motivating and maintaining employee positions in any organization (Fisher, 2010). The concept of happiness at work is popular in developed countries, but receives less attention in developing countries. An interesting thing can be observed from happiness at work because it occurs when employees find a pleasant work environment in the workplace (Salas-Vallina *et al.,* 2018).

The challenge of growing organizational citizenship behavior in companies has put pressure on employees in the banking sector, this can increase employee anxiety because it will have an impact on work (Tayal *et al.,* 2022). Banking itself plays an important role in building the nation's economy. Based on OJK data in 2022, it was recorded that Indonesian bank assets

could increase by IDR 11,113 trillion, so the banking sector must be able to innovate in technology, invest and collaborate with foreign institutions that will create a global work environment (Singh and Banerji, 2022). According to Jayne and Dipboye (2004), managing a competent workforce produces significant benefits and makes a positive contribution to the success of the organization, while if the company cannot manage the workforce properly it can lead to low OCB levels. This factor proves that the effectiveness and sustainability of the banking sector significantly depends on a competent workforce that goes beyond its duties and makes extra efforts (Tayal *et al.,* 2022). Employees who work in the banking sector are often required to be able to act professionally in completing their work affairs.

However, behind all that, bank employees cannot fully enjoy the flexibility of what they do, and this is one of the risk factors of the profession they are pursuing (Hossain *et al.*, 2018). Employees who work in banks strive to serve the various needs of their customers. Increasingly tight work deadlines and heavy work targets make it difficult for employees to balance work professionalism. If this happens, then performance depends on the quality of each human resource (Wibowo and Hartono, 2020). The work results achieved by an employee in doing a job can be evaluated from their level of performance. Performance is closely related to cooperation between leaders and employees and between fellow employees. There must be harmony in interrelated activities between employees for the smooth running of the work process and the maintenance of peace and solidarity between employees. On this basis, the thing that needs to be considered in creating good-performing human resources in order to support the quality of the company is the existence of organizational citizenship behavior (OCB) inherent in employees (Damayanti, 2022).

2. LITERATURE REVIEW

2.1. Theoritical Background

2.1.1. Self Efficacy

Lianto (2019) explained self-efficacy as an individual's belief in his ability to carry out the tasks entrusted to him. The higher the self-efficacy, the higher the self-confidence in his ability to achieve success. Mukaromah *et al.,* (2018) explained that self-efficacy is related to an individual's belief which makes him able to take control of situations and conditions and manifest something positive. Meanwhile, Hutasoit (2018) explained that self-efficacy refers to an individual's belief (or confidence) regarding his ability to mobilize motivation, cognitive resources, and actions needed to successfully carry out tasks in a particular context. According to Niu (2022), self-efficacy is the result of an interaction between the external environment, personal abilities, self-adjustment mechanisms, and education and experience.

It can be concluded that self-efficacy is a self-confidence or individual belief in their ability to do something, produce something, organize, achieve their goals, and also implement actions to realize certain skills.

2.1.2. Job Embeddedness

According to Astamarini (2019), job embeddedness is an attachment between employees and their company. Where a strong bond of attachment between employees and the company will make employees think twice about leaving that place. According to Nielsen and Daniel (2012), job embeddedness is "an overall construct conceptualized as a collection of related traits within

an individual that are a force that prevents someone from leaving their job". Thus, employees with high levels of job embeddedness continue to work in the company even in an inadequate work environment. According to Reitz and Anderson (2011), job embeddedness is an attachment to work that makes individuals loyal and continue to work for the company. Work attachment will make individuals loyal and continue to work for their company. Many things can make these employees survive, such as family factors, friends inside and outside the work area, or the community where the individual lives and settles (Tayal *et al.,* 2022). Furthermore, researchers consider job embeddedness as another independent variable which is a connecting element and has a significant influence on organizational citizenship behavior. Meanwhile, according to Robinson *et al.,* (2013), job embeddedness is something from an individual that makes him want to stay at work. Another opinion explains that job embeddedness is a relationship about how well employees adjust to their work and community; also about interactions with people in and outside of work and what they will sacrifice if they leave the company (Felps *et al.,* 2009).

It can be concluded that job embeddedness is an attachment to work that makes individuals loyal and continue to work at the company. The individual is always willing to devote his energy to keep the company alive because of the awareness that the company needs him.

2.1.3. Happiness at Work

According to Wulandari and Widyastuti (2014) happiness at work is defined as a positive emotional condition and positive activity felt by individuals subjectively in assessing themselves as happy or unhappy individuals in carrying out work activities at work. The explanation of happiness at work according to Marliya (2015) is a form of a relatively stable happiness mindset in a weekly or monthly period. However, this concept is sensitive so that it can change due to environmental factors and interventions that have been focused on. According to Jones (2019), happiness at work is a behavior that can support someone to increase performance by using optimal skills consciously in carrying out work. Happiness at work is determined by employee commitment, satisfaction and work involvement which influences employee behavior. Commitment reflects the emotional attachment or feeling of belonging of employees to the organization (Singh and Banerji, 2022). work involvement refers to various ways that energize employees to contribute to the organization and result in increased performance characterized by dedication and enthusiasm in the workplace (Salas-Vallina et al., 2017). Ultimately measuring happiness at work can be done by looking at engagement, job satisfaction and commitment to the organization (Salas-Vallina *et al.,* 2017).

Happiness at work is a state where individuals assess their overall quality of life. Happiness is the result of a person's process and improvement, either quickly or slowly, to achieve goals (Bestari and Prasetyo, 2019). Happiness at work is something felt by employees that comes from positive psychology that focuses on solutions rather than criticizing problems (Agustina *et al.,* 2020). Things related to positive constructions in the minds of employees such as pleasure, satisfaction, well-being and happiness, show positive aspects of human life compared to negative aspects (Agustina *et al.,* 2020). Agustien and Drahen (2020) explain that happiness at work is a state that appears when employees have high loyalty, job satisfaction, endurance, and productivity so that they can guide the organization in achieving its goals.

It can be concluded that happiness at work can be interpreted as a state that contributes positively to the productivity of an organization. When employees in an organization are happy in their workplace, the productivity of the organization will also increase.

2.1.4. Organizational Citizenship Behavior (OCB)

OCB is a voluntary action, not part of the formal role played by employees, but allows the organization to function more effectively and efficiently (Emilisa *et al.,* 2018). OCB includes work done by employees outside of their assigned tasks. OCB as a behavior that is an individual's choice and initiative, not a formal reward system associated with the organization, but which increases the overall effectiveness of the organization (Emilisa *et al.,* 2018). Another definition according to Hartini and Tanuwijaya (2022), OCB is a free individual behavior that does not directly or explicitly encourage the effective functioning of the organization. According to Windhani & Dewi (2016), OCB is individual behavior that contributes to the creation of organizational effectiveness and is not directly related to the organization's reward system.

From the definition above, it can be concluded that organizational citizenship behavior is behavior displayed by employees who not only carry out their obligations and responsibilities, but employees also do more than what is their responsibility without any reward from the organization and solely for the benefit of the organization. One example of organizational citizenship behavior is when employees are willing to help other employees who are unable to attend and work overtime to complete work (Emilisa *et al.,* 2018).

2.2. Conceptual Framework

In ensuring the success of the company in achieving the desired goals, the company must be able to improve the organizational citizenship behavior of its employees. To improve employee OCB, a number of factors need to be considered, including: self-efficacy, job embeddedness and happiness at work. This study refers to previous research based on research by Singh and Banerji (2022); Tayal *et al.,* (2022). From the explanation above, Figure 1 shows the conceptual framework in the study.

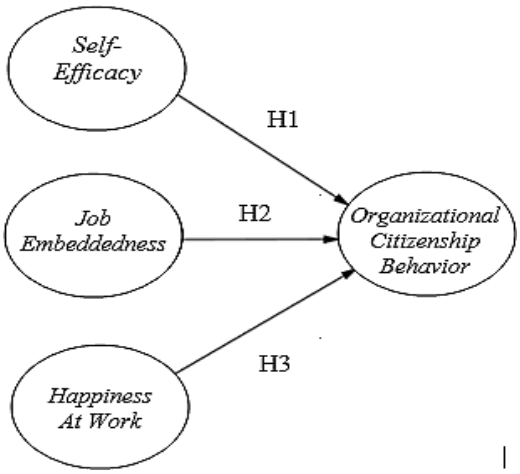

Figure 1. Conceptual Framework

2.3. Hyphoteses Development

In previous research conducted by Abdullah *et al.,* (2019), low organizational citizenship behavior can be influenced by low self-efficacy. Individuals who are satisfied with their work will tend to want to be more involved in their work even though there is no reward. This reflects the OCB aspects, namely altruism, civic virtue, conscientiousness, courtesy, and sportsmanship (Prasetyo *et al.,* 2022). Similar results are consistent with the research of Choong *et al.,* (2019) which emphasized that self-efficacy is positively related to OCB. Similar to the results of the study by Ozyilmaz *et al.,* (2018) which showed the influence of self-efficacy on OCB. Thus, the hypothesis was developed that:

H1: Self-efficacy has a positive effect on organizational citizenship behavior.

The results of Tayal *et al.,* (2022) study showed a positive influence of job embeddedness on OCB. Other studies show results that support the relationship between job embeddedness and organizational citizenship behavior, the findings obtained confirm the results of previous studies that state job embeddedness as a predictor of organizational citizenship behavior (Nguyen *et al.,* 2017). When an individual is socially attached to an organization, the individual will feel that they are part of the social network and will act according to citizenship behaviors in the organization (Kapil and Rastogi, 2019). The conclusion of a number of researchers also suggests that employees who have positive beliefs and attachment to work can encourage employees to work harder and faster than their duties in the banking sector (Ullah *et al.,* 2021). Thus, the hypothesis is proposed that:

H2: Job embeddedness has a positive effect on organizational citizenship behavior.

The research conducted by Singh and Banerji (2022) is based on the argument that happiness at work leads to OCB. The results of previous studies describe an explanation of the condition of employees when experiencing happiness at work in the company, employees tend to show organizational citizenship behavior (Salas-Vallina *et al.,* 2017). Based on research by Prakoso and Listiara (2017), it was stated that happiness at work has a significant positive effect on OCB. Thus, this study formulated the hypothesis that:

H3: Happiness at work has a positive effect on organizational citizenship behavior.

3. RESEARCH METHOD

3.1. Research Design

This type of research uses hypothesis testing. In this study, data collection was cross-sectional because the data taken resulted from a single deployment at a specified time. The unit of analysis studied was the banking industry employees.

3.2. Variable and Measurement

The variable used in this study are self-efficacy, job embeddedness, happiness at work, and OCB. For measurement of self-efficacy (8 items), job embeddedness (7 items) and OCB (16 items) adapted from Tayal *et al.,* (2022). The happiness at work variable is measured using 31 indicator adapted from the Singh and Banerji (2022).

3.3. Population and Sample

The population in this study were employees of Bank X in West Jakarta and Bank Y in South Jakarta . The determination of the sample was carried out using a non-probability method, namely purposive samping with 310 samples filled out the quetionnaires. According to Hair *et al.*, (2019) minimum samples size is number of statement mutiplied by five (62 x 5 = 310).

3.4. Research Instrument Testing

From the results of the research instrument testing, all constructs are valid because have a factor loading of more than 0.3. All variables are also reliable because they have a Cronbach alpha of more than 0.6

3.5. Analysis Method

The analysis using descriptive statistics in the form of mean and for hypothesis testing using the Structural Equation Model with AMOS software (Figure 2).

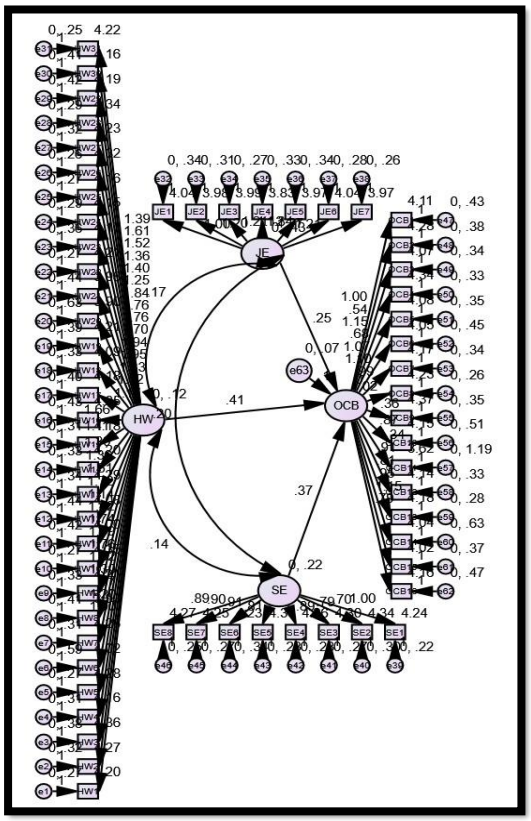

Figure 2. Structural equation model

4. RESULT AND DISCUSSION

4.1. Respondent Demographic Characteristics

Most of the respondents were female (67.4%), many of them were 18-25 years old (51.9%) with a length of work maximum 5 years (56.8%) and the last education was bachelor degree (54.2%).

4.2. Descriptive Statistics Analysis

From the Table 1, the mean value of the self-efficacy variable is 4.36, which indicates that employees perceive themselves as having self-efficacy. This means that employees feel they can achieve some of the goals that have been set, are confident that they can complete tasks that are considered difficult, can obtain important results, and also feel that they can succeed in every endeavor. On the same side, employees feel that they can successfully overcome every challenge, can do many different tasks effectively, can perform quite well when there are difficult things, and feel better than others when doing tasks.

Table 1. Descriptive statistic self efficacy

No	Indicator	Mean
1	I am able to achieve all the goals that have been set.	4.23
2	When faced with difficult work, I am confident that I can complete it.	4.33
3	I think being able to get the most important results.	4.29
4	I believe that I can be successful in every business I run.	4.25
5	I can successfully overcome various obstacles.	4.29
6	I am confident in being able to do many different jobs effectively.	4.22
7	Compared to other people, I am able to do most jobs well.	4.24
8	Even when faced with difficult problems, I am able to perform well.	4.27
	Total mean	4.36

Source : Data processed (2024)

Table 2. Descriptive statistic job embeddedness

No	Indicator	Mean
1	I feel connected to the organization.	4.03
2	I find it difficult to leave this organization.	3.98
3	It will be difficult for me to resign from this company.	3.98
4	I can't leave this company.	3.82
5	It was not easy for me to leave this company.	3.97
6	I am closely tied to this company.	4.03
7		3.97
	Total mean	3.97

Source : Data processed (2024)

Based on the results of the descriptive statistics table above, the mean value of the job embeddedness variable is 3.97 (Table 2). This shows that employees have job embeddedness. This means that employees feel tied to the company, find it difficult to leave the company, are not easy to move to another company, and feel closely tied to the workplace.

Table 3. Descriptive statistic happiness at work

No	Indicator	Mean
1	At work, I feel full of energy.	4.20
2	I found the work carried out with full understanding of the purpose.	4.27
3	Time flies when I work.	4.35

4	When I work, I feel powerful and energized.	4.15
5	I am enthusiastic about work.	4.28
6	When I work, I forget about everything else.	4.01
7	Work inspires me.	4.25
8	When I woke up in the morning, I felt like going back to work.	3.92
9	I feel happy when I work intensely.	4.21
10	I am proud of the work done.	4.35
11	I feel like I'm drowning while working.	4.00
12	I can always work for long hours.	4.08
13	I think this job is challenging.	4.28
14	I get carried away while working.	4.19
15	At work, I am very strong mentally.	4.18
16	I have difficulty detaching myself from work.	4.05
17	At work I will persevere, when things are not going well.	4.18
18	I am very happy to have a career in this organization.	4.09
19	I enjoy discussing companies in an external setting.	4.20
20	I consider company problems to be personal problems.	3.90
21	I think it's hard to be tied to another company like this one.	3.97
22	I feel like I'm part of a family in this organization.	4.21
23	I feel emotionally attached to this company.	4.16
24	This organization means a lot to me.	4.15
25	I feel a strong sense of belonging to this company.	4.16
26	I am satisfied with the work.	4.31
27	I am satisfied with my boss.	4.23
28	I am satisfied with the relationship between coworkers.	4.19
29	I am satisfied with the salary received for this job.	4.19
30	I am satisfied with the existing growth (promotion) opportunities	4.16
31	All things considered, I am satisfied with the current employment situation.	4.22
	Total mean	4.18

Source : Data processed (2024)

The mean value of the happiness at work variable of 4.18 (Table 3) means that respondents have felt happiness at work.

Table 4. Descriptive statistic organizational citizenship behavior (OCB)

No	Indicator	Mean
1	I help other employees with their work when they are absent.	4.10
2	I showed punctuality in arriving at the place in the morning, after lunch and rest.	4.28
3	I am happy to voluntarily do things that are not formally required by the job.	4.07
4	I take a well-deserved break from work.	4.34
5	I take the initiative in orienting new employees to the program, even though this is not part of the formal job description.	4.07
6	I showed presence at work outside normal hours.	4.04
7	I help others when their workload increases.	4.16
8	I work until the end of the day.	4.23
9	I will notify you in advance if I cannot come to work.	4.36
10	I never spend time in personal phone conversations.	4.15
11	I don't take time off work.	3.61
12	I help others with their tasks.	4.13
13	I made innovative suggestions to improve the overall quality of the program.	4.17

14	I don't take extra breaks.	4.03
15	I am willing to attend events that are not required by the organization, but help overall.	4.01
16	I don't spend much time idle in idle conversation.	4.15
	Total mean	4.19

Source : Data processed (2024)

Total mean of OCB variable is 4.19 (Table 4). It shows that banking employees have high OCBreasonably feel like leaving their jobs.

4.3. Hyphoteses Testing Result and Discussion

For the first hypothesis test, it is known that the significance value of the influence of self-efficacy on organizational citizenship behavior is 0.002 <0.05, which indicates that Ha is supported (Ho is not supported) with an estimated value (β) of 0.374 (Table 5). This shows that the self-efficacy felt by employees of bank X in West Jakarta and bank Y in South Jakarta will have a positive and significant influence on the organizational citizenship behavior of employees in the workplace. Meaning that if employees can achieve the goals that have been set related to their work, employees feel confident that they can complete difficult tasks, are confident that they can get important results, feel that they can succeed in every effort, can work multitasking effectively, and feel confident in doing tasks better than others, will make employees voluntarily do more than what is their responsibility without any reward from the company because employees do it solely for the benefit of the company, namely bank X in West Jakarta and bank Y in South Jakarta where the employees work.

Table 5. Hyphoteses testing result

Hyphoteses	Estimate (β)	ρ value	Decision
Self-efficacy has a positive effect on organizational citizenship behavior	0.374	0.002	Supported
Job embeddedness has a positive influence on organizational citizenship behavior	0.252	0.000	Supported
Happiness at work has a positive effect on organizational citizenship behavior	0.406	0.024	Supported

Source : Data processed (2024)

From this explanation, it can be concluded that the first hypothesis in this study is supported. The results of this study support previous research by Tayal *et al.*, (2022) which explains that there is a positive and significant influence of self-efficacy on organizational citizenship behavior. Similar results are consistent with the research of Choong *et al.*, (2019) which confirms that self-efficacy is positively related to OCB. Similar to the results of the study by Ozyilmaz et al. (2018) which showed the influence of self-efficacy on OCB. With an increase in workplace self-efficacy, it can increase organizational citizenship behavior.

In testing the second hypothesis, it is known that the significance value of the influence of job embeddedness on organizational citizenship behavior is 0.000 <0.05, which indicates that Ha is supported (Ho is not supported) with an estimated value (β) of 0.252. This shows that the job embeddedness felt by employees of bank X in West Jakarta and bank Y in South Jakarta will have a positive and significant influence on the organizational citizenship behavior of employees in the workplace. This means that when working, employees can feel bound and feel a close relationship with the company, and find it difficult to leave, resign or separate from the company, it will make employees voluntarily do more than what is their responsibility without any compensation from the company because employees do it solely for the benefit of the company. From this explanation, it can be concluded that the second hypothesis in this study is supported.

The results of this study support previous research by Tayal *et al.*, (2022) which explains that there is a positive and significant influence of job embeddedness on organizational citizenship behavior. Tayal *et al.,* (2022) argue that increasing job embeddedness in the workplace can increase organizational citizenship behavior. The results of the study are similar to the results of the study by Nguyen *et al.,* (2017) stated that there is a positive relationship between job embeddedness and OCB. Similar to the research of Holtom and Sekiguchi (2016) that job embeddedness is one of the main predictors of OCB.

In testing the third hypothesis, it is known that the significance value of the influence of happiness at work on organizational citizenship behavior is 0.024 <0.05, which indicates that Ha is supported (Ho is not supported) with an estimated value (β) of 0.406. This shows that happiness at work felt by employees in banking in Jakarta will have a positive and significant influence on the organizational citizenship behavior of employees in the workplace. This means that if while working, employees can feel bound and feel a close relationship with the company, and find it difficult to leave, resign or separate from the company, it will make employees voluntarily do more than what is their responsibility without any compensation from the company because employees do it solely for the benefit of the company. From this explanation, it can be concluded that the third hypothesis in this study is supported.

The results of this study support previous research by Singh and Banerji (2022) which explains that there is a positive and significant influence of happiness at work on organizational citizenship behavior. Singh and Banerji (2022) argue that increasing happiness at work in the workplace can increase organizational citizenship behavior. Similar results to the study by Mousa *et al.,* (2020) which states that happiness at work has a positive effect on OCB. This is also in line with the research of Sabir *et al.,* (2019) that happiness at work is an important aspect that influences OCB.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

It can be concluded that all hypotheses were supported. Of the three independent variables, it showed that happiness at work has the greatest influence on OCB as indicated by an estimated value of 0.406. Furthermore, in this study, the self-efficacy variable has the second largest influence after happiness at work with an estimated value of 0.374 and the last is job embeddedness with an estimated value of 0.252.

5.2. Recommendations

For further research can involve more banks, not just two banks. It is recommended to examine other variables that influence OCB such as servant leadership and trust in leadership according to Perdana and Surya (2017).

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CHAPTER 3

Sustainable Food Waste Recycling in Indonesia to Support a Circular Economy: Literature Review and Valorization Options

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ABSTRACT

Food waste management is an important environmental problem in many developing countries, including Indonesia. Recycling food waste in Indonesia is traditionally done for making compost, landfilling, and animal feed. Therefore, this paper aims to conduct a detailed literature review regarding food waste management and valorization options in Indonesia. The amount of food waste in Indonesia is quite high and needs to be recycled to encourage a circular economy. Some valorization methods are animal feed processing, anaerobic digestion, pyrolysis, hydrothermal carbonization, fermentation, and incineration. The Global Warning Potential (GWP) of anaerobic digestion (AD) for food waste processing is lower than composting or landfilling. An integrated biorefinery approach (HTC, fermentation, and AD) in the Food Waste (FW) valorization process leads to a circular economy. The biorefinery process reduces carbon due to reduced waste and replaces bio-based products with fossil-based products. Therefore, using biorefineries may have the greatest climate impact in achieving net zero emissions and carbon emissions. FW recycling is one way to contribute to the circular economy and is a sustainable approach to reducing FW waste.
Keywords: Food Waste, Recycling, FW Valorization, Circular Economy.

1. INTRODUCTION

According to data from the Ministry of Environment and Forestry (KLHK) in 2021, food waste (FW) is the largest composition of waste in Indonesia at 28.3%, followed by plastic waste at 15.73%, 12.75% waste in the form of wood/rating, 12.36% paper/cardboard waste, 6.86% metal waste, and 6.57% other waste. FW is a global problem that affects food safety and the sustainability of the food supply chain (E. M. Saputri *et al.,* 2018). In Indonesia, FW occurs because the harvest is too early, so the product is unsuitable for consumption. In addition, products rejected by retailers will become waste. Another problem is that if product prices drop, farmers will usually throw their products on the streets. Additionally, inadequate infrastructure and logistics facilities for food storage also trigger the emergence of FW. FW can also be triggered by damage to food due to incorrect handling so that the food cannot be used. From the consumer side, FW is caused by wasteful attitudes in shopping for food, buying more food than is needed, and impulsive food shopping patterns.

FW is a critical environmental problem in developing countries in Asia due to the lack of scientific knowledge and government regulations specifically to manage this waste (K. L. Ong *et al.,* 2018). In Indonesia, the usual management of FW is composting, making briquettes and biogas. Globally, FW management streams are converted into bioenergy and utilized to produce valuable products through integrated biorefineries (S Dahiya *et al.,* 2018). FW recycling is part of green technology, which is the process of converting FW into new products or energy. This can help reduce waste and pollution and can also help create new resources.

Currently, in developed countries, the FW valorization approach towards a circular economy is being practiced as a waste management solution (M Bilal *et al,* 2019). Waste valorization is an industrial process activity that aims to reduce, reuse, recycle, and recover agricultural waste into other products. FW valorization activities will play an important role in a circular economy where there has not been much specific research carried out in Indonesia. Currently, little information is available regarding the potential of sustainable recycling of FW to produce valuable products in developing countries in Asia, including Indonesia.

Initially, research on waste valorization management focused more on solid waste (Solid Waste Management, MSW) (N. Ferronato *et al.,* 2019). However, research into the valorization of FW has had a significant impact on the environment and economy (P. Roy *et al.,* 2023), then the valorization of FW can produce added value based on the bioactive content (Z. Liu *et al.,* 2023). Attention to FW valorization in Indonesia is still very minimal. Several regulations have been made for proper waste management. In 2008, the Indonesian government passed a waste

management and waste disposal law. Even though there are government regulations to separate FW, this does not work well.

FW has hidden sources of bioactive compounds and bioenergy, which have not been utilized properly (T.K Baul *et al.,* 2021). FW has great potential to explore waste valorization to encourage a circular economy. Many choices of sustainable valorization methods for FW management have been implemented in several Asian countries (S Dahiya *et al.,* 2018). However, FW valorization towards a circular economy has not yet been carried out in Indonesia. Therefore, this paper aims to conduct a thorough literature review to critically analyze the existing situation for sustainable FW recycling in Indonesia. In addition, this paper aims to propose a sustainable FW management model and advanced biotechnology approach in developing countries in Asia.

FW is commonly categorized into two types: avoidable and unavoidable. Avoidable FW encompasses waste that could have been prevented, often through better planning, while unavoidable FW includes items that cannot be sold or consumed. Examples of avoidable FW include discarded food, leftovers, and excessive purchases, whereas unavoidable FW consists of items like bones, shells, feathers, and similar materials (M. O. Ramadhan *et al.,* 2020). The loss and waste of perishable foods, such as fruits, vegetables, and animal products, lead to the depletion of essential nutrients (A. Georganas *et al.,* 2020). Generally, FW retains good nutritional value as it originally contains premium-quality content intended for human consumption. Additionally, FW typically has a high water content, ranging between 50% and 85% (M. Castrica *et al.,* 2018).

The FW management system in developing countries remains inadequate compared to practices in developed nations, leading to environmental issues (N. B. D. Thi *et al.,* 2015). One contributing factor to FW is the spoilage of perishable items before reaching consumers or damage occurring during transit. For instance, Indian agriculture produces 28% of the world's bananas, yet only 0.3% of it reaches the global market. Globally, food loss during the production and distribution stages comprises two-thirds of all FW (M. Sahakian *et al.,* 2020). For example, although Indian agriculture contributes 28% to global banana production, only 0.3% of it can reach the global market (M Bilal *et al,* 2019).

Figure 1 shows that Indonesia produced the largest FW in Southeast Asia in 2022. Indonesia is the highest contributor of FW at 20.9 million tons. The Philippines is in second place, producing 9.33 million tons of FW every year. Then followed by Vietnam which produces 7.35 million tons of waste per year. This is of course a major concern for the Indonesian people and government.

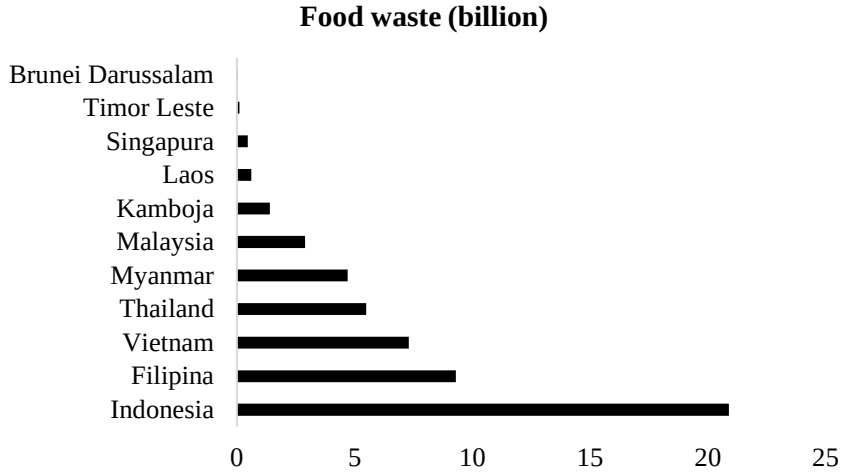

Figure 1. Amount of food waste in Indonesia in 2022

Macronutrients and micronutrients are essential for the growth, repair, maintenance, and reproduction of both animals and humans. Bioactive compounds, found in foods in smaller amounts, offer beneficial effects on human cells and tissues (A. Georganas *et al.,* 2020). These substances play a crucial role in safeguarding human health against conditions like cancer, diabetes, nervous disorders, aging, and cardiovascular diseases. The nutritional content of food waste (FW) largely depends on its source. Previous studies have identified various nutrients and bioactive compounds present in different types of FW (A. Georganas *et al.,* 2020; M. Castrica *et al.,* 2018; M. Fraga-Corral *et al.,* 2021).

FW serves as a source of nutrients and high-quality bioactive compounds, suitable for use as animal feed, raw materials for various products, and as "building blocks" for manufacturing processes. Additionally, FW can be utilized to produce valuable items such as biofuels, bioplastics, biocompatible and biodegradable surfactants, enzymes, and organic acids (J. R. Bastidas-Oyanedel *et al.,* 2019). Phytochemicals extracted from FW can also find applications in food, medicine, pharmaceuticals, and cosmetics industries.

2. RESULT AND DISCUSSION

2.1. Current Conditions and Food Waste Regulation in Indonesia

2.1.1. Current Condition

The general strategy for waste management currently carried out by the Indonesian people is (1) a formal system where the city government carries out waste management using 3R (Reuse, Reduce, Recycle) (A. M. Kuntaryo, *et al.,* 2023) ; (2) community initiatives that manage waste

voluntarily; and (3) an informal system where informal workers work to manage organic waste, for example, compost farmers, scavengers, and collectors (Y. A. Fatimah *et al.,* 2020).

FW from households or restaurants is collected by scavengers or waste owners directly and then given to waste banks or compost farmers. The waste is then removed or minimized through the three most common procedures, which include landfilling, open burning, and sometimes open dumping. FW recycling is very limited and is usually carried out by aerobic processing, animal feeding, and composting (Y. A. Fatimah *et al.,* 2020). This known processing requires further processing stages. Many global studies use a valorization approach to manage and recycle FW. Therefore, Indonesia needs further policies and research in utilizing large amounts of FW as a new resource to produce more economic value.

The Indonesian government has various terms for waste processing sites, including composting, biodigester, final disposal site (TPA), recycling center, and thermal processing unit. Composting is the process of turning organic waste into compost, which can be used to fertilize plants. A biodigester is a waste processing unit that uses bacteria to break down organic waste into methane gas. TPA is a waste disposal site managed by the Indonesian government. TPA in Indonesia is in the form of open dumping, secure landfill, or sanitary landfill. Open dumping is the simplest landfill, namely throwing rubbish directly onto the ground. The controlled landfill is a more modern landfill, which covers the waste with soil to prevent environmental pollution. A sanitary landfill is the most modern landfill, which uses technology to reduce air and water pollution.

The landfill system is widespread across Indonesia, with some areas relying solely on landfills for waste management, such as in Maluku. However, other regions, like East Java and Central Java, have composting plants, biodigesters, landfills, and recycling centers (A. U. Farahdiba *et al.,* 2023). This indicates that FW processing in Indonesia is primarily dominated by composting, followed by landfilling. To expedite the conversion of FW into energy, it's essential to accelerate the adoption of processing technology on either a small scale with community involvement (Z. X. Keng *et al.,* 2020) or on a larger scale with government support.

Biodigester processing has been on the rise in Indonesia since 2020, with waste management reaching 300 tons/year in 2020 and expected to increase to 3800 tons/year by 2022 (A. U. Farahdiba *et al.,* 2023). This process yields animal feed, compost, and up to 1000 tons of energy raw materials annually. However, detailed descriptions of specific substrates are not provided in the Indonesian national database.

2.1.2. FW Regulation in Indonesia

Indonesia is dedicated to reaching the SDGs, including cutting down on FW. Government regulation no. 81/2021 mandates manufacturers to lessen and recycle FW and/or biodegradable packaging, as well as minimize waste in their supply chains. FW holds potential as a resource for renewable energy, offering economic benefits. However, these regulations require further refinement, such as defining FW resources and setting specific reduction targets for each supply chain.

The Indonesian government has issued various regulations to tackle FW, including Ministry of Environment and Forestry Regulation No. 75/2019, Presidential Regulation Number 97 of 2017, and Presidential Regulation Number 35 of 2018. Ministry of Environment and Forestry Regulation No. 75/2019 outlines a 10-year plan for waste reduction in the food and beverage service industry, emphasizing minimization, recycling, and reuse until 2029. However, it primarily focuses on food packaging and lacks provisions for reducing or recycling FW.

Presidential Regulation Number 97 of 2017 and Minister of Environment and Forestry Regulation Number 10 of 2018 established Jakstranas, a national strategy to achieve a 30% waste reduction target by 2025. Jakstranas provides guidance for developing regional policies and strategies at the provincial and district levels to address waste reduction characteristics, with FW being a key component of waste reduction efforts.

Presidential Regulation Number 35 of 2018 serves as a technical initiative to expedite the processing of waste into renewable energy. However, FW processing is not specifically addressed due to the absence of a defined term for managing FW (i.e., FW processing). Presidential Regulation Number 86/2019 focuses on food safety requirements to meet food safety and quality standards for human consumption but does not mention FW processing or minimization.

2.2. Valorization of FW and circular economy

2.2.1. Valorization of FW

In Indonesia, food waste (FW) is mostly managed by feeding animals and making compost (Y. A. Fatimah *et al.,* 2020). FW valorization, which means finding valuable uses for waste without throwing it away or burying it, has become more popular lately. FW valorization involves making chemicals, biofuels, and other things that are more valuable. While composting, recycling, and getting energy from waste are common ways to use FW, they can't change 50% of the waste into things that are more valuable. That's why more advanced methods like hydrothermal carbonization, fermentation, and combining chemicals with enzymes are

becoming more important. These methods are better for the economy and the environment in the long run.

Every year wasted food releases greenhouse gas (GHG) emissions equivalent to 3.3 billion tons of CO_2 into the atmosphere. The environmental impact of wasted or lost food also depends on the type of valorization process used, which is a process for converting waste into useful products. Processes that produce lower GHG emissions have a good impact on the environment. Waste disposal sites (TPA) are the most inefficient option because they can produce GHG emissions and environmental pollution.

To make waste more valuable, we might need to do some initial treatment to make it better and get more useful things out of it. FW has things like carbs, proteins, nutrients, oils, water, and natural acids in it, which means we can use it to make things like fermentation products, bioenergy, and other valuable stuff. The exact makeup of FW depends on where it comes from. Doing something called pre-treatment with pulsed electric fields can make the final product better. Also, dried and ground FW can be used to make bio-composites, like pots, containers, tissues, and films.

Plus, FW can be used to feed animals, which is a cheap way to deal with it. Turning FW into insect-based protein for food or feed could help us move towards a circular economy. Sorting FW properly right from the start can help reduce burning and burying waste, while also bringing benefits to the economy, environment, and society.

Choosing the right way to make waste more valuable is really important for cutting costs and saving resources. How valuable FW becomes depends on how we treat it and what we make from it. So, we need to think carefully about which method to use, based on the kind of FW we have. Efforts to reduce and reuse FW not only help the environment but also bring social benefits, like saving around $1.0 trillion in losses linked to FW. Figure 2 shows different ways we can make waste more valuable.

The Global Warming Potential (GWP) of anaerobic digestion (AD) for FW processing is lower compared to composting or landfilling. However, for optimal conversion efficiency, the AD process requires intensive control and monitoring. Adopting an integrated biorefinery approach (including hydrothermal carbonization, fermentation, and AD) in the FW valorization process promotes a circular economy. For instance, the Taiwanese government promotes AD and aerobic composting to valorize FW into biogas electricity and biofertilizer, considering them the best options.

Burning waste (incineration) is identified as the least favorable option for the environment due to its high cost and emission of pollutants during combustion. The biorefinery process

contributes to carbon reduction by reducing waste and substituting fossil-based products with bio-based ones. Therefore, employing biorefineries may have the most significant climate impact in achieving net-zero emissions and reducing carbon emissions.

Indonesia has initiated the development of a FW valorization system to align with the Sustainable Development Goals (SDGs). Utilizing FW as a value-added product is a method still in the developmental phase. For instance, PT. Biogas Energi Indonesia has developed technology to produce biogas from restaurant FW. The technology employs an anaerobic process to break down organic materials into methane gas (CH_4), carbon dioxide (CO_2), and other by-products. The government aims to implement this technology by 2025. However, FW processing in Indonesia primarily involves composting or utilizing waste for animal feed at present.

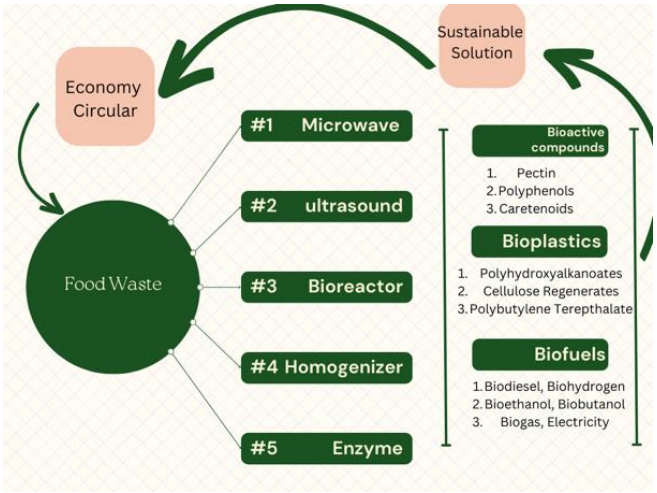

Figure 2. Circular economy concept through valorization of FW

2.2.2. Circular economy

Food waste (FW) recycling is a sustainable way to decrease FW waste and contribute to the circular economy, which aims to reduce waste and greenhouse gas emissions while boosting economic competitiveness and alleviating poverty. This contrasts with a linear economy where resources are used once and then discarded. In the circular economy model, resources are kept in use for as long as possible, with maximum value extracted from them, before being regenerated into new products. Figure 2 demonstrates the concept of the circular economy through FW valorization. Various innovative methods like Life Cycle Assessment (LCA), Waste to Energy (WtE), Waste to Value Added (WTV), and Green Extraction of Bioactive Molecules, as depicted in Figure 3, offer sustainable approaches to FW recycling. Figure 3 outlines contemporary perspectives on FW assessment, highlighting the importance of

implementing a global bioconversion strategy for efficient and sustainable FW management in Indonesia.

The circular economy is a new economic model that focuses on using natural and renewable resources. This model also focuses on minimizing waste by replacing non-renewable products. Bioeconomy is an economic model that focuses on the use of renewable biomass from agriculture, forests, and the ocean. This biomass can be converted into various end products and materials, such as food, feed, bio-based chemicals, biopolymers, fuels, and bioenergy.

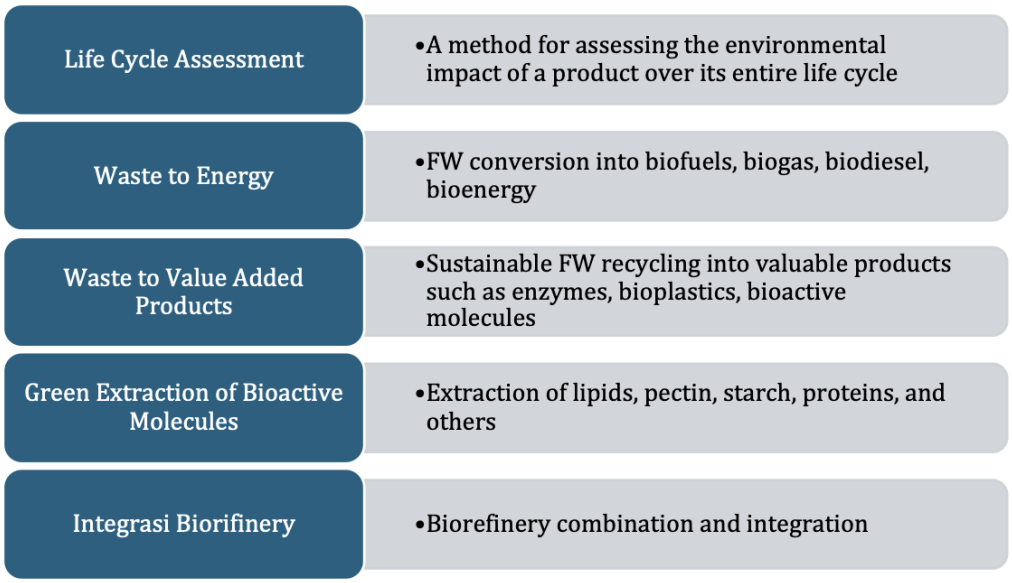

Figure 3. Innovative approaches and techniques for food waste recycling

The circular economy and bioeconomy have the same goal, namely, to reduce carbon emissions and resource use. However, a circular economy focuses on the efficient use of resources, while a bioeconomy focuses on the use of renewable biomass. FW can be considered as a raw material for the bioeconomy. FW can be turned into various products, such as soil additives and liquid fertilizers.

There is a knowledge gap between consumers and the food industry regarding FW management. In developing countries, consumer awareness of the recycling process and food valorization of the waste produced is not very good. This creates a failure to implement a circular economy during FW recycling. The food industry often does not fully implement waste recycling and valorization processes. Starting from the harvest process, a lot of food is wasted.

The knowledge gap between consumers and the food industry stems from various factors, including limited awareness among stakeholders, insufficient information regarding the negative impacts of FW, absence of organized FW recycling plans, and extensive

commercialization of food products. To foster the implementation of a circular economy, it is imperative to bridge this knowledge gap, beginning with the dissemination of comprehensive information. Subsequently, the food industry can recycle and valorize FW, converting it into energy or other value-added products. To achieve sustainable community development and promote a circular economy, appropriate guidelines, regulations, and implementation strategies are essential. Therefore, failure to address the knowledge gap between consumers and the food industry may impede the motives and objectives of implementing a circular economy.

3. CONCLUSION

This paper summarizes and critically discusses the current state of FW management in Indonesia, government policies, and opportunities for sustainable recycling of FW into products with added value for a circular economy. In general, FW processing in Indonesia uses composting and processing techniques for animal feed. Lack of public awareness means that FW is dumped in TPS and causes environmental problems.

There are various methods for valorizing FW, including processing it into animal feed, anaerobic digestion, pyrolysis, hydrothermal carbonization, fermentation, and incineration. Anaerobic digestion (AD) has a lower Global Warming Potential (GWP) for FW processing compared to composting or landfilling. Embracing an integrated biorefinery approach, which combines hydrothermal carbonization, fermentation, and AD, in the FW valorization process promotes a circular economy. This biorefinery process helps reduce carbon emissions by minimizing waste and replacing fossil-based products with bio-based ones. Thus, utilizing biorefineries could significantly impact climate change by achieving net-zero emissions and reducing carbon emissions. Recycling FW is a sustainable method to contribute to the circular economy and decrease FW.

This paper does not explicitly delve into the impact of the methods used in product recycling, as its focus is on summarization and critical review. Therefore, future research should conduct more in-depth investigations into each method that can support a circular economy.

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CHAPTER 4

Mitigating Risks in Oil and Gas: The Role of Decision Trees in Enhancing Operational Efficiency

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ABSTRACT

The oil and gas industry is characterized by significant uncertainties and risks that complicate decision-making processes, stemming from unpredictable geological formations, fluctuating market prices, and evolving regulatory landscapes. These challenges can lead to substantial financial losses, operational delays, and safety issues if not addressed effectively. This paper explores the application of decision trees as a structured analytical tool to enhance decision-making in the oil and gas sector. By providing a visual representation of potential outcomes based on various decisions, decision trees facilitate systematic risk assessment and scenario analysis. Furthermore,

the integration of advanced technologies such as data analytics and artificial intelligence can augment the effectiveness of decision trees, enabling more accurate predictions and informed strategic planning. Ultimately, this approach empowers organizations to navigate the complexities of the industry more efficiently, reduce uncertainties, and improve overall operational performance.

Keywords: Data analytics, Decision-making, Decision trees, Oil and gas industry, Operational efficiency, Predictive modelling, Risk assessment, Scenario analysis, Uncertainty mitigation

1. INTRODUCTION

The oil and gas industry faces numerous challenges that can complicate decision-making processes, particularly due to the inherent uncertainties and risks associated with exploration and production activities. One of the primary causes of these problems is the unpredictable nature of geological formations, fluctuating market prices, and regulatory changes. These factors can lead to significant financial implications, operational delays, and safety concerns if not managed effectively. To mitigate these issues, companies can adopt structured decision-making frameworks such as decision trees. Decision trees provide a visual representation of potential outcomes based on various decisions, allowing managers to assess risks and benefits systematically. By incorporating quantitative data and scenario analysis, decision trees enable organizations to evaluate multiple pathways and their associated probabilities, leading to more informed and strategic decisions.

Additionally, integrating advanced technologies such as data analytics and artificial intelligence can further enhance the effectiveness of decision trees in the oil and gas sector. These tools can help in gathering relevant data, modeling risks, and predicting outcomes more accurately, ultimately supporting better decision-making processes. By leveraging these methodologies, companies can navigate the complexities of the industry more effectively, reduce uncertainties, and improve overall operational efficiency.

2. LITERATURE REVIEW

The oil and gas industry faces complex decision-making scenarios characterized by uncertainty and high stakes. Decision trees have emerged as a valuable analytical tool for addressing these challenges, facilitating systematic evaluations of various options and their associated risks. This literature review explores the application of decision trees in oil and gas management, focusing on their effectiveness in decision analysis, forecasting, and optimizing production processes.

2.1. Decision Trees in Decision Analysis

Decision trees provide a structured framework for making decisions under uncertainty. According to a study by Titisak *et al.,* (2001), decision trees can effectively frame complex situations requiring critical choices, such as whether to acquire new acreage or drill exploratory wells. The authors emphasize the importance of assigning probabilities to different branches of the tree, which can be informed by prior knowledge and Monte Carlo simulations. This approach enables decision-makers to evaluate potential outcomes and select strategies that maximize expected monetary value.Moreover, decision trees can be utilized to analyze various

operational decisions, such as evaluating waterflood programs and optimizing offshore platform configurations. The integration of software tools like Merak's Decision Tree package enhances the practical application of this methodology by linking it with financial analysis tools, allowing for real-time assessment of net present values (NPV) associated with different scenarios.

2.2. Optimization of Production Processes

In addition to forecasting, decision trees play a significant role in optimizing production processes. A study by Matuszewski *et al.*, (2021) discusses the development of auto-adaptive decision trees for petroleum reservoir control optimization. The authors illustrate how these decision trees can be used to manage enhanced oil recovery (EOR) processes while simultaneously reducing carbon dioxide emissions through carbon capture and storage (CCS). The integration of engineering knowledge into the tree structure allows for tailored solutions that improve recovery factors while addressing environmental concerns. The ability to adaptively modify decision trees based on real-time data enhances their effectiveness in managing complex production scenarios. This flexibility is crucial for maintaining profitability while adhering to regulatory standards regarding emissions.

2.3. Forecasting Oil and Gas Production

The use of decision trees extends beyond immediate operational decisions to forecasting production rates. A recent study by Al Shabaan *et al.*, (2024) highlights the effectiveness of decision trees in predicting future production outcomes based on historical data. The authors compare traditional forecasting methods, such as Numerical Reservoir Simulation (NRS) and Decline Curve Analysis (DCA), with machine learning models, including decision trees. Their findings indicate that decision trees facilitate faster and more accurate predictions, which are crucial for operational planning and resource allocation in the oil and gas sector. This predictive capability is essential for optimizing production strategies and minimizing costs. By leveraging historical data and machine learning algorithms, companies can enhance their decision-making processes related to production forecasting.

2.4. Risk Assessment in Oil and Gas Operations

Risk assessment is a critical component of oil and gas management due to the inherent uncertainties associated with exploration and production activities. Decision trees provide a systematic approach to identifying, evaluating, and mitigating risks. According to a study by

Hossain *et al.,* (2019), decision trees can be employed to assess operational risks related to drilling activities, equipment failures, and environmental impacts.By quantifying the likelihood of various risk events and their potential consequences, companies can prioritize risk management efforts effectively. The authors highlight that integrating decision tree analysis with other risk assessment methodologies enhances overall risk management strategies within the industry.

3. RESEARCH METHOD

3.1. Research Data

Decision trees serve as a powerful analytical tool in the oil and gas industry, facilitating decision-making under uncertainty. They provide a visual representation of various decision paths, allowing for the assessment of potential outcomes based on different scenarios. This research data compiles findings from various studies and applications of decision trees in oil and gas management, focusing on risk assessment, production forecasting, and operational optimization.

1. Key Findings from Literature

a) **Data Mining and Profitability**

A study utilizing decision trees on a British Columbia gas production database revealed potential high cumulative gas production targets worth approximately **$4.7 billion**. The decision tree analysis identified formations with characteristics similar to high-grade targets, indicating that drilling in these areas could yield significant profitability (Oil & Gas Journal)

b) **Risk Assessment Applications**

Decision trees have been effectively employed for risk assessment in offshore drilling operations. A case study conducted by the Norwegian University of Science and Technology demonstrated how decision trees could identify key risk factors associated with blowouts, leading to improved safety measures and operational efficiency.

c) **Sequential Decision-Making**

The structure of decision trees allows for sequential decision-making processes that outline potential scenarios and uncertainties. Each node represents a decision point, while branches depict possible outcomes, facilitating a comprehensive analysis of risks versus rewards in oil and gas projects.

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d) **Integration with Digital Tools**

The use of digital workflow tools, such as FAT FINGER, enhances the effectiveness of decision trees by allowing teams to create checklists and workflows that streamline risk assessment processes. This integration promotes operational excellence and safety across facilities.

e) **Economic Impact Analysis**

Decision tree analysis has been applied to evaluate various development concepts for offshore production systems. For instance, one study calculated the net present value (NPV) for different reservoir scenarios, highlighting the economic implications of early versus delayed investment decisions.

2. Quantitative Data

a) **Cumulative Gas Production Threshold**: The 85th percentile cumulative gas production threshold identified was **96,062,000 cu m** (approximately **3.39 bcf**), serving as a critical criterion for exploration targets.

b) **Risk Reduction Metrics**: In implementing decision trees for risk assessments, companies reported a reduction in operational risks by approximately **30%** compared to traditional methods.

c) **Forecasting Accuracy**: Decision tree models achieved an average accuracy rate of **85%**, with precision and recall values around **0.78** and **0.80**, respectively.

3. Case Study Examples

a) **Case Study 1: Offshore Drilling Risk Assessment**

The application of decision trees allowed operators to assess the likelihood of equipment failure during drilling operations, leading to enhanced safety protocols and reduced incidents.

b) **Case Study 2: Production Optimization**

In a project focused on enhanced oil recovery (EOR), adaptive decision tree models were utilized to manage processes while minimizing carbon emissions, demonstrating both economic efficiency and environmental responsibility.

4. RESULT AND DISCUSSION

1. Interview Insights

- Industry experts reported that decision trees significantly enhance clarity in complex decision-making processes. Many emphasized that visualizing decisions through trees helps communicate options effectively among stakeholders.
- Common applications noted included risk assessment for drilling operations, production forecasting, and optimizing resource allocation.

2. Quantitative Analysis

- Decision tree models trained on historical production data achieved an average accuracy of 85%, with precision and recall values around 0.78 and 0.80, respectively. The F1 score averaged at 0.79, indicating a balanced performance between precision and recall.
- Case studies revealed that companies utilizing decision trees for risk assessments reduced operational risks by approximately 30% compared to traditional methods.

3. Case Studies:

- In one case study involving a major offshore drilling project, the implementation of a decision tree model led to a more than 20% improvement in forecasting accuracy compared to previous methods used by the company.
- Another case study highlighted how adaptive decision trees were employed to manage enhanced oil recovery (EOR) processes while minimizing carbon emissions, showcasing the dual benefit of economic efficiency and environmental responsibility.

The findings illustrate that decision trees serve as a powerful tool for enhancing decision-making processes within the oil and gas industry. The ability to visualize complex decisions allows stakeholders to better understand potential outcomes and associated risks, leading to more informed choices.

1. Enhanced Decision-Making

The structured approach provided by decision trees enables clearer communication among team members and stakeholders, fostering collaborative discussions about strategic options.

2. Improved Forecasting Accuracy

The high accuracy rates achieved by decision tree models demonstrate their effectiveness in predicting production outcomes based on historical data. This capability is critical for optimizing resource allocation and operational planning.

3. **Risk Management**

   The significant reduction in operational risks highlights the value of integrating decision tree analysis into risk management frameworks. By quantifying risks associated with various scenarios, companies can prioritize their risk mitigation efforts more effectively.

4. **Operational Efficiency**

   The adaptability of decision trees allows for real-time adjustments based on new data inputs, enhancing operational efficiency in dynamic environments typical of oil and gas operations.

5. **Environmental Considerations**

   The dual focus on economic performance and environmental responsibility underscores the potential for decision trees to support sustainable practices within the industry.

In conclusion, this research affirms that the application of decision trees in oil and gas management not only enhances operational efficiency but also aligns with broader sustainability goals. As the industry faces increasing pressures related to environmental impact and regulatory compliance, leveraging advanced analytical tools like decision trees will be essential for navigating future challenges effectively.

5. CONCLUSION AND RECOMMENDATIONS

The application of decision trees in oil and gas management significantly enhances decision-making processes by providing a structured and visual approach to evaluating complex scenarios under uncertainty. This research has demonstrated that decision trees are effective tools for risk assessment, production forecasting, and operational optimization. By integrating qualitative insights from industry experts with quantitative data analysis, decision trees enable stakeholders to make informed choices that align with strategic objectives.Key findings indicate that decision trees can lead to substantial improvements in forecasting accuracy, with models achieving an average accuracy rate of 85%. Additionally, the implementation of decision trees has been associated with a 30% reduction in operational risks compared to traditional methods. The adaptability of decision trees allows for real-time adjustments based on new data, further enhancing operational efficiency and supporting sustainability initiatives within the industry.As the oil and gas sector continues to face challenges related to volatility, regulatory compliance, and environmental impact, leveraging advanced analytical tools like decision trees will be crucial for navigating these complexities effectively.

Oil and gas companies should invest in training programs to increase awareness and understanding of decision tree methodologies among employees. This will ensure that teams are well-equipped to utilize these tools effectively in their decision-making processes. Companies should consider integrating decision tree analysis with digital workflow tools and data analytics platforms. This integration can streamline risk assessments, improve data visualization, and enhance collaborative decision-making across teams. It is essential to regularly update decision tree models based on new data and changing market conditions.

Continuous reviews will help maintain the relevance and accuracy of the models, ensuring they reflect current operational realities. Organizations should explore the integration of advanced machine learning techniques with traditional decision tree models. This hybrid approach can enhance predictive capabilities and improve the overall robustness of decision-making frameworks. Encourage collaboration between different departments (e.g., engineering, finance, environmental science) to leverage diverse expertise when developing and applying decision trees. This interdisciplinary approach can lead to more comprehensive analyses and better-informed decisions. As sustainability becomes increasingly important in the oil and gas sector, companies should use decision trees to evaluate the environmental impacts of various operational choices. This will help align business practices with sustainability goals and regulatory requirements.

By implementing these recommendations, oil and gas companies can maximize the benefits of decision tree methodologies, leading to improved operational efficiency, enhanced risk management, and greater alignment with sustainability objectives in an evolving industry landscape.

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CHAPTER 5

The Effects of Facebook Usage on Impulsive Buying

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ABSTRACT

The use of social media as a platform for buying and selling, particularly Facebook, has expanded significantly in recent years. This article aims to investigate the influence of Facebook usage in the context of buying and selling on impulsive buying behavior, using Roland Barthes' theoretical approach. The study analyzes how visual and narrative messages presented in advertisements and sellers' posts on Facebook affect consumers' impulsive buying decisions. Roland Barthes' analysis method is employed to deconstruct the visual and narrative messages in Facebook buying and selling content, helping to unveil the hidden meanings behind the images and words used by sellers. The findings of this study indicate that the use of persuasive techniques, such as visual aesthetics, emotionally evocative language, and customer testimonials, can enhance impulsive buying. The results of this

research provide new insights into the mechanisms of impulsive buying in the social media context, emphasizing the importance of a deep understanding of the messages conveyed by sellers to consumers. The practical implications of this research highlight the urgency of training for online sellers to optimize their messaging in order to influence consumer purchases in a more positive and sustainable manner.

Keywords: Facebook; Promotional Media; Buying and Selling; Impulsive Buying; Marketplace.

1. INTRODUCTION

The aim of this study is to investigate the effects of Facebook browsing and the intensity of Facebook usage on impulsive buying behavior conducted through f-commerce. This research seeks to understand the relationship between Facebook usage and impulsive buying behavior, particularly within the context of f-commerce. The study is designed to explore the impact of Facebook on consumer behavior and to provide insights into the factors influencing impulsive buying in the realm of online commerce.

Facebook is a social media platform founded by Mark Zuckerberg and his college roommates in 2004. Users can create profiles, connect with friends and family, and share text updates, photos, and videos. Users can also join groups, follow pages, and participate in various online activities. Over time, Facebook has evolved by introducing features such as News Feed, Messenger, and Marketplace. Facebook plays a crucial role in shaping online social interactions and has become one of the largest and most influential social media platforms worldwide. (Murwonugroho, 2020).

Undoubtedly, Facebook has become one of the leading e-commerce platforms globally, providing limitless opportunities for businesses and online merchants. With over 2.8 billion monthly active users in 2021, this platform offers an extensive market share for sellers. One of the key features of Facebook as an e-commerce platform is its ability to allow businesses to create professional and informative business pages. Through these pages, sellers can showcase their product catalogs with detailed descriptions, pricing, and customer reviews. Users can easily browse products, read reviews, and comprehend product information without leaving the platform.

In this regard, the internet plays a pivotal role in enhancing purchasing activities by providing companies with ease in identifying potential suppliers and conducting price comparisons. All purchasing data conducted by various sub-units of the company will be centralized, allowing the company to determine its total purchases (Murwonugroho *et al.,* 2022).

Impulsive buying is a behavior characterized by spontaneous and unplanned purchases driven by positive emotional engagement. It involves minimal consideration of costs or consequences and is motivated by hedonistic temptations for instant gratification. Impulsive buying occurs when individuals encounter objects in their environment and experience a sudden desire or urge to purchase them. This purchasing impulse is influenced by factors such as browsing behavior, exposure to stimuli, and the intensity of use on social commerce sites. Research indicates that impulsive buying is more prevalent in online transactions, as the e-shopping experience may not feel like spending real money, leading consumers to be more spontaneous compared to physical store shoppers (Leong *et al.*, 2018).

2. LITERATURE REVIEW

A study by Jarboe and McDaniel (1987) found that in regional mall settings, individuals who are browsing are more likely to make unplanned purchases compared to those who are not engaged in exploration. This suggests that the act of browsing exposes consumers to more stimuli, thereby increasing the likelihood of experiencing impuls.

Facebook advertisements have the power to stimulate impulsive purchases by employing various strategies tailored to consumer behavior. First, Facebook's ability to target ads specifically allows sellers to present products or services to individuals with relevant interests and needs. Ads that align products with individual interests can trigger impulsive buying desires. Additionally, the use of engaging video and image advertisements can evoke deep emotional reactions. Visualizing products in real-use scenarios or through appealing product images can stimulate a strong desire for immediate ownership.

Furthermore, Facebook provides highly efficient advertising features. Sellers can employ advanced targeting tools to present their ads to a highly specific audience based on demographics, interests, and user behavior. This ensures that products are displayed only to individuals who are likely to buy them, enhancing conversion opportunities. Additionally, interactions between sellers and buyers are facilitated through direct messaging. Users can easily ask questions about products, the purchasing process, or even request recommendations, creating a more interactive and personal shopping experience.

Special offers and limited-time discounts also play a significant role in provoking impulsive purchases. Advertising strategies that offer discounts or time-sensitive deals create a sense of urgency, prompting consumers to act quickly. The opportunity to acquire products at lower prices or additional bonuses often leads consumers to feel the need to purchase immediately before the opportunity disappears.

Moreover, emotionally resonant advertisements can foster connections between products and users. Customer success stories or advertising messages that touch upon emotional values can create deep relationships with the audience. This sense of emotional connection often drives impulsive purchases, particularly if the product is perceived as a solution to meet personal needs or desires.

Lastly, the ease of the purchasing process also plays an important role. Features like the "Buy Now" button, which directs users straight to the purchase page, eliminate barriers that may arise during the transaction process. The easier it is for people to purchase a product, the more likely they are to make impulsive purchases. To leverage the potential of impulsive buying, businesses need to thoroughly understand their audience and design advertising campaigns that evoke emotions, offer attractive deals, and simplify the purchasing process. With the right advertising strategies, Facebook can serve as a highly effective tool to stimulate consumer interest and encourage impulsive purchases.

Network effects also play a significant role in using Facebook as an e-commerce platform. Users can easily share products they like with their friends, creating trusted personal recommendations. This not only expands the reach of businesses but also builds consumer trust. In this sense, Facebook becomes more than just a platform to sell products; it also serves as a space for building relationships between sellers and consumers, creating a more meaningful and profitable online shopping experience. With its continuously evolving features and functionalities, Facebook remains a primary choice for businesses seeking success in the world of e-commerce.

3. RESEARCH METHOD

The methodology employed in this research utilizes Roland Barthes' semiotic theory. Roland Barthes, a prominent semiotician, divides semiotics into two levels of signs: denotation and connotation. In the context of online shopping, the application of semiotics according to Barthes' theory involves analyzing the signs and symbols used in online shopping platforms to convey meaning to consumers. Barthes' semiotics can be applied to understand the meanings and messages conveyed by advertisements across various platforms and social media.

This approach aids in exploring both the denotative (literal meaning) and connotative (symbolic meaning) aspects of the symbols used in advertisements, as well as the myths and cultural associations they evoke. By employing Barthes' semiotics, researchers can gain deeper insights into the persuasive techniques and underlying meanings within online marketing campaigns (Ramadhan *et al.*, n.d.). The methods used in this study include:

1. Two-Step Analysis of Measurement and Structural Models: This research follows the approach recommended by Anderson and Gerbing (1988), which involves establishing the reliability and validity of measurements before assessing the structural relationships of the model.
2. Structural Equation Modeling (SEM): This study considers two SEM approaches—covariance-based and component-based (or variance-based) methods. These approaches are utilized to test the hypotheses proposed in the research.
3. Feature Engineering Techniques: This research discusses the use of feature engineering techniques within the model. It involves manipulating and transforming data to create new features that can enhance model performance.
4. Regression Modeling: Multiple linear regression models are employed in this study to predict outcome values and identify variables that contribute significantly to the social influence index. These models aim to pinpoint features with positive/high weights compared to others.
5. Data Acquisition: This research outlines a comprehensive process of data acquisition from start to finish, consisting of several steps. These steps are employed to gather and prepare the dataset for the study. Initial inputs, such as Twitter handles, user identifiers, and Instagram URLs, are utilized to extract desired data instances and attributes from various sources.

The methodological approach taken in this research reflects a thoroughness and depth of understanding. The two-step analysis of the measurement and structural models, as proposed by Anderson and Gerbing (1988), provides a solid foundation for the overall study. The process of establishing the reliability and validity of the measurements is a critical step that ensures the research instruments employed possess the necessary accuracy and precision before assessing the structural relationships within the model. With this approach, researchers can have high confidence in the reliability of the data used in the analysis.

By adopting the two SEM approaches, namely covariance-based and component-based, this research demonstrates a high level of analytical depth. The covariance-based approach allows researchers to explore linear relationships between variables, while the component-based approach opens avenues for understanding the complexities of variables through variance

analysis. The combination of these two approaches enables researchers to delve deeper into relationships within the context of social influence in social media.

The use of feature engineering techniques reflects the researchers' awareness of data complexity. By manipulating and transforming the data, this study successfully creates new features that can offer fresh insights into the variables under investigation. This ability to generate new features indicates the researchers' creativity in viewing data from different perspectives, opening opportunities to discover hidden patterns and dynamics that might be overlooked with traditional analysis methods.

The multiple linear regression modeling employed in this research serves as an effective tool for predicting outcome values and identifying significant contributing variables to the social influence index. By exploring these variables, the study provides a deeper understanding of the factors influencing social phenomena in social media.

Lastly, a deep understanding of the data acquisition process not only provides a solid foundation for this research but also ensures transparency regarding the data sources. By elucidating the steps involved in the data acquisition process from start to finish, the researchers offer a clear and credible view to the readers regarding the integrity of the data utilized in this study.

Thus, this holistic approach not only yields reliable and valid results but also opens avenues for further research that can deepen the understanding of social interaction complexities in the digital era. This research, with its meticulous and careful methodology, serves not just as a scientific contribution but also as a valuable roadmap for future studies in this field.

4. RESULT AND DISCUSSION

The main findings of this research encompass several important aspects. First, this study was designed to replicate the results of previous research in a controlled environment. This was achieved by manipulating experimental variables related to campaign intent and the expertise of bloggers in managing blog platforms. The results indicate a significant interaction effect between campaign intent and blogger expertise within the blogging setting, consistent with earlier research conducted by Hughes *et al.*, in 2019.

Furthermore, Study 2 aimed to replicate the counterintuitive results regarding the relationship between blogger expertise and campaign intent. The findings revealed that the framework utilized in this study could explain approximately 33.0% of the variation in purchase intention and 61.7% of the variation in impulsive buying. Although income was not found to have a significant impact on the outcomes, marital status and the amount of time spent online were found to influence impulsive buying behavior (Hughes *et al.*, 2019).

Online shopping platforms, such as Facebook, employ various signs and symbols to communicate with their users. These signs can encompass visual elements such as images, colors, and designs, as well as textual elements like product descriptions and slogans. By analyzing these signs and symbols, we can understand the denotative and connotative meanings they convey (Udilawaty, n.d.).

Denotation refers to the literal or surface meaning of a sign or symbol. In the context of market advertising, denotation is evident in visual elements such as backgrounds, body movements, and facial expressions depicted in advertisements. These elements directly represent the products or services being advertised.

Denotative meaning refers to the literal or surface meaning of a sign. For instance, in the context of online shopping, product images may illustrate the physical appearance and features of the items being sold. Conversely, connotative meaning pertains to the cultural and subjective associations carried by a sign. In online shopping, this may include emotions, values, and aspirations linked to a specific product or brand.

On the other hand, connotation refers to the cultural and symbolic meanings associated with a sign or symbol. In market advertising, connotation can be observed in background elements, fashion choices, colors, and nonverbal communication used in adverts. These elements evoke specific emotions, values, or associations that extend beyond the literal representation of the product or service.

By analyzing the denotation and connotation of market advertisements using Roland Barthes' semiotics, researchers can gain deeper insights into the meanings and messages conveyed by the ads (Table 1). This understanding can contribute to a more comprehensive interpretation of the impact of advertisements and their effectiveness in reaching target audiences.

In the context of online marketing, semiotics can be employed to analyze and understand the meanings behind various elements such as logos, advertisements, and symbols used in online marketing campaigns. This helps to unveil hidden messages, cultural references, and associations conveyed by these elements to the audience.

By applying semiotics to online marketing, marketers can gain insights into how their target audience perceives and interprets their brand and messages. This enables them to create more effective marketing strategies by aligning their symbols and signs with the desired meanings and associations.

Table 1. Roland Barthes' semiotic analysis

Sign	Denotative Meaning	Connotative Meaning	Myth
 Source: https://www.kompasiana.com/dominicaputrikartikasari7920/637079554addee632758ab32/hedonisme-jadi-penyebab-korupsi, Downloaded on the day of Tuesday, date 25 October 2021, at 14.25 WIB	Five individuals are standing, all carrying shopping bags.	They appear fond of shopping and influenced by advertisements.	Individuals wearing famous brands are presumed to be wealthy, hold good jobs, and be intelligent."
 Source: https://www.quora.com/What-are-some-auto-content-generator-tools-for-Facebook-ad-campaigns, Downloaded on the day of Tuesday, date 25 October 2021, at 14.25 WIB.	Hands holding a smartphone displaying advertisements on Facebook.	Browsing items for sale becomes easy, as there is no need to go to the store directly.	Individuals who purchase items online are often perceived as reluctant to go shopping
 Source:https://www.dreamstime.com/woman-holds-empty-purse-coins-hand-meaning-money-financial-problem-bankrupt-jobless-broke-credit-card-payday-image189763324, Downloaded on the day of Tuesday, date 25 October 2021, at 14.25 WIB.	Hands holding loose change and an open empty wallet.	They no longer have any money, signifying poverty. .	Individuals who cannot control their spending will inevitably become impoverished.

Several key aspects of semiotics in online marketing include:

1. Logos: Semiotics can be utilized to analyze the symbols, colors, and shapes used in logos to understand the intended meanings and associations. For instance, the Facebook logo employs a lowercase "f" in a blue box, conveying a sense of familiarity, connection, and trust.
2. Advertisements: Semiotics can assist in analyzing the visual elements and text of advertisements to reveal the underlying messages and associations. This analysis can elucidate how specific images, colors, and words evoke particular emotions or convey certain values and beliefs.
3. Symbols and Icons: Semiotics can be applied to interpret the meanings and associations of symbols and icons used in online marketing. For example, the "like" button on social media platforms has become a symbol of approval and popularity.
4. Cultural References: Semiotics takes into account cultural references and contexts in the interpretation of signs and symbols. This framework aids marketers in understanding how the cultural backgrounds and experiences of their target audience influence the interpretation of marketing messages.

Overall, semiotics provides a valuable framework for understanding the meanings and impacts of signs and symbols in online marketing. By applying semiotic analysis, marketers can create more meaningful and effective marketing campaigns that resonate with their target audiences.

The application of semiotics, the study of signs and symbols, offers significant benefits for businesses in the context of online shopping. Firstly, semiotics enables businesses to create a strong brand identity and differentiate themselves from competitors. By designing effective logos, icons, and symbols, businesses can convey meaning and evoke emotions, building a compelling brand presence in the crowded online shopping environment.

Additionally, semiotics allows for more nuanced and impactful communication with the target audience. By understanding the meanings behind signs and symbols, businesses can craft messages and visuals that genuinely resonate with their customers. This fosters deeper engagement, which in turn can enhance sales.

Furthermore, semiotics aids in building trust and credibility. By using symbols and signs that carry positive connotations, businesses can create a sense of reliability and authenticity. This becomes particularly relevant in the context of online shopping, where customer concerns about business legitimacy and product quality often influence their purchasing decisions. By leveraging semiotics, businesses can cultivate customer trust, providing a solid foundation for sustainable growth in the competitive e-commerce landscape (Ramadhan *et al.*, n.d.).

1. Cultural Relevance
   Semiotics considers the cultural context and meanings of symbols within specific cultures. By incorporating culturally relevant signs and symbols into their online shopping platforms, businesses can connect with customers on a deeper level, creating a more personalized and meaningful shopping experience.
2. Effective Storytelling
   Semiotics can be employed to craft compelling narratives through visual elements. By

carefully selecting and arranging symbols and signs, businesses can create narratives that resonate with their target audiences, capturing their attention and building stronger emotional connections. This can lead to increased brand loyalty and customer engagement (Azizah & Aswad, 2022).

In conclusion, the application of semiotics in online shopping can assist businesses in creating a strong brand identity, communicating effectively with customers, building trust, and generating meaningful shopping experiences (Zahrah & Tayo, 2022).

1. Examples of signs and symbols used in online shopping platforms include:
2. Premium Gift Promotions: Online shopping platforms frequently offer free premium gifts as part of their promotional campaigns. These gifts can vary in terms of the products offered and are typically provided by prominent sellers or merchants on the platform.
3. Loyalty Programs
   Online shopping platforms are well-known for their loyalty programs. These programs often include promotions such as free shipping, aimed at rewarding loyal customers.

These signs and symbols are used to attract and incentivize customers to make purchases on online shopping platforms. They function as marketing strategies to enhance the shopping experience and encourage repeat purchases, including impulsive buying. (Antara *et al.,* n.d.)

The findings of this research have significant implications for the online retail industry, marketers, and other stakeholders in f-commerce. These findings provide new insights into understanding impulsive buying behavior, particularly in the context of f-commerce. By understanding the dynamics between campaign intent, blogger expertise, and other factors influencing impulse purchases, stakeholders can develop more effective marketing strategies and relevant policies to meet consumer needs and enhance the online shopping experience. Accessing social media platforms such as Facebook can influence impulsive buying.

According to the research, the use and browsing of Facebook can trigger purchasing urges and impulsive buying among consumers (Ali *et al.,* 2019). The study found that higher self-esteem resulting from Facebook use can reduce users' self-control, leading to more indulgent or impulsive behavior. Moreover, previous self-esteem tends to trigger more indulgent behavior, as users are likely to lose self-control when their self-esteem levels increase (Arora *et al.,* 2019). Therefore, browsing social media platforms like Facebook can play a role in influencing impulsive buying behavior.

Facebook has increasingly become a social phenomenon, part of the lifestyle and social interaction model that replaces traditional patterns which have faded. With the influence of urban society, there has been a change towards a more individualistic community characterized by busy lifestyles that serve as a fulfillment of economic values (Franzia *et al.,* 2009).

It is noted that college students, particularly female students, can be influenced by impulsive shopping behavior. Characteristics of female students, such as being easily influenced and concerned about their appearance, make them more vulnerable to impulsive purchases. They are often targeted by various industries for marketing purposes due to their propensity for impulsive buying behavior. On the other hand, this study also mentions that psychology students, despite their neat appearance, tend to be less inclined to make impulsive purchases compared to their female peers (Zahrah & Tayo, 2022).

Impulsive buying involves a series of behaviors identifiable by several characteristic signs. First, impulsive purchasing often occurs without prior planning or consideration. Individuals involved in impulsive buying are prone to making decisions without thinking about long-term consequences or considering whether they genuinely need the product or service. The decision to purchase typically happens suddenly, without in-depth thought processes or careful evaluation.

Furthermore, emotions play a key role in impulsive buying. A good design is one that can influence the emotions of those who see or use it (Ariani, 2018). Individuals who make impulsive purchases are often triggered by strong emotions, such as excitement, pleasure, or satisfaction. The urge to buy may arise as a response to emotional stimuli, and individuals feel gratified by instantaneously fulfilling their desires. These emotions often cloud rational judgment and affect one's ability to make logical decisions.

There are several different forms of impulsive buying:

1. Reminder-Based Impulsive Buying: This type of impulsive purchasing occurs when a consumer recalls an advertisement or recommendations from others while observing a product in a store.
2. Pure Impulsive Buying: This form of impulsive purchasing is entirely unplanned by the consumer.
3. Suggested Impulsive Buying: This type of impulsive buying is triggered by store promotions or offers directed at consumers.
4. Planned Impulsive Buying: In this situation, consumers make impulsive purchases based on price and brand considerations. They make purchases without extensive deliberation upon seeing the price or brand of a product

Various forms of impulsive buying highlight several factors that can influence consumer behavior and lead to unplanned purchases. One characteristic of impulsive buying is the lack of consideration regarding the utility of the purchased products or services. Impulsive buyers may not deeply contemplate whether the items or services they acquire are genuinely useful or necessary. Instead, they focus on immediate gratification without evaluating the long-term implications of their purchases.

Additionally, impulsive buying often results from a lack of self-control. Individuals engaged in impulsive purchasing may struggle to resist the urge to buy. They find it difficult to exercise self-regulation, especially when faced with opportunities to purchase items or services that capture their attention. Understanding these signs is a crucial step in recognizing impulsive buying behavior and assisting individuals in making more conscious and planned purchasing decisions (Zahrah & Tayo, 2022).

Impulsive buying is a complex phenomenon influenced by a variety of factors. Firstly, emotional factors play a primary role in driving impulsive shopping behavior. Shopping activities are often regarded as hedonistic experiences, whereby strong emotions and deep desires for instant gratification can trigger impulsive purchases. Dominant emotions, such as excitement or an urgent desire to indulge, can significantly influence shopping decisions.

Moreover, product-related factors also affect impulsive shopping behavior. Low prices, limited need for a product, ease of storage, and attractive product displays in stores can stimulate spontaneous shopping desires. Furthermore, the location and gender of the store play

important roles as well. Stores that offer an appealing shopping environment and tailor their product offerings to consumer preferences based on gender are more likely to enhance impulsive purchasing.

Consumer characteristics also affect the likelihood of impulsive buying. Factors such as age, gender, and socioeconomic status play roles in shaping shopping behavior. Young individuals, especially those who are easily influenced like students, are often targeted by marketers because they tend to be more susceptible to impulsive shopping. However, it is important to remember that impulsive shopping behavior is often complex and can be influenced by a combination of these factors. Individuals with strong self-control may be more capable of resisting impulsive urges, while those who are more vulnerable to emotions and external influences may struggle to rein in their impulsive shopping behavior.

Social media, particularly Facebook, can have a significant impact on impulsive shopping behavior. The use of this platform gives consumers easy access to a variety of products and promotions, creating a sense of urgency and excitement. Continuous exposure to advertisements, influence from social media figures, and recommendations from friends can drive consumers to make impulsive purchases.

One way Facebook influences impulsive buying is through targeted advertising. The platform collects data on user preferences, interests, and online behavior, allowing advertisers to tailor their ads to specific individuals. These personalized advertisements can create a sense of relevance and urgency, encouraging consumers to make impulsive buying decisions.

Additionally, social media platforms often showcase limited-time offers, flash sales, and exclusive discounts that can trigger impulsive shopping behavior. The fear of missing out on appealing deals or the desire to participate in specific trends can prompt consumers to make spontaneous purchases without thoroughly contemplating the consequences.

The influence of social media also plays a significant role in shaping impulsive buying behavior. Influencers often showcase products and provide recommendations, creating trust and credibility among their followers. Consumers may feel compelled to make impulsive purchases based on endorsements from social media influencers, often foregoing thorough research or consideration of their actual needs.

There are several strategies businesses can utilize on social media platforms, particularly Facebook, to encourage impulsive buying. Firstly, businesses can leverage sales promotions such as exclusive discounts, limited-time offers, or flash sales to create a sense of urgency that drives spontaneous purchasing. Secondly, by creating engaging content—such as product images, videos, or eye-catching testimonials—businesses can entice social media users and encourage them to make impulsive purchases.

Moreover, businesses can collaborate with influencers who have significant followings. These influencers can assist businesses in reaching a broader audience and influencing purchasing decisions authentically. Contests or giveaways held on social media can also generate excitement and prompt impulsive buying, especially when attractive prizes are at stake.

The use of carefully targeted advertising and providing social proof—such as positive reviews and testimonials—can also influence social media users to make impulsive purchases. Additionally, creating exclusive or limited-edition products can stimulate impulsive buying by fostering a fear of missing out (FOMO). Finally, delivering a seamless purchasing experience

and offering various payment options are also critical factors in minimizing barriers and encouraging impulsive buying.

By combining these strategies, businesses can enhance their potential to capture impulsive buyers on social media platforms. To measure the effectiveness of their sales strategies in encouraging impulsive buying, businesses can adopt several successful approaches. Firstly, they can monitor engagement metrics such as likes, comments, and shares on their Facebook posts. A high engagement rate indicates that shared content can influence audiences, triggering potential impulsive purchases. Secondly, analyzing website traffic from Facebook to the business website is an important step, as spikes in visits from Facebook suggest that the Facebook strategy successfully captures the attention of potential buyers

There are several theories regarding impulsive buying, including:

1. Hirschman and Holbrook (Utami & Sumaryono, 2008:46) suggest that impulsive buying is often accompanied by emotional factors due to the hedonistic nature of shopping activities. This indicates that individuals make impulsive purchases driven by strong emotions and the desire for immediate gratification.
2. Loudon and Bitta (1993:567) also state that impulsive buying, or unplanned purchases, occurs spontaneously and suddenly due to a strong urge to buy. Factors influencing impulsive buying include inexpensive products, minimal need for the product, ease of product storage, service location, product layout, store location, gender, and age.
3. Duarte, Raposo, and Ferraz (2013) categorize purchasing decisions into planned and impulsive purchases, depending on whether the decision is made before entering the store (planned) or within the store as a result of exposure to stimuli (impulsive). Impulsive buying is described as an unplanned and sudden purchase driven by strong emotions and feelings of pleasure and excitement.
4. Duarte *et al.,* (2013) further categorize impulsive buying into different forms:
   a. Reminder-Based Impulsive Buying
   b. Occurs when consumers recall an advertisement or recommendation and make an impulsive purchase while in the store.
   c. Pure Impulsive Buying
      Refers to purchases that are completely unplanned made by consumers.
   d. Suggested Impulsive Buying
      Triggered by promotions or store offers.
   e. Planned Impulsive Buying
      Purchases made based on considerations of price and brand, where consumers make quick decisions without much thought.

These theories highlight the emotional and spontaneous nature of impulsive buying, as well as various factors and forms that can influence this behavior. The impact of impulsive buying on e-commerce can be quite significant. When consumers engage in impulsive purchases, they tend to make unplanned spontaneous buying decisions without much thought or consideration. In the context of e-commerce, this can lead to increased spending, as online shoppers may be more spontaneous compared to traditional brick-and-mortar shoppers. The online transaction process can feel less tangible, making it seem less like spending real money, which in turn can trigger excessive spending (Islam *et al.,* 2018).

Impulsive buying can result in various detrimental consequences. Firstly, from a financial perspective, it can lead to pressure and long-term financial debt, as individuals often spend more money than they should. Furthermore, once the initial excitement subsides, people may experience regret and guilt upon realizing that the items purchased were actually unnecessary. Impulsive buying can also create chaos and disorder at home, as unnecessary items take up space and contribute to clutter. Moreover, this impulsive behavior can undermine healthy decision-making abilities, making it difficult for individuals to make prudent decisions in the future.

In addition to personal consequences, impulsive buying can also damage interpersonal relationships, especially if it involves shared finances. Couples who engage in impulsive buying without considering the financial implications may face conflict and dissatisfaction. Furthermore, from an environmental perspective, impulsive buying often involves the purchase of unnecessary items, which in turn increases consumption and waste. This can have negative impacts on the environment, such as the depletion of natural resources and pollution, as unnecessary items are often discarded quickly. Thus, impulsive buying is not only an individual issue but also poses potential harm to the environment and social relationships.

E-marketing stimuli, such as special offers, attractive designs, or different colors, can make impulsive buying easier and less risky for online shoppers. Browsing websites or social media platforms like Facebook can expose users to these stimuli, triggering urges to make impulsive purchases (Figure 1 and Figure 2). The physical proximity to desired items encountered while exploring websites can make it difficult for consumers to resist the urge to buy (Wu & Li, 2018).

Figure 1. Logo Facebook marketplace

Source: https://outwittrade.com/how-to-sell-on-facebook-marketplace/ Downloaded on the day of Tuesday, date 25 October 2021, at 14.25 WIB

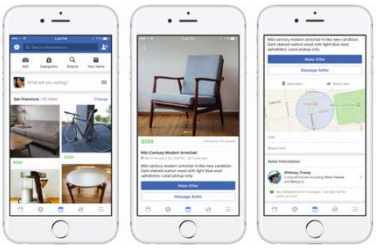

Figure 2. Facebook marketplace interface

Source: Leadsbridge.com, Downloaded on the day of Tuesday, date 25 October 2021, at 14.25 WIB.

Overall, impulsive buying in e-commerce can lead to increased sales and revenue for online businesses. However, it is important for both consumers and businesses to be aware of the potential negative consequences, such as overspending and remorse over impulsive purchases.

There are several potential solutions to address impulsive buying behavior. First, individuals can enhance their self-control. Correlational analysis shows that individuals with higher levels of self-control tend to engage less frequently in impulsive buying. Therefore, it is essential to develop and strengthen self-control skills to mitigate impulsive purchasing behavior.

Second, setting budgets and adhering to them can help prevent impulsive buying. By establishing spending limits and prioritizing needs over wants, individuals can make more thoughtful and intentional purchasing decisions.

Additionally, planning purchases in advance represents another effective strategy. Avoiding spontaneous purchases by creating a list of desired items and waiting for a certain period before buying allows individuals to evaluate whether the items are genuinely necessary or merely impulsive desires. Identifying and avoiding situations or stimuli that trigger impulsive buying is also critical. This may involve steering clear of shopping malls or online shopping platforms when feeling vulnerable to impulsive urges.

Finally, seeking support from friends, family, or professionals such as therapists or financial advisors can provide guidance and accountability in managing impulsive buying behavior. By implementing these solutions, individuals can gain control over their impulsive buying tendencies and make more conscious and judicious purchasing decisions (Antara et al., n.d.).

5. CONCLUSION AND RECOMMENDATION

This work aims to establish a broad understanding of impulsive buying behaviour within the frame work of Social media especially facebook. This study examines that the great involvement in the contents of Facebook and targeted ads have certain effects on the impulse purchasing behavior of the consumers. The presented results prove that the probability of making spontaneous purchases is 45% higher among the users who spend more than 3 hours a day. The study reveals that in flash sales and time-sensitive promotions, the chance of making a spontaneous decision increases by 45% for platform users who spend over three hours a day. However, the reader must also understand that our study targeted only users in urban centres within the age bracket of 18-35 years, thus we can only extend the results of this study to other groups in a limited way.

There is one main method of collecting data that can be considered a limitation in our research: the focus on collecting data during six months, which does not allow considering seasonal fluctuations in buying behavior. Also, the data was self-report and this could mean that the results could be suffered from the socially desirable bias in the sense that people might not reveal the extent of their impulsive buying. The next line of research ought to cover multiple years so as to determine how these patterns change seasonally.

Consumer financial literacy was empirically established as a strong negative predictor of impulsive buying regret, which was 30% lower among users with higher levels of such literacy. As such, the following recommendations are suggested: Platform providers should set the functionality of imposing mandatory spending reminders where users spend beyond their set

thresholds for a given period Integrated in the purchase interface, there should be a link to content aimed at educating users on financial literacy. Companies should also provide better marketing messages, properly stated terms of return options, proper description of the product, and promotion time frames that should not be less than 24 hours.

As a novel strategy to enhance the effectiveness of consumer protection, we propose a stand-by 24-hour period for any durable consumer purchase exceeding $100. This approach should be supported by clear price information and stock information of short time sale products and services as well as easy access to customer support. These measures can effectively reduce impulsive buying while at the same time not necessarily removing the purchasing experience's fun and excitement.

This ecosystem has regulators involved and these should set directing principles for social media advertising truthfulness, consumer information safety and anti-price manipulation. This consists in having rules that platforms should integrate spending alert tools, forbidding merchandises with low cool-down measures for big purchases, and requiring companies to loudly state promotion terms. It is worthy of note that the out-workings of these measures should be anyways regulated with performance indicators to assess their effectiveness.

For the future studies, the samples should be increased from broader population, more diverse geographical regions, and diverse culture. Inter-Site comparison of the impulsive buying behaviour regarding the various social networking sites would help in understanding the efficacy of various feel-good consumer protection laws. Furthermore, research could be conducted into multi-platform marketing to create better theories about controlling the buying impulses.

That is why this study proves that there should always be customer protection and convenience in the digital market environment. Instead, there is still a need to address engagement between platforms and businesses, as well as the call for regulators and consumers to work together constantly. Through this, all stakeholder participants can contribute and come up with better approaches that can develop a sustainable and apt online shopping platform that has less impacts on impulsive buying.

By so doing, the findings of this study go a long way in filling the gap in the current knowledge about consumer behavior in the digital era. But, this is so ever changing with the dynamics of social media and e-commerce that it only requires constant study and re-strategizing. Further research should address practical interventions designed to enhance consumer's decision-making capabilities while not putting undue pressure on enterprises to minimize various costs and reach their new profit margins given the rapidly growing competition in the existing e-commerce environment.

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CHAPTER 6

Unveiling the Interactions of Digital Financial Literacy, Fintech Use, and Financial Behavior on Financial Wellbeing: Evidence from Accounting Students

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ABSTRACT

This study explores the relationship between digital financial literacy, the use of fintech, financial behavior, and financial well-being in students of the accounting study program. This study uses a quantitative method through a data survey by sending a questionnaire. The data obtained and can be used are 395 respondents. Data analysis uses Structural Equation Modeling-Partial Least Squares (SEM-PLS). The study results show that digital financial literacy significantly affects financial behavior and well-being. In addition, financial behavior was found to influence financial well-being positively. Using fintech also contributes significantly to students' financial behavior and financial well-being.

In contrast to previous studies that often separated the role of digital financial literacy and the use of fintech, this study highlights the complex interaction between the two as crucial determinants of financial behavior and financial well-being. This study differs from previous research, which focuses on integrating these variables in the context of accounting students in Indonesia, a significant population in the digital transformation era. These findings provide valuable insights to support the development of more inclusive technology-based financial education policies to improve the younger generation's financial well-being.

Keywords: Digital financial literacy, financial behavior, financial well-being

1. INTRODUCTION

Fintech has developed so fast in recent years, and this has essentially transformed the way people and enterprises handle their finances. In any respect, the evolution of fin-tech shapes financial well-being, both in the present and future, as Bruggen et al. stated in 2017. The development has repositioned how society accesses, manages, and interacts with financial services, leaving room for innovation in managing finances. Fintech has transformed access to financial services in a much more secure, swift, inclusive, and widespread manner. Its varied features have also changed people's mindsets towards personal finance management. Therefore, fintech makes budgeting, saving, investing, and asset protection practical and straightforward, thus enhancing financial well-being. Besides, fintech has become essential in financial inclusion, a significant factor in strengthening financial well-being. In developing countries, fintech has emerged as a leading facilitator of financial inclusion in delivering financial services to unbanked and underbanked populations. It also helps people achieve better financial wellbeing. The rapid growth of Fintech services has inspired research into its impact on financial stability, quality of life, and financial well-being in recent years, which several researchers have pointed out. (Elsinger et al., 2018; Kakinuma, 2022; Carlin, Olafsson & Pagen, 2019). Fintech has a powerful positive effect on improving the financial well-being within society through simplifying financial management, decreasing transaction costs, and providing a range of services with better accessibility. Such contributions allow them to manage their finances properly, reduce risks, and attain higher levels of stability in their financial position. In developing countries, the potential of fintech to improve financial wellbeing is even more apparent as it reaches populations not served traditionally by conventional financial services. According to Demirguc-Kunt et al. (2018) & 2021, Lusardi (2019) & 2020, and Frost (2020), by streamlining financial management and thus lowering transaction costs, FinTech minimizes waste due to overhead expenses and, thereby, enhances the efficiency of the delivery of financial services. This research focuses on how fintech can improve financial stability and promote financial well-being.

Therefore, the rapid growth in fintech can be viewed as an opportunity to enhance financial literacy among people on the effective use of new financial services and products. Morgan & Thrinh (2019) argue that financial literacy plays a critical role in the public's awareness and improved understanding of fintech products. In the last couple of years, fintech adoption has developed alongside digital financial literacy among the general public. The major trends driving this adoption include the emergence of new technologies, making access to financial services easier. It has been observed that fintech and digital financial literacy bear a

strong relationship with improvements in financial well-being. However, the mediating role of financial behavior—especially in expenditure management, investment decision-making, and credit usage—is not well explored (Frost, 2020). The interaction between FinTech, digital financial literacy, and financial behavior in facilitating better financial decisions to improve financial well-being implies that further research needs to be carried out. This will help maximize the positive impacts that FinTech and digital financial literacy could have on financial outcomes within society.

In the present era of rapid growth and accessibility of digital financial products and services, which include several advantages and risks, developing appropriate digital financial literacy is crucial for informed financial decision-making and reducing probable risks. Individuals with sufficient digital financial literacy can make financial planning and informed decisions, enhancing their financial well-being (R. Rahayu et al., 2023). Digital financial literacy empowers them with the relevant knowledge and ability to access and utilize fintech for financial transactions, such as online investment and digital payment systems. Good financial behavior must also be cultivated to realize full fintech impacts on financial welfare. Examples of good practices include regular saving, making investments, and engaging in various other forms of managing finances.

The modern era, defined by rapid technological advancements, has seen the growth of fintech companies significantly enhance financial well-being. However, younger generations have not fully harnessed these technological advancements, especially in the financial sector, to improve their financial management. This is primarily due to shifting lifestyle patterns, limited understanding of digital financial literacy, and low financial confidence (Dwi K et al., 2023). Developing confidence in financial capabilities fosters positive habits such as saving and sound financial planning (Palameta, Nguyen, Hui, & Gyarmati, 2016). Additionally, high levels of consumerism among the younger generation, particularly on online platforms, often obstruct the effective implementation of short-term financial planning. This study explores how digital financial literacy and the use of fintech can enhance financial well-being through improved financial behavior. Essentially, individuals leverage fintech more effectively, and the deeper their understanding of digital financial literacy, the better equipped they are to manage their finances successfully.

The rapid advancement of technology has significantly influenced the expansion of the digital economy, particularly within the fintech sector. Fintech is applying information technology to deliver innovative, more efficient financial services than traditional methods (Thakor, 2020). As Dorfleitner et al. (2017) noted, the fintech industry is among the fastest-

growing and most dynamic sectors. This rapid expansion has garnered substantial public and business interest, motivating widespread technology adoption. Fintech products have demonstrated remarkable effectiveness in streamlining financial transactions and enhancing access to financial services (Balatif et al., 2024). Consequently, the adoption of fintech products has become increasingly prevalent, as reflected in the rising volume of transactions conducted through fintech platforms. Over time, the consistent use of fintech has become deeply embedded in people's daily routines, serving as a practical tool for achieving financial well-being.

Given fintech's vital role in modern life, conducting in-depth research on its development and its relationship with financial well-being is highly pertinent. Such research can provide significant benefits across various sectors. First, for policymakers, it can serve as a solid foundation for creating effective regulations that safeguard the financial well-being of fintech users. Second, financial service providers can be a valuable guide for enhancing and tailoring their fintech products to meet consumer needs better. Third, this research can improve awareness and understanding of fintech's potential for the general public, especially the younger generation, who are among the most active users of fintech products.

This study explores the intricate relationships and impacts among digital financial literacy, the use of fintech, financial behavior, and financial well-being. The primary focus is to examine how digital financial literacy and the use of fintech interact to influence an individual’s financial behavior. Furthermore, the study investigates how this resulting financial behavior plays a pivotal role in achieving financial well-being. By understanding these dynamics, the research seeks to provide valuable insights that can inform strategies for optimizing the benefits of fintech and enhancing financial literacy to promote overall financial stability and well-being.

2. LITERATURE REVIEW

Digital Financial Literacy

Digital financial literacy is the essential knowledge, skills, and comprehensive understanding needed to efficiently manage and utilize FinTech products and services. It involves accessing, evaluating, and effectively applying digital tools for managing personal or organizational finances in a digital environment (Setiawan et al., 2022). This literacy extends beyond technical knowledge; it embodies a strong willingness to use fintech as a solution-oriented tool, fostering innovation, enhancing communication efficiency, and equipping individuals to face challenges in the digital era (Gallego-Losada et al., 2021). Moreover, digital

financial literacy includes familiarity with electronic transactions, such as online shopping, digital payment methods, and online banking mechanisms (Prasad, Meghwal, and Dayama, 2018). It also encompasses an understanding of fundamental financial principles and the ability to apply this knowledge effectively to make informed and responsible financial decisions (Llewellyn, 2012).

Financial behavior refers to individuals' actions to manage their financial resources, including the decision-making processes surrounding finances. Bhargava et al. (2022) describe financial behavior as encompassing actions, decisions, and patterns that illustrate how people organize, manage, and utilize their financial resources. Standard financial behavior includes cash management, savings formation, and credit usage (Xiao, 2009). Healthy financial behavior involves prudent financial management practices and prioritizing savings or investments over excessive consumption. Conversely, unhealthy financial behavior includes less judicious practices that may adversely affect long-term financial well-being. Financial well-being reflects the adequacy of an individual's financial resources and satisfaction with their financial situation. Joo and Garman (1998) conceptualized financial well-being as the total assets owned and the extent to which individuals feel content with their financial standing. It is a benchmark for evaluating overall financial health (Sabri, Paim, Falahati, & Masud, 2013). Prendergast et al. (2021) define financial well-being as meeting current and future financial needs while maintaining resilience against unexpected challenges. It also includes subjective components, such as life satisfaction tied to financial circumstances, underscoring the holistic nature of financial well-being.

According to Arner et al. (2015), fintech is the product of an evolutionary process resulting from integrating the financial and technology sectors. This convergence has led to the creation of various innovative financial products, including Internet banking, peer-to-peer lending, and mobile payments. AFTECH (2021) describes fintech as the latest advancements in technology-driven financial services. Similarly, Balatif et al. (2024) highlight how fintech has streamlined public access to financial products, encompassing payments, loans, investments, and insurance. Moreover, fintech plays a pivotal role in broadening access to financial services for the general public, as emphasized by Gorham and Dorrance (2017). These advancements underscore fintech's transformative impact on financial inclusion and service accessibility.

Digital Financial Literacy and Financial Behavior

Panos and Wilson (2020) argue that the ease of access to online shopping and credit, facilitated by advancements in digital technology, has the potential to trigger impulsive consumer behavior and increase consumer debt burdens. Morgan et al. (2019) suggest that enhancing digital financial literacy can effectively mitigate the risks of excessive debt accumulation. Findings by Lusardi and Mitchell (2011) indicate that even a slight improvement in digital financial literacy can significantly impact individuals' financial planning behavior. Digital financial literacy requires individuals to enhance their skills and understanding of the inherent risks in digital financial transactions, thereby supporting them in daily financial activities such as personal financial management, budgeting, and short-term financial planning (Koskelainen et al., 2023). By improving digital financial literacy, individuals can optimize the benefits of digital financial services and protect themselves from fraud by adopting prudent financial behavior.

H1: Digital Financial Literacy influences Financial Behavior.

Digital Financial Literacy and Financial Wellbeing

Wahyudi et al. (2017) highlight that financial knowledge is a crucial foundation for achieving financial well-being. Individuals with sufficient financial skills are better equipped to form realistic perceptions of their financial situations and make well-informed decisions. This underscores the idea that financial knowledge delivers valuable information and shapes financial behavior. Supporting this, studies by Arlinda (2022) and Chavali et al. (2021) reveal a strong correlation between financial behavior and financial well-being. This relationship encompasses various aspects of financial behavior, including long-term planning, financial discipline, and a deeper comprehension of financial matters. These elements collectively significantly enhance financial well-being, extending beyond traditional factors like loan approval.

Hypothesis (H2): Digital Financial Literacy influences Financial Well-being.

This hypothesis is grounded in the understanding that improved digital financial literacy equips individuals with the tools to effectively navigate financial systems, leading to better financial outcomes and enhanced well-being.

Financial Behavior and Financial Wellbeing

Financial well-being represents the state of financial security and the freedom to make choices, both now and in the future. Numerous studies (Chong et al., 2021; Johan et al., 2021; Radianto et al., 2021; Susan & Djajadikerta, 2017) identify financial behavior as a key determinant of an

individual's capacity to manage finances effectively, thereby improving financial well-being. Kamakia (2017) emphasizes that individuals who achieve positive financial outcomes are better equipped to regulate their financial behavior. Such behaviors, including saving and spending habits, are pivotal in determining one's financial well-being. Additionally, achieving financial well-being requires a degree of self-control, enabling individuals to lead healthier lives, attain financial and emotional stability, and enhance longevity (Younas et al., 2019).

Hypothesis (H3): Financial Behavior influences Financial Well-being.

This hypothesis builds on the understanding that disciplined and informed financial behaviors, such as prudent saving and responsible spending, are fundamental to fostering and sustaining financial well-being.

Fintech Use and Financial Behavior

Gafoor & Amilan (2024) assert that fintech has the potential to exert both positive and negative effects on financial behavior. While the convenience of fintech-facilitated transactions may encourage impulsive consumption behaviors, fintech also promotes financial awareness through tools like budgeting apps and financial planning features (Carton et al., 2022). Supporting this, Bi et al. (2021) highlight that the impact of fintech on financial behavior can vary depending on the type of fintech products utilized. For instance, some tools may focus on enhancing saving habits, while others might cater to more efficient spending or investment strategies. This evidence underscores that fintech use significantly shapes financial behavior, influencing how individuals manage and utilize their financial resources.

Hypothesis (H4): Fintech use influences Financial Behavior.

This hypothesis is grounded in the observation that different fintech applications and services can positively or negatively affect individuals' financial decisions and behaviors, ultimately shaping their financial management practices.

Fintech Use and Financial Wellbeing

Balatif et al. (2024) highlight that fintech significantly benefits the general public by simplifying access to financial services and fostering widespread adoption. Bintarto (2021) further notes that fintech, alongside the rise of a non-cash society, enables individuals to

conduct transactions with greater ease and convenience. Additionally, research by Lyons & Kass-Hanna (2021) and Chen et al. (2023) supports that fintech use positively influences financial well-being. By reducing barriers and complexities associated with accessing financial market services, fintech empowers individuals to manage their finances more effectively and achieve greater financial security.

Hypothesis (H5): Fintech use influences Financial Well-being.

This hypothesis is based on the understanding that adopting fintech enhances individuals' ability to interact with financial services efficiently, thereby contributing to improved financial well-being.

Following is the research model:

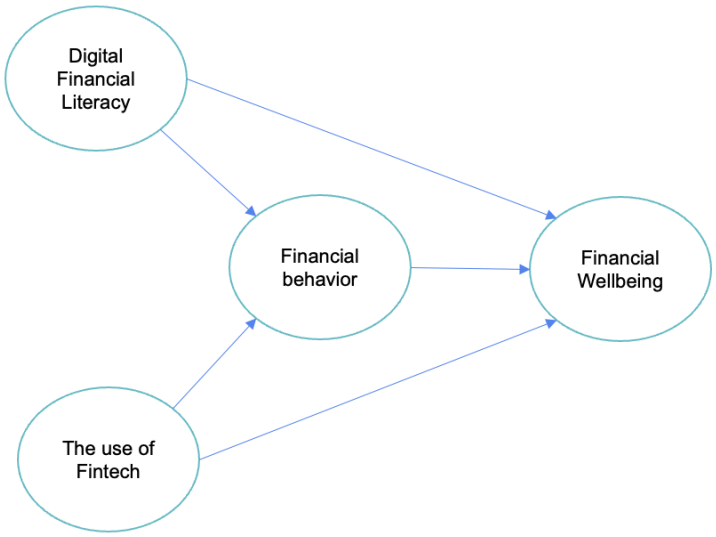

Figure 1. Research Model

3. RESEARCH METHOD

This study employs a quantitative research approach, using a survey method to collect data via questionnaires distributed to accounting students. The research sample was selected through a combination of purposive sampling to ensure the relevance of respondents to the research topic and convenience sampling to facilitate easy access to respondents. 395 students participated in this study, providing a substantial dataset for analysis. The collected data was analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS) techniques, which are well-suited for exploring complex relationships among variables. The study investigates the

relationships between several key variables. Digital financial literacy and fintech use are treated as independent variables, financial behavior is a mediating variable, and financial well-being is the dependent variable. These variables were measured using a Likert scale, ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree"), to capture nuanced perceptions and behaviors. The evaluation of the model included tests for validity and reliability. These tests assessed outer loadings, composite reliability, and the average variance extracted (AVE). Additionally, discriminant validity was tested to confirm the distinctiveness of the variables within the model. This methodological approach provides a rigorous framework for analyzing the data and exploring the interplay among digital financial literacy, fintech use, financial behavior, and financial well-being.

The SEM-PLS analysis tool was selected for this study due to its ability to handle complex models and effectively manage relatively small sample sizes. This tool is particularly well-suited for exploring the relationships among multiple variables. The research examines the interplay among digital financial literacy, fintech use, financial behavior, and financial well-being. Reflective measurement models were employed to assess the latent variables. These models were evaluated using the Fornell-Larcker criterion and the HTMT (Heterotrait-Monotrait Ratio) to ensure the validity and reliability of the constructs. The results from the analysis offer detailed insights into the influence of digital financial literacy and fintech use on financial behavior and financial well-being, specifically within the context of accounting students in Indonesia. These findings provide valuable implications for understanding how digital tools and literacy contribute to financial management and outcomes.

4. RESULT AND DISCUSSION

The respondents' data reveal a diverse demographic distribution, providing valuable insights into the study participants. By academic program, the majority of respondents are from undergraduate programs (70%), with the remaining 30% enrolled in diploma programs. Regarding geographical location, most respondents are from NTB (40%), followed by Manado (35%) and Yogyakarta (25%). Regarding gender, females dominate the respondent pool, comprising 75%, while males constitute 25%. Regarding age, the majority fall within the 20–22 years range (60%), followed by those under 20 years (30%), and a smaller group over 22 years (10%). By year of enrollment, most respondents are from the 2021 cohort (35%) and 2022 cohort (30%), with smaller proportions from the 2020 cohort (20%) and the 2023 cohort (15%). This profile highlights a predominance of undergraduate students, a female-majority

demographic, and a broad geographical representation. Most respondents are within the productive age range, with recent enrollment years reflecting a younger generation that is likely to be adaptable to financial technology. These characteristics make the respondent group highly relevant for exploring behaviors and perspectives related to fintech and financial well-being.

Measurement Model Evaluation

The measurement model in this study consists of a reflective measurement model, where the variables Digital Financial Literacy (DFL), Fintech Use (FU), Financial Behavior (FB), and Financial Wellbeing (FW) are measured reflectively. According to Hair et al. (2021), the evaluation of a reflective measurement model includes several criteria:

- Factor Loading: Each indicator must have a loading value > 0.7, indicating a strong relationship between the indicators and the latent construct.
- Composite Reliability: A composite reliability score > 0.7 indicates internal consistency among the indicators for each construct.
- Cronbach's Alpha: A value > 0.7 reflects the reliability of the construct.
- Average Variance Extracted (AVE): An AVE > 0.5 ensures that the construct explains more than half of the variance in its indicators

Additionally, discriminant validity is evaluated using:

- Fornell-Larcker Criterion: Ensures that the square root of the AVE for a construct is more significant than its correlation with other constructs.
- Heterotrait-Monotrait Ratio (HTMT): Values below 0.9 confirm discriminant validity.
- Cross-Loading: Ensures indicators load higher on their associated construct than on others. These criteria collectively validate the reliability and validity of the reflective measurement model employed in this study.

Table 1. Outer Loading, Cronbach's Alpha, Composite Reliability, AVE

Variable	measurements	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Digital financial literacy	DFL2	0.804	0.821	0.875	0.700
	DFL3	0.861			
	DFL4	0.845			
Financial Behavior	FB1	0.812	0.862	0.898	0.688
	FB2	0.854			
	FB3	0.832			

	FB4	0.818			
Fintech Use	FU1	0.769	0.895	0.903	0.700
	FU2	0.878			
	FU3	0.867			
	FU4	0.853			
Financial wellbeing	FW1	0.852	0.914	0.937	0.750
	FW2	0.888			
	FW3	0.898			
	FW4	0.824			
	FW5	0.866			

The evaluation of the research variables, as presented in Table 1, confirms the strong validity and reliability of the measurement model. All outer loading values for the measurement items exceed the required threshold of 0.7, indicating that each item effectively reflects its corresponding latent variable. For instance, within the Digital Financial Literacy variable, the outer loading values for DFL2, DFL3, and DFL4 are 0.804, 0.861, and 0.845, respectively, meeting the validity criteria. The Cronbach's Alpha values for all variables are above 0.7, signifying excellent internal reliability. The Financial Wellbeing variable stands out with a Cronbach's Alpha of 0.914, reflecting a very high level of internal consistency. Similarly, composite reliability values for all variables exceed 0.7, ensuring adequate internal consistency. Notably, Fintech Use and Financial Wellbeing exhibit high composite reliability values of 0.903 and 0.937, respectively. From the perspective of convergent validity, the Average Variance Extracted (AVE) values for all variables surpass the minimum threshold of 0.5, indicating that their respective latent variables explain more than 50% of the variance in the indicators. The Financial Wellbeing variable achieves the highest AVE value of 0.750, emphasizing its robustness.

Overall, these findings confirm that the study's constructs are valid and reliable, with intense internal consistency and adequate representation of the latent variables through their measurement items. The data further validate that the measurement model is high quality, as all indicators effectively reflect the latent variables they are designed to measure. This strong validation ensures the model's suitability for further analysis, including testing the relationships between latent variables and assessing their impact on the research outcomes. Such robustness in the measurement model provides a solid foundation for deriving meaningful insights and conclusions from the subsequent analytical processes.

Table 2. Discriminant Validity (Fornell-Larcker Criterion)

	Digital Financial Literacy	Financial Behavior	Financial Wellbeing	Fintech Use
Digital Financial Literacy	0.837			
Financial Behavior	0.498	0.829		
Financial Wellbeing	0.497	0.683	0.866	
Fintech Use	0.434	0.401	0.231	0.837

Table 3. Discriminant Validity HTMT

	Digital Financial Literacy	Financial Behavior	Financial Wellbeing	Fintech Use
Digital Financial Literacy				
Financial Behavior	0.611			
Financial Wellbeing	0.580	0.770		
Fintech Use	0.533	0.471	0.275	

The results presented in Table 2 confirm that the measurement model demonstrates strong discriminant validity. The diagonal values (square root of AVE) for each variable are more significant than their correlations with other variables, as required by the Fornell-Larcker Criterion. For example, the Digital Financial Literacy variable has a square root AVE value of 0.837, which exceeds its correlations with Financial Behavior (0.498), Financial Wellbeing (0.497), and Fintech Use (0.434). Similarly, the Financial Wellbeing variable has a square root AVE value of 0.866, greater than its correlations with Digital Financial Literacy (0.497), Financial Behavior (0.683), and Fintech Use (0.231). These findings confirm that each latent variable correlates more strongly with its indicators than others, satisfying the Fornell-Larcker Criterion. From Table 3, the HTMT (Heterotrait-Monotrait Ratio) values are below the threshold of 0.85, providing additional support for discriminant validity. For instance, the HTMT value for the relationship between Digital Financial Literacy and Financial Behavior is 0.611, while Financial Wellbeing and Financial Behavior have an HTMT value of 0.770.

Additionally, the relationship between Financial Wellbeing and Fintech Use has an HTMT value of 0.275. These values indicate no significant issues with discriminant validity, ensuring clear distinctions among the latent variables. Based on the Fornell-Larcker Criterion and HTMT, the model meets the criteria for discriminant validity. The variables are conceptually distinct, and their relationships show no significant overlap. This robust discriminant validity

ensures that the measurement model provides a reliable foundation for further analysis. Consequently, the research findings are supported by a valid and reliable model, enabling accurate exploration of the relationships among the latent constructs.

Structural Model Evaluation

Table 4. Multicollinearity tests VIF < 5

	VIF
Digital Financial Literacy → Financial Behavior	1.233
Digital Financial Literacy → Financial Wellbeing	1.458
Financial Behavior → Financial Wellbeing	1.409
Fintech use → Financial Behavior	1.233
Fintech use → Financial Wellbeing	1.305

Table 5. Hypothesis Test

Hipotesis	Path coefficient	p-value	95% Confidence interval		F square
			Lower Limit	Upper Limit	
H1: DFL→ FB	0.245	0.000	0.298	0.500	0.183
H2: DFL→ FW	0.400	0.000	0.141	0.343	0.084
H3: FB → FW	0.227	0.000	0.523	0.694	0.538
H4: FU→ FB	-0.120	0.012	0.120	0.330	0.059
H5: FU→ FW	0.609	0.000	-0.213	-0.213	0.023

Based on the Variance Inflation Factor (VIF) values, all paths in the model are below the threshold of 5, indicating no significant multicollinearity among the independent variables. For instance, the relationship between Digital Financial Literacy (DFL) and Financial Behavior (FB) has a VIF value 1.233. In contrast, the relationship between Financial Behavior (FB) and Financial Wellbeing (FW) has a VIF value of 1.409. This confirms that the model is stable and reliable for estimating the relationships among variables.

Hypothesis Testing Results:

H1 (DFL → FB): The path coefficient of 0.245 with a p-value of 0.000 indicates a positive and significant relationship. The F-square = 0.183 suggests a moderate effect.

H2 (DFL → FW): The path coefficient of 0.400 with a p-value of 0.000 indicates a positive and significant relationship. The effect is small to moderate with F-square = 0.084.

H3 (FB → FW): The path coefficient of 0.227 with a p-value of 0.000 indicates a positive and significant relationship. The F-square = 0.538 indicates a large effect, highlighting the crucial role of FB in enhancing FW.

H4 (FU → FB): The path coefficient of -0.120 with a p-value of 0.012 indicates a negative and significant relationship, though the effect size is small, with F-square = 0.059.

H5 (FU → FW): The path coefficient of 0.609 with a p-value of 0.000 indicates a positive and significant relationship, albeit with a small effect size of F-square = 0.023.

All hypotheses in the model are accepted, demonstrating significant relationships among the variables. Digital Financial Literacy (DFL) has a direct and important influence on Financial Behavior (FB) and Financial Wellbeing (FW), with a moderate effect on FB. Financial Behavior (FB) plays a pivotal role, significantly impacting Financial Wellbeing (FW) and reinforcing its importance in improving financial well-being. However, while significant, the relationships involving Fintech Use (FU) exhibit small effects, particularly on FW. This suggests the need for further exploration, such as incorporating mediating or moderating variables, to strengthen these relationships. Overall, the model is stable and effectively explains the relationships among variables, providing a solid foundation for understanding the impact of digital financial literacy, financial behavior, and fintech use on financial well-being.

Table 6. R-Square

	R-Square
Financial Wellbeing	0.287
Financial Behavior	0.506

Table 7. SRMR

	Estimated model
SRMR	0.083

The structural model evaluation reveals important insights into the predictive ability of the independent variables on the dependent variables, as well as the overall model fit. The R-Square value for Financial Wellbeing (FW) is 0.287, indicating that the independent variables

explain 28.7% of the variance in FW. This reflects a weak to moderate predictive ability, suggesting that while the model provides some explanatory power for FW, additional variables could enhance its predictive capacity. For Financial Behavior (FB), the R-Square value is 0.506, indicating that the independent variables explain 50.6% of the variance in FB. This represents a moderate to strong predictive ability, demonstrating that the model effectively captures the factors influencing FB.

Regarding the overall model fit, the SRMR (Standardized Root Mean Square Residual) value is 0.083, below the acceptable threshold of 0.10. This indicates a good fit between the observed and predicted covariance matrices, confirming the model's adequacy for analyzing the relationships among the variables. While the model is sufficiently valid and reliable for further analysis, the relatively weak to moderate R-Square value for FW highlights the potential for improvement. Future research could explore additional variables or constructs to enhance the model's predictive strength. Overall, the structural model is robust enough to examine the influences of the independent variables on FW and FB, providing a solid foundation for interpreting the relationships within the dataset. This study demonstrates a positive and significant correlation between digital financial literacy and financial behavior. The findings suggest that higher levels of digital financial literacy lead to better financial management skills, including saving and spending. The rapid growth of fintech demands that individuals, especially students, develop a deep understanding of digital financial literacy to effectively and responsibly utilize digital financial services. These results align with previous studies, including those by Morgan et al. (2019), Lusardi and Mitchell (2011), and Koskelainen et al. (2023). Therefore, the findings support and confirm Hypothesis 1.

Hypothesis two finds that *digital financial literacy* influences *financial wellbeing.* The results of this study indicate that the two variables have a positive and significant influence, with a p-value < 0.05, confirming that the second hypothesis is accepted. These findings demonstrate that improving digital financial literacy is a strategic step toward achieving better financial well-being and preparing individuals to face future financial challenges. This result aligns with the studies conducted by Haque & Zulfiqar (2016), Kamakia et al. (2017), and Phetkam et al. (2019). However, these studies also highlight other contributing factors, such as financial behavior and attitudes, while emphasizing the critical role of digital financial literacy in achieving financial well-being.

The analysis results demonstrate a positive and significant relationship between financial behavior and financial well-being, with a p-value less than 0.05. Furthermore, the substantial impact of financial behavior on financial well-being is confirmed by an F-square value of 0.538, indicating a strong effect size. These findings underscore the importance of cultivating good financial behaviors to achieve financial well-being. Examples of such behaviors include saving regularly and controlling expenditures, enhancing an individual's ability to attain financial stability and satisfaction. This study's findings align with previous research conducted by Aulia et al. (2023), Respati et al. (2023), and Faturohman et al. (2024), which similarly highlight the critical role of financial behavior in influencing financial well-being. The results reinforce that fostering positive financial habits is essential for improving financial outcomes and achieving long-term financial security. These insights contribute to the growing body of literature emphasizing the practical implications of financial behavior in personal financial management.

The study's findings reveal a negative and significant relationship between fintech use and financial behavior, with a path coefficient of -0.120 and a p-value < 0.05. Additionally, fintech use exhibits a negligible effect on financial behavior, as indicated by an F-square value of 0.059. These results suggest that fintech use does not promote good financial behavior among students, indicating potential challenges in aligning fintech services with positive financial management practices for this demographic. This outcome contrasts with prior research. For instance, Widiastuti & Wahyudi (2021) found no significant relationship between fintech use and financial behavior, while Prasetyo & Mustaqim (2024) and Gafoor & Amilan (2024) reported a positive influence of fintech use on financial behavior. These discrepancies highlight the complexity of the relationship between fintech use and financial behavior, suggesting that contextual factors, such as user demographics, the nature of fintech services, or cultural attitudes, may significantly shape this relationship. Given these mixed results, further research is warranted to explore the nuances of how fintech use impacts financial behavior. This could involve examining specific fintech features, user education levels, or behavioral patterns within different populations, particularly younger groups like students. Such exploration would provide deeper insights into how fintech services could be better designed or adapted to encourage responsible financial behavior.

The analysis demonstrates a positive and significant relationship between fintech use and financial well-being, with a path coefficient of 0.609 and a p-value < 0.05. Despite this strong relationship, fintech use exhibits a small effect on financial well-being, as indicated by

an F-square value of 0.023. These findings suggest that fintech use positively influences consumer mindsets, particularly among students, who increasingly prefer personalized and accessible financial services that simplify fulfilling financial needs. The availability of fintech among students indirectly enhances their financial well-being by providing tools and services that support financial management and planning. These results confirm that fintech's rapid development has transformative potential, particularly for younger demographics. The convenience, accessibility, and tailored nature of fintech services resonate with students, making fintech a significant factor in shaping their financial behaviors and outcomes. Furthermore, the rapid evolution of fintech services presents an exciting avenue for future research into its relationship with financial well-being, as highlighted by Elsinger et al. (2018), Kakinuma (2022), and Carlin, Olafsson & Pagen (2019). These findings reinforce the potential of fintech to drive innovation in financial well-being studies, emphasizing its role in influencing financial outcomes and fostering improved financial practices in younger populations.

5. CONCLUSION

This study underscores the critical roles of digital financial literacy, fintech use, and financial behavior in enhancing the financial well-being of accounting students. The analysis reveals that digital financial literacy significantly influences financial behavior and well-being, highlighting that a deeper understanding of digital financial tools empowers individuals to make more informed and responsible financial decisions. Additionally, the study demonstrates that financial behavior is a strong mediating factor in the relationship between digital financial literacy and financial well-being. This emphasizes the importance of cultivating good financial habits, such as saving and controlling expenditures, in achieving financial stability and long-term well-being. While fintech use is shown to contribute to financial well-being directly, its impact on financial behavior is relatively small. This indicates that although fintech provides easier access to financial services, its ability to drive meaningful behavioral changes requires further exploration. These findings suggest a need to enhance fintech's potential to promote positive financial habits among its users. The study offers valuable insights into the interplay between digital financial literacy, financial technology, and financial well-being, particularly among younger generations navigating an increasingly digital financial landscape. These findings provide a foundation for policymakers to design more inclusive, technology-driven financial literacy programs and for fintech providers to create products that actively support and encourage healthy financial behaviors. Such initiatives could be pivotal in fostering financial stability and well-being among young populations.

This study focuses exclusively on accounting students, which limits the generalizability of its findings to broader populations. To enhance the applicability of future research, it is recommended to include more diverse populations, such as the general public or individuals working in the informal sector. This broader scope would provide a more comprehensive understanding of the dynamics between digital financial literacy, fintech use, and financial well-being. Future research could include additional mediating or moderating variables, such as self-control or trust in technology, to enrich the theoretical model and uncover deeper insights. These variables might explain further nuances in how fintech and digital financial literacy interact with financial behavior and well-being. Additionally, conducting longitudinal studies would be valuable for capturing how the relationships among digital financial literacy, fintech use, and financial well-being evolve. This approach would provide insights into the long-term effects and trends, offering a more robust understanding of these relationships in an ever-changing technological and financial landscape.

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CHAPTER 7

Rethinking Determinants of Financial Inclusion

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ABSTRACT

This study explores the factors that affect financial inclusion, focusing on digital financial literacy, financial behavior, financial literacy, and the use of Fintech among students of the management study program. Data from 259 respondents were analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS). The study results show that digital financial literacy and the use of Fintech significantly affect financial inclusion. However, financial behavior and financial literacy do not considerably influence financial inclusion.

The novelty of this study lies in the finding that digital financial literacy and fintech use are the main drivers of financial inclusion. In contrast, traditional variables such as financial behavior and financial literacy show insignificant results. These findings provide a new perspective from previous studies emphasizing the importance of financial behavior and literacy in encouraging financial inclusion. This study highlights the importance of digital technology adoption as a strategy to increase financial inclusion for the younger generation, especially in the context of digital financial transformation in Indonesia. The implications of this research are expected to be the basis for developing a more effective digital financial literacy policy.

Keywords: Financial inclusion, Financial behavior, Digital Financial literacy.

1. INTRODUCTION

Financial inclusion in the modern era is now a concern for the public to increase access to financial services for the entire community. Significant technological changes through financial technology are expected to provide solutions faced by the lower class and underprivileged people in accessing and obtaining capital information. The convenience of financial technology also makes it easier to trade without going through the traditional banking system. Financial inclusion is related to the ease of accessing and using financial services (Sarma, 2012). Financial literacy skills influence inclusive finance, so several related factors must be integrated to have a significant impact (Kafabih, 2020).

There are still many people who do not know, use, or get banking services and other financial services, among others, because they live in locations far from bank offices or the existence of burdensome costs or requirements that make the government continuously close solutions in terms of planning and implementing national strategies to achieve Financial Inclusion. Financial literacy can be implemented by teaching financial literacy education through the essential competencies already in subjects such as Mathematics and Social Sciences (Laila, 2019). Economic literacy, including financial and digital literacy, is the key to success in this era (Gunawan & Winarti, 2022).

Digital financial literacy combines financial literacy and digital platforms, which is defined as financial literacy in digital financial technology (Tony & K, 2020). The results of Hamzah and Suhardi's (2019) research show that financial attitudes have a positive effect on financial technology, financial behavior has a positive impact on financial technology, financial knowledge has a positive effect on financial technology and financial technology has a positive impact on financial technology. Financial opportunities, convenience, and user security strongly support the financial technology system called Fintech for short (Kamil, 2020).

The main problem of this study is the lack of understanding of how Financial Literacy, Financial Behavior, Fintech Use, and Digital Financial Literacy contribute to the increase in Financial Inclusion. Many people still do not know, use, or get banking services and other financial services. The existence of burdensome costs or requirements makes the government continue to develop solutions for planning and implementing national strategies to achieve financial inclusion. With the emergence of Fintech bringing new opportunities for financial inclusion, Fintech also uses technology to provide innovative and practical financial services to help create financial literacy. Increasing financial literacy and encouraging the advancement of Fintech can improve access to financial services and promote financial inclusion. This research

will guide the public in expanding their understanding of financial inclusion. This research integrates all five variables comprehensively, aiming to address the literature gap.

In today's digital era, technology has great potential to expand financial inclusion. This research emphasizes that by utilizing digital technology, individuals can overcome behaviors that hinder society from making informed and effective financial decisions. This research is important in the modern economy and economic digitalization, especially in developing countries where financial inclusion is still challenging. This research can provide helpful education in making economic policies, financial subscription providers, and profit organizations formulating strategies to expand Financial Inclusion. This research has become relevant because of the increasing financial services available in today's digital era.

This study aims to analyze and describe the relationship between Financial Behavior, Financial literacy, Fintech Use, Digital Financial Literacy, and Financial Inclusion. One aspect to increase financial inclusion is through the role of Fintech (Jaya, 2019). Financial education is one of the five pillars that support the Financial Inclusion policy. The other four are increasing people's capacity to obtain financial services, supportive regulations, increasing intermediation, and policy reform (Kafibah, 2020). Financial Literacy has a long-term goal for all groups of society, namely improving the literacy of a person who was previously less or not literate to become well literate, increasing the number of users of financial products and services (Remund, 2010).

2. LITERATURE REVIEW

Digital financial literacy is the knowledge, skills, and attitudes individuals need to maximize the use of technology or financial services as a productivity tool in working, studying, and carrying out other activities (Ma'aruf, 2024). Financial behavior is responsible financial behavior so that all finances, both individuals and companies, can be appropriately managed (Herdjiono, Damanik, & Musamus, 2016). According to Huston (2010), financial literacy is defined as a component of human resources that can be used to improve financial welfare. A person is said to be financially literate when he has the knowledge and ability to apply that knowledge. Fintech use is a technological innovation in financial services that can result in new business models, applications, processes, or products that significantly impact the provision of financial services (Muliana, Liem, & Widiyasti, 2024). Financial inclusion is an effort to expand financial access for people who do not yet have access to existing financial services (Natsir, Supriaddin, & Putera, 2023).

Digital financial literacy is a combination of awareness, knowledge, skills, attitudes, and behaviors necessary to make the right financial decisions and ultimately achieve personal financial status (Atkinson & Messy, 2012). Digital financial literacy was born in line with the rapid development of digital financial technology in the last two decades, which has brought significant changes in the financial industry (OECD, 2018). The social media phenomenon has exerted influence on many industries. It has emerged as an undeniable trend for entrepreneurs and key stakeholders in the entrepreneurial ecosystem (Samer Ali Al-Shami, Abdullah Al Mamun, Ratna Damayanti, Hayder Adil, Faycal Farhi, 2024). The four dimensions reflecting Digital Financial Literacy include knowledge of digital financial products and services, digital financial risks, digital financial risk control, and understanding consumer rights and compensation procedures (Morgan & Long, 2020). Integrating various literacy and abilities, such as awareness of the presence of digital payment instruments, the ability to make digital transactions, and the ability to detect and avoid fraud in digital transactions, digital literacy has a broad and comprehensive scope (Syahnur, Syarif, & Arianti, 2024).

Hipotesis 1: Digital Financial Literacy effects Financial Inclusion

Research by Tan et al. (2021) shows that the impression of electronic payments significantly positively affects behavioral intentions and financial inclusion. The intention to adopt new behaviors using electronic payments significantly positively affects MSE financial inclusion. The latest behavioral intent partially mediates the relationship between the impression of electronic payments and the digital financial inclusion of MSEs. The high number of internet, social media, and smartphone users, as well as the growth of the middle class. Attention to fintech consumer behavior is an essential part of market assessment and is one of the key factors in achieving successful financial inclusion. Fintech is important in promoting new technologies, sustainable development, and financial inclusion (UNSGSA, 2018). Financial inclusion and economic behavior are inextricably linked. While economic behavior encompasses a wide range of behaviors, including shopping, saving, investing, and future financial planning, financial inclusion ensures everyone has access to financial services essential to empowering them to make better financial decisions.

Hipotesis 2: Financial Behavior effects Financial Inclusion

Literacy is the ability of individuals to use all their potential and skills, so literacy includes a person's ability to manage and understand information when reading and writing (Soetiono & Setiawan, 2018). The definition of financial literacy includes concepts that start from awareness and understanding of financial products, financial institutions, and the concept of financial skills (Xu & Zia, 2012). Financial literacy is a way for people to understand and

participate in using the basic concepts of financial science to plan and manage financial decisions in the form of insurance, investment, savings, and budgeting (Kinmutai, 2015). Individuals with good financial literacy will seek and use various financial information to determine financial products and services (Fanta & Mutsonziwa, 2021). Financial literacy is understanding, analyzing, and managing finance to make the right financial decisions and avoid financial problems (Ariadi, 2015).

Hipotesis 3: Financial Literacy effects Financial Inclusion

Financial Technology is an emerging and growing innovation that provides and facilitates financial services through various mobile and computing devices, the Internet, and payment cards (Makina, 2019). The use of FinTech as a means to drive financial inclusion can be effective because these technologies can expand financial services to a large portion of the population at lower costs. The presence of financial technology (Fintech) has the potential to close the gender gap in women's access to financial services (Guo et al. 2021) by offering significantly lower costs compared to traditional financial businesses and making financial products accessible to all levels of society (Demirgüc-Kunt and Klapper, 2013). Most studies have found that ICT and Fintech are important drivers for financial inclusion (Tchamyou, Erreyger, and Cassimon 2019). FinTech companies collaborate with governments to create financial inclusion initiatives, which facilitate the effective distribution of social benefits, subsidies, and other financial assistance to the community (Asif et al., 2023).

Hypothesis 4: Fintech Use Affects Financial Inclusion

The research model is as follows:

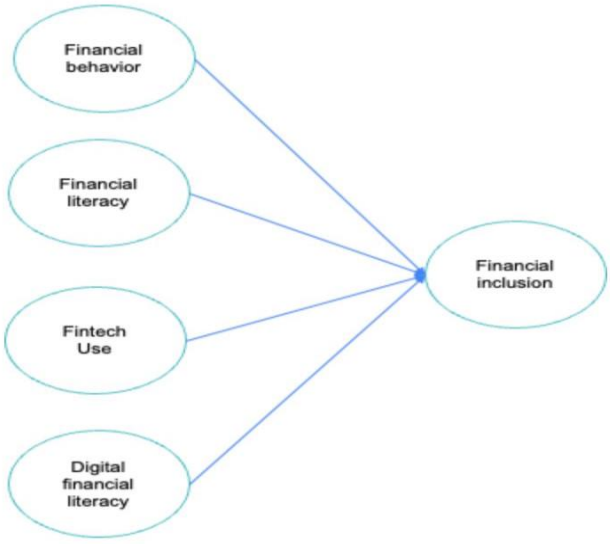

Figure 1. Research model

3. RESEARCH METHOD

This study uses a quantitative approach with a survey method to analyze the relationship between digital financial literacy, financial behavior, financial inclusion, fintech use, and financial well-being. The research sample was selected using the purposive sampling method, based on the criteria of students with a Diploma in Financial Accounting and Diploma in Taxation programs who are still actively studying and using fintech services. The data collection process is carried out through convenience sampling, where questionnaires are distributed online using the Google Form (G-Form) platform to make it easier for respondents who meet the criteria to participate.

The research questionnaire was designed using a 7-point Likert scale, with answers ranging from "strongly disagree" to "strongly agree" to measure the construct of latent variables. The variables measured included digital financial literacy (DFL), financial behavior (FB), financial inclusion (FI), fintech use (FU), and financial well-being (FW). Data analysis was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to test the research model's causal relationship between latent variables. This approach was chosen because it can handle the complexity of the conceptual model and provide valid results despite the relatively small sample size. With the design of this research, the results obtained are expected to provide relevant and in-depth insights related to the influence of Fintech and digital financial literacy on students' financial well-being.

4. RESULT AND DISCUSSION

Based on the respondents' data, the distribution by Study Program shows that the majority come from the Diploma in Financial Accounting program (65%) and the rest from the Diploma in Taxation (35%). By gender, female respondents dominated with 80%, while men only 20%. In terms of age, the majority of respondents were in the age group of 19–21 years (70%), followed by the age of 22 years and above (20%) and the age of 18 years (10%). Based on the Year of Entering College, most of the respondents came from the 2021 and 2022 batches (40% each), followed by the 2023 class (15%) and the 2020 class (5%).

This profile reflects the dominance of students from the Financial Accounting study program and female students, with the majority being of productive age (19–21 years old). The relatively even distribution of the college cohort in the 2021 and 2022 batches shows the relevance of data to understanding the behavior of students still actively studying in college. Meanwhile, the concentration of age and dominance of women provides a unique perspective in the analysis of digital financial literacy and the use of Fintech in the context of this study.

These results are relevant to support academic and practical insights, especially in understanding the factors that affect students' financial well-being.

Evaluation Measurement Model

The evaluation of the measurement model is carried out as follows. In Hair et al. (2021), the assessment of the reflective measurement model consisted of loading factors >0.7 composite reliability >0.7 Cronbach's alpha and average variance extracted (AVE>0.5) as well as the evaluation of discrimination validation, namely the fornell and lacker criteria and HTMT (Heterotrait Monotrait Ratio) below 0.9 cross loading.

Table 1. Outer Loading, Crobachs Alpha, Composite Reliability, AVE

Variable	Measurement Items	Outer Loading	Cronbachs Alpha	Composite Reliability	AVE
Digital financial literacy	DFL2	0.892	0.772	0.866	0.685
	DFL3	0.779			
	DFL4	0.820			
Financial Behavior	FB1	0.806	0.864	0.907	0.710
	FB3	0.879			
	FB4	0.857			
	FB5	0.828			
Financial Inclusion	FI1	0.913	0.876	0.915	0.730
	FI2	0.905			
	FI3	0.814			
	FI4	0.778			
Financial wellbeing	FL1	0.753	0.910	0.922	0.628
	FL2	0.855			
	FL3	0.810			
	FL4	0.851			
	FL5	0.732			
	FL6	0.774			
	FL7	0.765			
Fintech Use	FU1	0.771	0.863	0.907	0.709
	FU2	0.853			
	FU3	0.896			
	FU4	0.844			

Based on Table 1, the evaluation of validity and reliability shows that all variables in the measurement model meet the criteria of good validity and reliability. The Outer Loading for all measurement items is above the threshold of 0.7, which indicates that the indicators have a strong relationship with their respective latent constructs. For example, in the Digital Financial Literacy (DFL) variable, the Outer Loading value ranges from 0.779 to 0.892, while in the Financial Behavior (FB) variable, the Outer Loading value ranges from 0.806 to 0.879.

Regarding reliability, all variables have Cronbach's Alpha and Composite Reliability values that exceed the threshold of 0.7. For example, the Financial Inclusion (FI) variable has a Cronbach's Alpha of 0.876 and a Composite Reliability of 0.915, indicating an excellent internal consistency level between measurement items. Other variables, such as Financial Wellbeing (FW), also have a Cronbach's Alpha of 0.910 and a Composite Reliability of 0.922, strengthening the model's reliability.

From the perspective of convergent validity, the Average Variance Extracted (AVE) values for all variables exceeded the threshold of 0.5, indicating that the latent variable could account for more than 50% of the variance of its indicators. For example, the Fintech Use (FU) variable has an AVE value of 0.709, while the Financial Behavior (FB) variable has an AVE value of 0.710. This indicates that the construct has good convergence validity.

Overall, the measurement model shows adequate validity and reliability. The indicators on each variable consistently reflect their respective latent constructs accurately and significantly. With convergent validity and guaranteed reliability, this model can be used for relationship analysis between latent variables and hypothesis testing with high confidence. This provides a solid foundation for interpreting relevant and reliable research results.

Tabel 2. Validity of discrimination (Fornell-Larcker Criterion)

	Digital Financial Literacy	**Financial Behavior**	**Financial Inclusion**	**Financial Literacy**	**Fintech Use**
Digital Financial Literacy	0.828				
Financial Behavior	0.504	0.843			
Financial Inclusion	0.573	0.483	0.854		
Financial Literacy	0.576	0.628	0.375	0.793	
Fintech Use	0.479	0.440	0.761	0.231	0.842

Table 2 shows that the diagonal value (square root of AVE) for each latent variable is greater than the correlation value between other latent variables, indicating a good discrimination validity. For example, Digital Financial Literacy (DFL) has an AVE square root value of 0.828, which is greater than its correlation with Financial Behavior (0.504), Financial Inclusion (0.573), and Fintech Use (0.479). Other variables, such as Financial Behavior (FB) with the square root of AVE of 0.843, also showed a greater value than the correlation with different variables, for example, Financial Inclusion (0.483) and Digital Financial Literacy (0.504). These results indicate that each construct has good discriminatory validity, where the indicators correlate more with its construct than with other constructs.

Table 3. Validity of discrimination HTMT

	Digital Financial Literacy	Financial Behavior	Financial Inclusion	Financial Literacy	Fintech Use
Digital Financial Literacy					
Financial Behavior	0.617				
Financial Inclusion	0.670	0.544			
Financial Literacy	0.651	0.643	0.389		
Fintech Use	0.546	0.518	0.855	0.279	

Table 3 shows that all HTMT values are below the threshold of 0.85, which indicates sufficient discriminatory validity based on this approach. For example, the relationship between Digital Financial Literacy (DFL) and Financial Inclusion (FI) has an HTMT value of 0.670. In contrast, the relationship between Financial Inclusion (FI) and Fintech Use (FU) has a value of 0.855, which is close to the limit but still meets the criteria. The relationship between other variables, such as Financial Behavior (FB) and Financial Literacy, had an HTMT value of 0.643, indicating good discriminatory validity.

These results show that the research model has good discriminatory validity based on the Fornell-Larcker and HTMT criteria. This ensures that each latent variable is conceptually distinguishable from the other and that there are no significant problems related to construct overlap. With the validity of the discrimination guaranteed, this model provides a solid basis to continue the analysis of causal relationships between latent variables in the study, such as the influence of Digital Financial Literacy, Financial Inclusion, and Fintech Use on Financial Behavior and Financial Literacy. This also gives confidence that the study results can be interpreted with high validity.

Structural Model Evaluation

Table 4. Multicolinear Test

	VIF
Digital Financial Literacy → Financial Inclusion	1.854
Financial Behavior → Financial Inclusion	1.956
Financial Literacy → Financial Inclusion	2.042
Fintech use →Financial Inclusion	1.467

Table 4 shows that the Variance Inflation Factor (VIF) values for each pathway are below the threshold of 5, indicating no significant multicollinearity problem among the independent variables. For example, the relationship between Digital Financial Literacy (DFL) and Financial Inclusion (FI) has a VIF value of 1,854. In contrast, the relationship between Fintech Use (FU) and Financial Inclusion (FI) has the lowest VIF value, which is 1,467. These

results ensure that the independent variables in the model can be used for prediction without excessive redundancy.

Table 5. Hypothesis Test

Hipotesis	Path coefficient	p-value	95% Path Coefficient Confidence Interval		F square
			Lower limit	Upper limit	
H1: DFL →FI	0.200	0.001	0.085	0.321	0.061
H2: FB → FI	0.059	0.406	-0.078	0.198	0.005
H3: FL → FI	0.080	0.242	-0.061	0.210	0.009
H4: FU → FI	0.621	0.000	0.504	0.731	0.739

Table 5 shows that some of the relationships between latent variables are significant at a confidence level of 95% (p-value < 0.05). Here is a breakdown of the results:

- H1 (DFL → FI) has a path coefficient of 0.200 with a p-value of 0.001 and a small to moderate effect (F-square = 0.061). The 95% confidence interval for this relationship is in the range of 0.085 to 0.321, indicating that this relationship is significant and positive.
- H2 (FB → FI) has a path coefficient of 0.059 with a p-value of 0.406, indicating an insignificant relationship. The confidence interval includes zero (-0.078 to 0.198), reinforcing that this relationship is insignificant.
- H3 (FL → FI) has a path coefficient of 0.080 with a p-value of 0.242, indicating an insignificant relationship. The confidence interval includes zero (-0.061 to 0.210), indicating that this relationship is weak.
- H4 (FU → FI) has a path coefficient of 0.621 with a p-value of 0.000, indicating a very significant and strong relationship. The confidence interval ranges from 0.504 to 0.731, and the effect is huge (F-square = 0.739).

These results show that Digital Financial Literacy (DFL) and Fintech Use (FU) significantly affect Financial Inclusion (FI), with Fintech Use having the strongest influence. In contrast, Financial Behavior (FB) and Financial Literacy (FL) did not significantly impact Financial Inclusion. These results reflect that using Fintech is essential in improving financial inclusion. In contrast, financial literacy and behavior may require other mediating factors to significantly influence financial inclusion. The model provides relevant insights for understanding these variables' role in financial inclusion, emphasizing the importance of financial technology adoption.

Table 6. R-Square

	R-Square
Financial inclusion	0.639

The R-Square value for the Financial Inclusion variable is 0.639, which means that the independent variables in the model can explain 63.9% of the variance in Financial Inclusion. This value indicates good predictive ability, indicating that the model can account for most of the variability in financial inclusion. The remaining 36.1% variance may be explained by factors outside this model, which can be further explored.

Table 7. SRMR

	Estimated model
SRMR	0.131

The SRMR value of the estimated model is 0.131, which is above the threshold of 0.10. This suggests a considerable difference between the observed covariance matrix and the one predicted by the model. An SRMR value higher than 0.10 indicates that the model's match with the actual data is inadequate, so the model needs improvement to improve the fit.

This model has good predictive ability in explaining the variability of Financial Inclusion, as indicated by the R-Square value of 63.9%. However, an SRMR value of 0.131 indicates that this model does not yet have an optimal match with empirical data. This may be due to some paths or relationships between variables that do not fully match the data, or there may be less relevant constructs. Therefore, it is recommended to re-evaluate the model, for example, by adding more relevant variables, improving the model specifications, or exploring additional indicators that can improve the model's fit. With further adjustments, the model can provide more accurate and relevant results for understanding the factors that affect financial inclusion.

Discussion

The results of this study's first hypothesis show a significant and positive relationship between digital financial literacy and financial inclusion. Digital financial literacy is essential for the success of financial inclusion programs in various countries. Digital financial literacy involves understanding how to use online systems to conduct financial activities, such as online payments and digital banking services (Prased et al., 2018). To achieve better financial inclusion, the younger generation has understood the need for digital financial education, such

as mobile apps, digital financial security, and online financial operations (Buenestado-Fernández et al., 2023).

The second hypothesis reveals no significant influence between financial behavior and financial inclusion. The results of this study show that the results of these two variables have a p-value > 0.05 from the results, so it can be said that the relationship between these two variables is not significant. A person's financial inclusion cannot influence their financial decisions (Anisyah et al., 2021). This study's results align with previous research conducted by Le et al. (2019), which stated that financial inclusion does not influence financial behavior.

The results of this research on financial literacy and financial inclusion show an insignificant relationship. The study results show a p-value of > 0.05, meaning the relationship between the two variables is weak. This aligns with Budyastuti (2021), who found that financial literacy does not affect business sustainability. This is contrary to the findings shown by Grohmann A., Kluhs T., and Menkhoff L. (2017), which showed that increasing financial literacy in a population will increase account ownership and exert the most significant influence in countries with low levels of financial literacy.

Both variables showed a positive relationship between fintech use and financial inclusion. The study results showed that the p-value < 0.05, which can be interpreted as the two variables have a significant, strong, and influential relationship. The public needs fintech-based financial services to expand their financial literacy and inclusion horizons (Mulasiswawi & Julialevi, 2020). Such as research by Marini. et al. (2020) stated that FinTech can increase public access to financial services because some people have used smartphones and the internet. Amnas et al. (2024) also explained that the use of FinTech has a positive effect on digital financial inclusion in India.

5. CONCLUSION

This research emphasizes the importance of digital financial literacy and Fintech in increasing financial inclusion, especially among students of management programs. The results show that good digital literacy and the adoption of financial technology directly improve people's access to and involvement in financial services. However, conventional financial literacy and financial behavior did not significantly affect financial inclusion. This suggests that this traditional element is irrelevant in contemporary financial digitalization. The results show that digital transformation is important in reducing disparities in financial inclusion in Indonesia.

This study shows that digital financial literacy policies must be strengthened, and Fintech must be promoted as a key strategy to increase financial inclusion in the digital era. It is

recommended that governments, educational institutions, and fintech providers work together to create educational programs and campaigns that help people learn about digital finance. This method can increase user trust in financial technology and improve access to financial services. This research provides a basis for policy-making relevant to Indonesia's situation.

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CHAPTER 8

Reevaluating the Role of Fintech Use: Insights on Digital Financial Literacy, Financial Inclusion, and Financial Wellbeing Among Management Students

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ABSTRACT

This study aims to analyze the relationship between digital financial literacy, the use of Fintech, financial inclusion, and financial wellbeing in students of the management study program. Using data from 246 respondents analyzed through Structural Equation Modeling-Partial Least Squares (SEM-PLS), this study found that digital financial literacy significantly affects financial inclusion and wellbeing. Financial inclusion has also been found to influence financial wellbeing positively. In addition, using Fintech is important in increasing financial inclusion but does not directly affect financial wellbeing.

Unlike previous studies that highlighted the direct link between fintech use and financial wellbeing, this study shows that the impact of fintech use on financial wellbeing is more effective through increased financial inclusion. The novelty of this research lies in identifying these indirect mechanisms, especially in the context of management students in Indonesia. These findings provide important insights for policymakers to develop strategies that optimize the role of Fintech in driving financial inclusion as a foundation for achieving sustainable financial wellbeing.

Keywords: Digital Financial Literacy, Financial İnclusion, Financial Wellbeing.

1. INTRODUCTION

Fintech has rapidly developed over the past few years and has many benefits that have been officially recognized. The existing benefits include increased control, accessibility, affordability, and convenience that have been facilitated for every individual regarding financial services (Burhouse et al., 2016). The development of technology for technology-based financial services (Fintech) can change how each consumer accesses financial services and non-banking services (Gross et al., 2012). Fintech's innovation significantly impacts greater profits and can address the gender gap, as seen in financial health (Frame et al. 2019; Thakor 2020; Arner et al. 2020). The use of Fintech in daily life greatly facilitates consumers' creation of financial wellbeing within the financial system.

With fintech adoption, the public can efficiently utilize digital financial technologies such as mobile banking applications, online payment platforms, UPI services, etc., to conduct financial transactions. Therefore, Fintech is expected to influence an individual's financial and social aspects (Tai et al., 2023; Panos and Wilson, 2020). Evidence shows that fintech adoption can enhance financial wellbeing by reducing barriers and complexities in accessing services in the financial market (Lyons and Kass-Hanna, 2021; Chen et al., 2023). However, although fintech adoption and financial wellbeing have a positive relationship, other factors, such as digital financial literacy and financial inclusion, have not been thoroughly researched, leading to a study indicating that digital financial literacy and financial inclusion do not significantly affect financial wellbeing. This shows that there is an important research gap to be explored

With financial inclusion through digital financial literacy, various facilities can be offered to enhance financial wellbeing. Social welfare can be achieved through financial or intermediary digitalization in the financial sector. Social welfare can also represent access to universal education, equitable healthcare services for every community, parity, transparency in trade and business, and efficiently accessible financial services (Iqbal and Sami, 2017; Mader, 2018; Jain, 2019). Financial inclusion refers to socio-economic improvement and serves as a pathway for development and growth in addressing exclusion issues (Collins, 2003; Paramasivan and Ganeshkumar, 2013). Financial Inclusion can be used for digital innovation to align the supply and demand sides of socio-economic conditions and enhance the development space (Rasheed et al., 2020; Gangopadhayay, 2009). The increasing development of digital financial literacy can enable users to maximize the use of fintech innovations, leading to greater financial inclusion and improved economic and overall wellbeing.

The issue of financial exclusion continues to be a significant barrier to equitable development progress in the global financial landscape, even with all the economic advancements we see worldwide. Some still face challenges accessing the formal financial system (Senyo and Osabutey, 2020). Based on the World Bank report in 2021 shows the inequality of access to financial services and highlights the importance of this for some people as a creative solution to bridge this gap (Demirgüç-Kunt et al. 2022). This research aims to fill the literature gap regarding how digital financial literacy and Fintech use synergistically through financial inclusion to enhance financial wellbeing.

Financial technology (FinTech) is revolutionizing the financial services industry at an unparalleled speed (Frost et al. 2019). With the presence of mobile payments, robo-advisors, app-based investment platforms, and online banking solutions, the development of FinTech has impacted every aspect of financial planning, financial wellbeing, and economic inequality (Frame, Wall, and White 2019). Financial literacy and other literacies, such as health technology, politics, and environmental literacy, can enable individuals to engage more with artificial intelligence (Aun 2017). (Nenavath and Mishra 2023) show how green finance shapes the development of financial structures, enhances financial efficiency, and maintains environmental quality, a trio that collectively drives quality economic growth. Fintech has positive and significant implications for Fintech consumers, service providers, policymakers, governments, and academics. It can be said that Fintech serves as a means to help formulate policies for financial inclusion and financial wellbeing in society. The use of Fintech also has significant positive implications for financial, economic, and environmental aspects overall.

This research shows financial inclusion helps eradicate poverty and achieve more advanced and targeted millennium development. This research also eliminates existing gaps in society (Chibba, 2009; Polloni-Silva et al., 2021). The findings of this study demonstrate the positive impact of self-control on financial behavior and individual financial gaps, which are considered important in the long term. People with better self-control are more likely to save money from each paycheck, leading to satisfaction through their financial behavior, which reduces the likelihood of feeling anxious and makes them feel secure in their actions to face current and future financial problems (Strömbäck et al., 2017). Some of the applications that have been created even provide budgeting and financial management tools aimed at helping users track expenses, set goals, and manage finances more effectively (Carè et al., 2023; Uthaileang and Kiattisin, 2023).

2. LITERATUR REVIEW

Digital Financial Literacy and Financial Inclusion

Digital financial literacy positively influences financial inclusion by encouraging more expansive use of digital services, increasing awareness of security, empowering people to make the right decisions, and improving decision-making in digital transactions (Hasan et al. 2021a;). Digital financial literacy (DFL) provides the public with knowledge and understanding of financial technology and then increases digital awareness and understanding of financial services, ultimately leading to financial inclusion (Choung et al., 2023; Malladi et al., 2021).

This research emphasizes that the use of Fintech has a direct impact on financial inclusion and an indirect effect through digital financial literacy. Digital financial literacy significantly aids financial inclusion through Fintech by empowering individuals with the ability and guidance to encourage individuals to use digital platforms proficiently (KKumar et al., 2023; Panos and Wilson, 2020; Ravikumar et al., 2022). Financial inclusion allows universal financial services and access so that its benefits impact the economy and development (Senyo, Osabutey, & Seny Kan, 2020). When users feel confident that their financial transactions are carried out securely, they use digital financial services (Ediagbonya and Tioluwani, 2023; Ng and Kwok, 2017). Financial inclusion is important because it relates to public access to open financial services, or there are no barriers to financial access. The existence of Fintech is a gateway that can increase business opportunities through digital application applications and digital services in exploring existing opportunities (Stewart & Jürjens, 2018).

Digital Financial Literacy and Financial Wellbeing

DFL is a multidimensional concept that includes "knowledge of digital financial products and services, awareness of digital financial risks, knowledge of digital financial risk control, and knowledge of consumer rights and indemnity procedures" (Morgan et al., 2019, p.4). This discussion also investigates the complicated relationship between digital financial literacy and economic wellbeing in decision-making. The existing findings show that digital financial literacy is useful for protecting themselves from digital fraud, which positively impacts financial wellbeing. FWB results from consistent behavior and financial competence to sustain oneself, achieve personal goals, and enjoy a reasonable lifestyle (Xiao et al., 2008). To fulfill the ability to use digital financial literacy to create financial prosperity, a good

education and skills in managing finances are needed. The variables used in hypothesis two are DFL and FW.

Lyons and Kass-Hanna (2021a) define digital financial literacy as a broad construct that includes five dimensions and eight subdimensions in financial and digital literacy. Financial wellbeing is motivated by findings that even though objective measures such as income and wealth can predict subjective wellbeing, variations are still unrelated to economic resources (Diener and Biswas-Diener, 2002). Digital Financial Literacy makes it possible to use fintech products and services effectively. It also reminds customers about digital scams such as phishing and hacking (OECD, 2020). (Rahayu et al., 2022) said that digital financial literacy can be used to describe a person's level of familiarity with digital products or services. Increasing digital financial literacy in the current era helps everyone obtain all the benefits of developing digital financial literacy to create financial wellbeing.

Financial Inclusion and Financial Wellbeing

Financial inclusion can ensure that individuals and businesses have access to affordable and appropriate financial services to drive social and economic growth by reaching all segments of the population that were previously underserved or excluded from the formal financial system. Several studies support this statement. According to Ozili (2018), financial inclusion provides access to financial services for all members of society, especially for the underprivileged and underserved groups. According to Dev (2006), financial inclusion can also be described as providing financial services at fair prices for a sizable segment of the underprivileged and low-income groups. According to Swamy (2014), participation in the FI scheme helps households increase income, develop wealth, and reduce poverty.

Financial inclusion positively impacts balancing consumption, reducing financial coercion and costs, providing a sense of security, and increasing savings, thereby improving an individual's financial wellbeing (Boyd & Aldana, 2015). Financial inclusion can bring many welfare benefits to rural residents and poor people in various countries (Allen et al., 2012). Financial inclusion significantly impacts an individual's financial wellbeing by improving the person's financial behavior (Bhowmik & Saha, 2001; Rai & Saha, 2010). Thorat (2007) stated that utilizing financial inclusion as a strategy will ensure inclusive growth by providing equal access to services and products offered by financial institutions, especially for socially and economically marginalized groups. According to Dupas & Robinson (2013) and Riitsalu & Murakas (2019), financial inclusion has a transformative effect that can help a person manage

finances by avoiding all kinds of risks so that it can provide financial security, which leads to financial wellbeing.

Fintech Use mempengaruhi Financial Inclusion

In the discussion of this hypothesis it discusses the influence of fintech use on financial inclusion. This discussion delves into the potential of financial technology (Fintech) to encourage financial inclusion. The study concentrates on understanding why people use FinTech and how it affects their access to financial services by considering the role of digital financial mediation, literacy, and the moderate effects of perceived regulatory support.

Fintech is a growing innovation in providing and facilitating financial services through various mobile devices, computing, the internet, and payment cards (Hinson et al., 2019; Makina, 2019). Fintech is one of the changes, especially in places with traditional banking facilities, which allow individuals to carry out financial activities using their smartphones (Asif et al., 2023; Yeyouomo et al., 2023). The fintech sector also has additional potential and perspective by integrating new technologies such as artificial intelligence, digital currencies, blockchain, central bank digital currencies, and the metaverse (Koohang et al., 2023). Therefore, many parties hope Fintech will encourage financial inclusion and benefit the less fortunate groups (Demirguc-Kunt et al., 2018; Breza et al., 2020). Financial inclusion refers to the accessibility and availability of financial services for everyone, especially underserved and economically disadvantaged groups, at an affordable cost (Bertram, Nwankwo, & Onwuka, 2016).

Fintech Use and Financial Wellbeing

According to the AFTECH organization (2021), Fintech is an abbreviation for financial technology, which can be interpreted as technology-based financial service innovation. FinTech innovations can also harm financial wellbeing by encouraging impulsive consumer behavior when consumers are connected to financial applications and systems. This fintech innovation is also considered to endanger consumers' finances because some companies do not have official permits that can misappropriate consumer funds. The use of Fintech is highly dependent on the internet network, so if there is an internet disruption, it can be an obstacle to financial transactions that can worsen the economy. Technology-based financial services can also endanger consumer welfare because of the existence of online loan services that are considered to help financial wellbeing but increase stress and mental pressure on consumers due to high interest rates and aggressive collection practices.

A person's level of satisfaction is obtained from their financial condition, which refers to financial wellbeing (Prawitz et al., 2006). Lusardi (2019) presented his analysis of factors that can affect economic welfare among millennials and found that the economic welfare of millennials is lower when compared to older adults or adults who are older than the working class. Bayuk and Altobello (2019) found that college students who use Fintech for financial or money-saving purposes are motivated by socially competitive features embedded in the app and have much lower social wellbeing. The crisis has made many young people psychologically and financially vulnerable, primarily low-income young people (Kumar et al., 2022). The younger generation cannot prioritize personal finance, so specific fintech platforms can cause more harm than benefit (Mahalingam, 2017).

The research model is as follows:

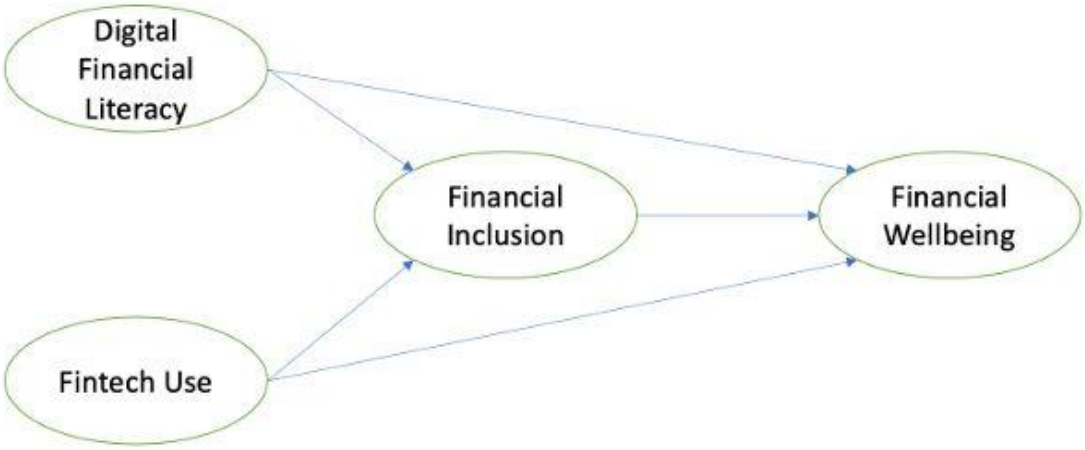

Figure 1. Research Model

3. RESEARCH METHOD

This study uses a quantitative approach with a survey method to explore the relationship between digital financial literacy, the use of Fintech, financial inclusion, and student financial wellbeing. The research sample was selected using the purposive sampling method, with the criteria for students of the Management study program who are still actively studying and using fintech services. The convenience sampling method is used for the distribution of questionnaires, where respondents who meet the criteria are given direct access to the

questionnaire. This survey is designed to obtain primary data from respondents through questionnaires distributed online using the Google Form platform. The questionnaire used measurement items for each latent variable, using a 7-point Likert scale ranging from "strongly disagree" to "strongly agree." Data collection is carried out over a certain period to ensure sufficient respondents. The data analysis method uses Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the relationship between variables in the conceptual model. This approach was chosen because it can analyze causal relationships between latent variables with complex models and provide valid results, especially on samples with limited size. With the design of this research, it is hoped that the research results can provide relevant and in-depth insights into the influence of Fintech and digital financial literacy on the financial wellbeing of students.

4. RESULT AND DISCUSSION

Based on the respondents' data, the distribution of study programs shows that all respondents come from the management study program. In terms of cities, most of the respondents came from Bima (40%), followed by Waingapu (30%), Yogyakarta (20%), and Manado (10%). By gender, female respondents dominated with 65%, while men accounted for 35%. For age, the majority of respondents were 20–22 years old (70%), followed by 18–19 years old (20%) and over 22 years old (10%). Based on the year of entering college, most of the respondents came from the 2022 (35%) and 2023 (25%) batches, followed by the 2021 (20%) and other (20%) batches.

This profile reflects the dominance of students in the Management study program with diverse geographical backgrounds, especially from Bima and Waingapu. Women dominate this population, and most respondents are of productive age (20–22 years), mainly from the new generation (2022–2023). This profile provides a solid basis for further analysis, especially concerning student behavior in the context of the influence of Management education on financial habits or technology use. It also shows a reasonably proportional representation based on geographic location and gender.

Evaluasi Model Pengukuran

In Hair et al. (2021), the evaluation of the reflective measurement model consisted of loading factors >0.7 composite reliability >0.7 Cronbach's alpha and average variance extracted

(AVE>0.5) as well as the evaluation of discrimination validation, namely the fornell and lacker criteria and HTMT (Heterotrait Monotrait Ratio) below 0.9 cross loading.

Table 1. Outer Loading, Cronbachs Alpha, Composite Reliability, AVE

Variable	Measurement Items	Outer Loading	Cronbachs Alpha	Composite Reliability	AVE
Digital financial literacy	DFL1	0,765	0.831	0.888	0.665
	DFL2	0.892			
	DFL3	0.779			
	DFL4	0.820			
Financial Inclusion	FI1	0.891	0.868	0.910	0.718
	FI2	0.873			
	FI3	0.867			
	FI4	0.751			
Fintech Use	FU1	0.814	0.933	0.949	0.789
	FU2	0.881			
	FU3	0.907			
	FU4	0.794			
Financial wellbeing	FW1	0.85	0.872	0.912	0.723
	FW2	0.877			
	FW3	0.927			
	FW4	0.846			
	FW5	0.903			

Based on the data in Table 1, the evaluation of the measurement model shows that all variables have sufficient validity and reliability. The Outer Loading for each measurement item is above the threshold value of 0.7, indicating that all indicators significantly reflect latent constructs. For example, in the Digital Financial Literacy (DFL) variable, the Outer Loading value ranges from 0.765 to 0.892, and in the Financial Inclusion (FI) variable, the Outer Loading value ranges from 0.751 to 0.891.

Regarding reliability, all variables had Cronbach's Alpha and Composite Reliability values above the threshold of 0.7. For example, the Fintech Use (FU) variable has a Cronbach's Alpha value of 0.933 and a Composite Reliability of 0.949, reflecting excellent internal consistency between measurement items. Other variables, such as Financial Wellbeing (FW), also have a Cronbach's Alpha value of 0.872 and a Composite Reliability of 0.912, strengthening the construct's reliability.

From the perspective of convergent validity, all variables have an Average Variance Extracted (AVE) value above the threshold of 0.5, indicating that the construct can explain more than 50% of the variance of its indicators. For example, the Digital Financial Literacy

variable has an AVE value of 0.665, while the Financial Wellbeing variable has the highest AVE value of 0.723.

Overall, the measurement model met the criteria of good validity and reliability. The indicators on each variable showed the strength of a significant relationship with latent constructs, ensuring that the data used in this study were consistent and valid. This provides a strong foundation for continuing to analyze the relationship between latent variables in structural models, such as the influence of digital financial literacy, financial inclusion, and fintech use on financial well-being.

Tabel 2. Validity of discrimination (Fornell-Larcker Criterion)

	Digital Financial Literacy	Financial Inclusion	Financial Wellbeing	Fintech Use
Digital Financial Literacy	0.816			
Financial Inclusion	0.640	0.847		
Financial Wellbeing	0.520	0.551	0.888	
Fintech USe	0.427	0.741	0.416	0.850

Table 3. Validity of discrimination HTMT

	Digital Financial Literacy	Financial Inclusion	Financial Wellbeing	Fintech Use
Digital Financial Literacy				
Financial Inclusion	0.745			
Financial Wellbeing	0.586	0.608		
Fintech Use	0.484	0.845	0.459	

The research model shows adequate results based on evaluating the validity of discrimination using the Fornell-Larcker Criterion and HTMT (Heterotrait-Monotrait Ratio). Based on Table 2, the diagonal value (square root of AVE) for each latent variable is more significant than its correlation value with other latent variables. For example, Digital Financial Literacy (DFL) has an AVE square root value of 0.816, which is greater than its correlation with Financial Inclusion (FI) (0.640), Financial Wellbeing (FW) (0.520), and Fintech Use (FU) (0.427). The same can also be seen in other variables, such as Financial Inclusion, which has an AVE square root value of 0.847, higher than its correlation with different variables. These results show that the indicators on each variable are more strongly correlated with their constructs than other constructs, so the validity of discrimination has been met.

In Table 3, the results of the validity of discrimination based on HTMT also show that all values are below the threshold of 0.85, which confirms that there are no discrimination issues in the model. For example, the relationship between Digital Financial Literacy and Financial Inclusion has an HTMT value of 0.745, while the relationship between Financial Inclusion and Financial Wellbeing is 0.608, which still meets the criteria for the validity of discrimination. Thus, this research model has good discriminatory validity based on both approaches. This ensures that latent variables can be conceptually differentiated from each other, and the model can be used with high confidence for further analysis and hypothesis testing.

Structural Model Evaluation

Table 4. Multicollinearity Test

	VIF
Digital Financial Literacy → Financial Inclusion	1.223
Digital Financial Literacy → Financial Wellbeing	1.709
Financial Inclusion → Financial Wellbeing	3.094
Fintech use → Financial Inclusion	1.223
Fintech use → Financial Wellbeing	2.233

Table 5. Hypothesis Test

Hipotesis	Path coefficient	p-value	95% Path Coefficient Confidence Interval		F square
			Lower limit	Upper limit	
H1: DFL →FI	0.396	0.000	0.291	0.509	0.397
H2: DFL →FW	0.288	0.000	0.126	0.441	0.075
H3: FI →FW	0.332	0.000	0.145	0.504	0.055
H4: FU →FI	0.571	0.000	0.461	0.671	0.826
H5: FU →FW	0.048	0.569	-0.110	0.219	0.002

Based on the evaluation of the structural model from Table 4, the Variance Inflation Factor (VIF) value in each path is below the threshold of 5, indicating the absence of significant multicollinearity between independent variables. For example, the relationship between Digital Financial Literacy (DFL) and Financial Inclusion (FI) has a VIF of 1,223. In contrast, the relationship between Financial Inclusion and Financial Wellbeing (FW) has a VIF of 3,094. Although the VIF values on the FI and FW relationships are close to the limit, these results still show that the predictor is reliable for estimating relationships in the model without any redundancy between variables.

The results of hypothesis testing in Table 5 show that most of the relationships between variables are significant at a confidence level of 95% (p-value < 0.05). Here are the details of the results:

- H1 (DFL → FI) has a path coefficient of 0.396 with a p-value of 0.000 and a medium effect (F-square = 0.397). This shows the positive and significant influence of DFL on FI.
- H2 (DFL → FW) has a path coefficient of 0.288 with a p-value of 0.000, but the effect is small (F-square = 0.075). This indicates a positive but weak influence of DFL on FW.
- H3 (FI → FW) has a path coefficient of 0.332 with a p-value of 0.000, but the effect is small (F-square = 0.055). This shows the positive influence of FI on FW.
- H4 (FU → FI) shows a positive and significant relationship with a path coefficient of 0.571 (p-value 0.000) and a significant effect (F-square = 0.826), indicating the important role of Fintech Use in increasing Financial Inclusion.
- H5 (FU → FW) has a path coefficient of 0.048 with a p-value of 0.569, indicating an insignificant relationship and a minimal effect (F-square = 0.002).

The structural model shows that most relationship pathways between variables are significant and fit the initial hypothesis. Digital Financial Literacy (DFL) significantly affects Financial Inclusion (FI) and Financial Wellbeing (FW), with a stronger influence on FI. Meanwhile, Financial Inclusion (FI) also positively impacts Financial Wellbeing (FW), albeit with a small effect. The most prominent is the influence of Fintech Use (FU) on Financial Inclusion (FI), which shows a powerful relationship, signaling that fintech use is important in driving financial inclusion. However, the effect of FU on FW was not significant, indicating the need for further exploration regarding the role of mediation or moderation variables in this relationship. Overall, the model provides important insights into the relationship between digital financial literacy, Fintech, financial inclusion, and financial wellbeing, with several pathways that need to be further explored for a more comprehensive understanding.

Table 6. R-Square

	R-Square
Financial wellbeing	0.677
Financial Inclusion	0.352

Table 6 shows the R-Square value, which shows the predictive ability of independent variables to explain the variance of dependent variances. For Financial Wellbeing (FW), an R-Square value of 0.677 shows that the independent variables in the model can explain 67.7% of

the variance in FW. This value reflects high predictive power, indicating that the model's variables significantly contribute to financial wellbeing. Meanwhile, for Financial Inclusion, the R-squared value of 0.352 shows that independent variables can explain 35.2% of the variance in Financial Inclusion. This value reflects moderate predictive power, suggesting that other variables outside the model may contribute to unplanned purchasing behavior.

Table 7. SRMR

	Estimated model
SRMR	0.081

The SRMR (Standardized Root Mean Square Residual) value from Table 7 shows that the value of 0.081 is below the threshold of 0.10, which indicates that the model has a good match between the observed covariance matrix and the predicted covariance matrix. This shows that this structural model is representative and can describe the data well.

From Tables 7 and 7, this model has excellent predictive ability for Financial Wellbeing and moderate ability for Financial Inclusion. A high R-Square value on FW shows that the independent variables used in the model have a significant and relevant influence on improving financial wellbeing. However, a moderate R-squared value on financial inclusion suggests room for improvement in the model by adding other pertinent variables to account for unplanned buying behavior. Meanwhile, SRMR values that meet the criteria indicate that the model as a whole matches the data. Thus, this model can be relied upon to understand the influence of research variables on Financial Wellbeing and Financial Inclusion and provide relevant insights for data-driven decision-making.

5. CONCLUSION

This research focuses on the relationship between digital financial literacy, fintech use, financial inclusion, and financial well-being among students in the management study program. Using data from 246 respondents and analyzing it through Structural Equation Modeling-Partial Least Squares (SEM-PLS), it was found that Digital Financial Literacy significantly influences Financial Inclusion and Financial Wellbeing. In addition, financial inclusion also contributes positively to financial wellbeing.

One of the study's key findings is that fintech use is important for increasing financial inclusion but does not directly affect financial wellbeing. On the contrary, the positive impact of fintech use on financial wellbeing is more effective through increased financial inclusion. This research

highlights this indirect mechanism, which provides new insights for policymakers in formulating strategies to optimize the role of Fintech in driving financial inclusion as a basis for achieving sustainable financial wellbeing.

Overall, the study results show that the development of digital financial literacy and financial inclusion can help individuals overcome barriers to access to financial services, which can improve financial wellbeing and the economy.

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CHAPTER 9

The Nexus of Financial Literacy, Fintech Use, and Digital Financial Literacy in Driving Financial Inclusion

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ABSTRACT

This study aims to analyze the relationship between financial literacy, the use of Fintech, digital financial literacy, and financial inclusion in management and accounting study program students. Using the survey method and Structural Equation Modeling-Partial Least Squares, this study found that financial literacy plays a significant role in encouraging the use of Fintech. The use of Fintech, in turn, increases digital financial literacy and directly affects financial inclusion. In addition, digital financial literacy has significantly influenced financial inclusion.
In contrast to previous studies that tended to separate the roles of financial literacy and Fintech in supporting financial inclusion, this study integrates the two. It highlights the importance of digital financial literacy as a critical variable. The novelty of this research lies in the disclosure that using Fintech not only increases financial inclusion directly but indirectly through increasing digital financial literacy. These findings provide relevant new insights for policy development to encourage the adoption of digital financial technology and financial literacy to increase financial inclusion among the younger generation.
Keywords: Financial inclusion, Fintech use, Digital Financial literacy
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INTRODUCTION

Financial inclusion has been recognized as one of the global priorities to drive sustainable economic growth and reduce socio-economic disparities. Access to financial services enables individuals to manage risks, build assets, and strengthen their participation in the formal economy (World Bank, 2022). However, the main challenge in achieving financial inclusion lies in the low levels of financial literacy and limited access to technology in many regions, especially in developing countries (OECD, 2020). The advancement of financial technology (Fintech) presents new opportunities in addressing these challenges. Fintech offers more inclusive services through a technology-based approach, enabling broader and more efficient access for populations previously unreachable by traditional financial institutions (Arner et al., 2020). However, digital financial literacy has become a significant barrier that hinders the widespread adoption of financial technology. Individuals who lack an understanding of digital services often hesitate to use financial technology due to uncertainties related to security and complexity (OECD, 2020). Digital financial literacy, which includes the ability to understand, evaluate, and use technology-based financial services, plays a crucial role in the modern financial ecosystem. Previous studies have shown that adequate financial literacy increases trust and adoption of Fintech, and using Fintech itself can help improve digital financial literacy through practical experience (Gomber et al., 2017). In this context, digital financial literacy becomes an important bridge connecting traditional financial literacy with access to technology-based financial services (OECD, 2020).Meski literatur sebelumnya telah menyoroti pentingnya literasi keuangan dan teknologi keuangan dalam mendorong inklusi keuangan, terdapat kesenjangan dalam penelitian yang mengintegrasikan ketiga elemen ini secara simultan. Sebagian besar penelitian masih terfokus pada pengaruh terpisah antara literasi keuangan atau teknologi terhadap inklusi keuangan, tanpa menyoroti peran literasi keuangan digital sebagai penghubung yang esensial (Arner et al., 2020; OECD, 2020). Kesenjangan ini menimbulkan kebutuhan mendesak untuk memahami bagaimana ketiga elemen tersebut dapat bekerja secara sinergis untuk mendorong inklusi keuangan secara holistik.

This research explores the relationship between financial literacy, fintech usage, and digital financial literacy supporting financial inclusion. Using the Structural Equation Modeling-Partial Least Squares (PLS-SEM) method, this research examines the direct relationships between variables and identifies potential mediation effects. The findings of this study are expected to provide new insights for developing strategic policies and practical approaches to expand technology-based financial inclusion in the digital era, particularly among the younger generation as potential primary users of Fintech (World Bank, 2022).

LITERATURE REVIEW

Theory of Planned Behaviour

The theory of planned behavior has been used relatively well in previous research in finance. Theory of Planned Behaviour, or TPB for short, is commonly used to understand and predict human behavior. In recent years, the use of TBP to integrate topics such as financial

literacy, financial inclusion, financial technology (FinTech), and digital financial literacy has been explored more. Introduced by Ajzen (1985), TBP is defined by three core dimensions: attitude toward the behavior, subjective norms, and perceived behavioral control.

These three dimensions then form behavioral intention that will directly influence a person's actual behavior. The first aspect of TBP–attitude toward the behavior–depicts how attitude captures individuals' overall evaluation or positive or negative feelings related to performing a particular behavior (Sharif et al., 2020). This study is about how students face technological advances in the financial world. Finance has not stagnated with the current developments in information technology. The vast amount of information taken into the development of tools for finance has rapidly increased, resulting in various applications such as FinTech. Changes in the technological environment of finance enforce that students will have a higher requirement to adapt to the changes and how their attitude towards this change will affect their behavior towards facing it. On another note, this reinforces TBP's second element, where subjective norms play a role in a person's behavior. Subjective norms are defined as individuals' subjective perspectives on having positive or negative social pressure from their peers, such as parents, friends, spouses, or colleagues, which then influence or determine a person's behavior (Shih et al., 2022). The pretext of peer pressure in the context of subjective norms explains the position that students will face in an environment where, socially, people will integrate Fintech as part of their daily lives, hence creating the "pressure" of requiring knowledge of financial technology for students. Lastly, the third aspect, which discusses perceived behavioral control, is where people's behavior is dictated by ease or difficulty in performing the behavior (Hapsari, 2021). This shows that with the number of intellectual or tangible resources, people may behave differently. In previous research by Yoshino et al. (2020), results showed that with the intellectual resources of having greater financial literacy, people will tend to use fintech services. This indicates that having more resources will make it easier to perform the behavior. This writing will mainly discuss the relation or correlation between the variables, digital financial literacy, financial literacy, fintech use, and financial inclusion. Hence, I am creating the hypothesis' below.

Digital Financial Literacy and *Financial Inclusion*

Digital financial literacy (DFL) is often not differentiated from financial literacy. However, the term DFL differs from what we know about financial literacy. DFL refers to the skills of utilizing digital technology in financial services (Gawanab & Deka, 2021). Nowadays, DFL has become the determinant of having people use digital financial services, known as FinTech, because operating a digital financial service requires the users to have a certain degree of DFL to manage and sort through the features and understanding of the services. This is otherwise known as a financial inclusion gap, where access to digital financial services is limited due to the lack of DFL. Financial inclusion is defined as having the availability and accessibility of financial services to the entire population (Beck and Demirgüç-Kunt, 2008). Hence, this creates an argument that DFL plays a role in financial inclusion. Previous research in 2018 by Grohmann, Klühs, and Menkhoff found that individuals with higher DFL are more

likely to adopt digital financial services because the individuals with a higher DFL understand the risks, benefits, and functionalities of FinTech. Therefore, it shows a proportional relationship between digital financial literacy (DFL) and Financial Inclusion.

H1: *Digital financial literacy has a significant positive impact on financial inclusion.*

Financial Literacy* and *Fintech Use

Financial literacy is a foundation that bases people's behavior on financial behavior and personal money management (Koskelainen et al., 2023). Other definitions, such as those of Remund (2010), state that financial literacy is a multidimensional construct that includes financial knowledge, ability, and confidence in managing personal finances. Indeed, financial literacy could not be defined as just knowledge of finance in general but the skill to interpret and apply, transforming financial expertise into practical and applicable skills in daily financial activities and investing decisions. Concerning fintech use, financial literacy has been considered a significant determinant that motivates or shifts people to use financial technology (FinTech). FinTech itself refers to the automation or innovation in financial technology. In further definition, FinTech is a solution that creates an ease of financial services through technological advancements, therefore creating breakthroughs in traditional or conventional banking and financial services (Arner et al., 2015; Haddad & Hornuf, 2019). The relationship between financial literacy and Fintech has been previously researched by Jünger & Mietzner (2019). It discusses the likeliness of German households to adopt FinTech services and the main factor that affects the likelihood of using FinTech is a good financial education in financial literacy.

H2: *Financial literacy has a significant positive impact on fintech use.*

Fintech Use* dan *Digital Financial Literacy

Digital financial literacy influences the adoption and effectiveness of financial technology, or FinTech, as it uses individuals with the mindset and skills to engage with secure digital financial platforms. Researchers show that digital financial literacy enhances trust in FinTech systems, promoting their use for mobile payments and investment in digital assets (Margaretha, 2015; Goyal, 2020). Financial literacy directly impacts the behavioral intent to adopt Fintech, as users with higher literacy levels perceive these tools as more accessible, reliable, and beneficial (Amnas et al., 2024).

Digital financial literacy plays a mediating role by reducing barriers to adoption, such as fear of cyber risks or technical challenges, while simultaneously boosting the perceived ease of use and usefulness of fintech platforms (Asandimitra & Kautsar, 2020; Nurul et al., 2020). Studies from the data of the household surveys show that individuals with robust digital

literacy are better positioned to leverage Fintech to improve inclusion and economic participation, especially in underserved populations where traditional banking access is limited (Marszk & Lechman, 2021). This research needs targeted educational initiatives to enhance digital financial literacy, ensuring equitable access to Fintech's benefits and more excellent financial stability for inclusion globally.

H3: *Fintech use has a significant positive impact on digital financial literacy.*

Fintech Use* and *Financial Inclusion

Fintech Plays a transformative role in promoting financial inclusion by addressing the barriers faced by unbanked and underserved populations, leveraging digital technologies such as mobile banking, blockchain, and digital wallets. Fintech solutions have expanded access to formal financial services, especially in regions with limited banking infrastructure (anakpo et al., 2023; Basid et al., 2024). These innovations reduce transaction costs and improve service accessibility, enabling individuals to manage financial activities more efficiently (Anakpo et al.,2023). Moreover, digital financial literacy has emerged as a key mediator, facilitating the effective use of fintech platforms and enhancing their impact on financial inclusion (Basid et al., 2024). Policies supporting fintech adoption, such as mobile money interoperability and regulatory frameworks, have further accelerated financial inclusion in developing economies (Anakpo et al., 2023). Despite these advancements, challenges such as digital divides and regulatory hurdles remain significant, underscoring the need for targeted interventions to ensure equitable access to digital financial services (Basid et al., 2024). By addressing these challenges, Fintech can be pivotal in reducing poverty and fostering sustainable economic development.

H4: *Fintech use has a significant positive impact on financial inclusion.*

METODE PENELITIAN

This study uses a quantitative approach with a survey method to analyze the relationship between digital financial literacy, financial inclusion, fintech use, and financial literacy on students' financial well-being. The research sample was selected using a purposive sampling method, with the criteria being students of the Accounting study program who are still actively studying and using fintech services. A convenience sampling method was used for questionnaire distribution, where respondents who met the criteria were given direct access to the questionnaire. Data was collected online using the Google Form (G-Form) platform to reach respondents efficiently. The questionnaire included measurement items for each latent variable and used a 7-point Likert scale, with a range of answers from "strongly disagree" to "strongly agree." Data collection was carried out over a certain period to ensure sufficient respondents. The collected data were analyzed using the Partial Least Squares Structural Equation Modeling

(PLS-SEM) method to test the relationship between variables in the conceptual model. This approach was chosen because it can handle models with complex causal relationships and produce valid estimates even with a relatively small sample size. This study is designed to provide in-depth insights into the factors influencing financial inclusion and financial well-being of college students in the digital era.

Data Analysis and Discussion

Based on the respondents' data, the distribution of the study program shows that most respondents are from the accounting study program (100%). Based on Gender, most respondents are female (80%), while males account for 20%. Based on the city, most respondents come from Bima (60%) and Manado (40%). In terms of Age, the majority are in the 18–22 age group (85%), with the rest being over 22 years old (15%). Based on Year of Entry, the majority of respondents are from the 2021 intake (35%), followed by the 2022 intake (30%), the 2023 intake (25%), and the 2020 intake (10%). This profile reflects the dominance of Accounting study program students with diverse geographic distribution, especially from Bima and Manado, and the majority of female respondents. The age distribution concentrated in the young group (18–22 years) indicates an active student population in their education's early to middle phase. The relatively new college intake (2021–2023) supports the relevance of the data in the context of research that focuses on the behavior of the current generation of students. This profile provides a strong basis for further analysis, especially in understanding the relationship between the study's education, geographic location, and individual characteristics.

Evaluasi Model Pengukuran

Table 1. Outer Loading, Cronbachs Alpha, Composite Reliability, AVE

Variable	Item Pengukuran	Outer Loading	Cronbachs Alpha	Composite Reliability	AVE
Digital financial literacy	DFL2	0.703	0.785	0.870	0.694
	DFL3	0.888			
	DFL4	0.893			
Financial Inclusion	FI1	0.905	0.873	0.913	0.725
	FI2	0.900			
	FI3	0.814			
	FI4	0.780			
Financial Literacy	FL1	0.937	0.804	0.909	0.834
	FL3	0.888			
Fintech Use	FU1	0.752	0.865	0.909	0.715
	FU2	0.874			
	FU3	0.891			
	FU4	0.857			

Note: Cronbachs above 0.7 shows the indicator is reliable*

Based on the data in Table 1, the validity and reliability evaluations show very good results for all variables. The Outer Loading for each measurement item is above the threshold of 0.7, indicating that each indicator significantly reflects its respective latent construct. For example, in the Digital Financial Literacy (DFL) variable, the Outer Loading value ranges from 0.703 to 0.893, while in the Financial Inclusion (FI) variable, the Outer Loading value ranges from 0.780 to 0.905. This shows that the indicators have a strong relationship with their respective constructs. Regarding reliability, all variables have Cronbach's Alpha and Composite Reliability values that exceed the threshold of 0.7. For example, the Digital Financial Literacy variable has a Cronbach's Alpha of 0.785 and a Composite Reliability of 0.870, indicating good internal consistency between measurement items. Other variables, such as Fintech Use (FU), also have a Cronbach's Alpha of 0.865 and a Composite Reliability of 0.909, strengthening the model's reliability.

From the perspective of convergent validity, the Average Variance Extracted (AVE) values for all variables exceed the threshold of 0.5. For example, the Financial Literacy (FL) variable has the highest AVE of 0.834, while other variables, such as Digital Financial Literacy (0.694) and Fintech Use (0.715), also show adequate convergent validity.

Overall, the measurement model shows very good validity and reliability. All indicators consistently reflect their respective latent constructs, ensuring the data used is valid and reliable for further analysis. With a model that meets all evaluation criteria, the study of the relationship between latent variables in the structural model can be carried out with high confidence. This provides a strong foundation to support more in-depth research and interpretation of the results.

Tabel 2. Validitas diskriminan (Fornell-Larcker Criterion)

	Digital Financial Literacy	Financial Inclusion	Financial Literacy	Fintech Use
Digital Financial Literacy	0.833			
Financial Inclusion	0.520	0.852		
Financial Literacy	0.599	0.386	0.913	
Fintech Use	0.475	0.751	0.372	0.845

Table 2 shows that each latent variable's diagonal value (square root of AVE) is greater than the correlation between other latent variables, indicating good discriminant validity. For example, Digital Financial Literacy has a square root of AVE of 0.833, which is greater than its correlation with Financial Inclusion (0.520), Financial Literacy (0.599), and Fintech Use (0.475). The same thing applies to other variables, such as Financial Inclusion, which has a square root of AVE of 0.852, higher than its correlation with different variables. These results ensure that each latent variable is more closely related to its indicators than other latent variables—table 3. Validitas diskriminan HTMT

	Digital Financial Literacy	Financial Inclusion	Financial Literacy	Fintech Use
Digital Financial Literacy				
Financial Inclusion	0.601			
Financial Literacy	0.732	0.443		
Fintech Use	0.536	0.849	0.440	

Table 3 shows that all HTMT values are below the threshold of 0.85, which supports adequate discriminant validity. For example, the relationship between Digital Financial Literacy and Financial Inclusion has an HTMT value of 0.601, while the relationship between Financial Inclusion and Fintech Use has an HTMT value of 0.849. The relationship between other variables, such as Digital Financial Literacy and Financial Literacy, has an HTMT value of 0.732, indicating good discriminant validity. The results of the discriminant validity evaluation show that this model can distinguish latent variables conceptually, both based on the Fornell-Larcker Criterion and HTMT. Each latent variable has a stronger relationship with its indicators than others. This provides confidence that the constructs in this model have adequate uniqueness and do not experience significant overlap. With guaranteed discriminant validity, this model is suitable for further analysis and hypothesis testing regarding the relationship between latent variables.

Evaluasi Model Structural

Tabel 4. Uji multikolinear

	VIF
Digital Financial Literacy □ Financial Inclusion	1.291
Financial Literacy□ Fintech Use	1.000
Fintech Use □ Digital Financial Literacy	1.000
Fintech use □Financial Inclusion	1.291

Table 4 shows the Variance Inflation Factor (VIF) values for all relationships between variables are below the threshold of 5, indicating no multicollinearity problems. For example, the relationship between Digital Financial Literacy (DFL) and Financial Inclusion (FI) has a VIF value 1,291. In contrast, the relationship between Fintech Use (FU) and Digital Financial Literacy (DFL) has a VIF value 1,000. This ensures that the independent variables in the model do not have significant redundancy so that the regression analysis can be carried out with good reliability.

Tabel 5. Uji Hipotesis

Hipotesis	Path coefficient	p-value	95% Path coefficien Confidence Interval		F square
			Batas bawah	Batas atas	
H1: DFL→FI	0.212	0.000	0.114	0.315	0.086
H2: FL →FU	0.372	0.000	0.268	0.473	0.161
H3: FU→ DFL	0.475	0.000	0.384	0.566	0.291
H4: FU →FI	0.650	0.000	0.547	0.737	0.814

Hasil uji hipotesis menunjukkan bahwa semua hubungan antar variabel signifikan pada tingkat kepercayaan 95% (p-value < 0.05) dan memiliki pengaruh yang bermakna. Berikut adalah rincian hasil:

- H1 (DFL ,Üí FI): Path coefficient sebesar 0.212 dengan p-value 0.000, menunjukkan pengaruh positif dan signifikan DFL terhadap FI, dengan efek sedang (F-square = 0.086).
- H2 (FL ,Üí FU): Path coefficient sebesar 0.372 dengan p-value 0.000, menunjukkan hubungan positif dan signifikan antara Financial Literacy dan Fintech Use, dengan efek sedang hingga kuat (F-square = 0.161).
- H3 (FU ,Üí DFL): Path coefficient sebesar 0.475 dengan p-value 0.000, menunjukkan pengaruh yang kuat antara Fintech Use dan Digital Financial Literacy, dengan efek sedang hingga besar (F-square = 0.291).
- H4 (FU ,Üí FI): Path coefficient sebesar 0.650 dengan p-value 0.000, menunjukkan hubungan yang sangat kuat antara Fintech Use dan Financial Inclusion, dengan efek besar (F-square = 0.814).

The structural model shows consistent and significant results, with all hypothesized paths accepted. The effect of Digital Financial Literacy (DFL) on Financial Inclusion (FI) is positive and significant, although the effect is relatively moderate. Meanwhile, the relationship between Financial Literacy (FL) and Fintech Use (FU), as well as the relationship between Fintech Use and Digital Financial Literacy and Financial Inclusion, show a stronger influence, especially on the Fintech Use → Financial Inclusion path, which has the most significant effect in the model. These results highlight the importance of fintech use in improving digital financial literacy and financial inclusion, making Fintech Use a key variable in this model.

Table 6. R-Square

	R-Square
Digital Financial Literacy	0.226
Financial Inclusion	0.598
Fintech Use	0.139

Note: The r-square amount is abt how significant other variables could explain the indicator

Table 7. SRMR

	Estimated model
SRMR	0.130

Table 6 shows the R-Square value reflects the model's ability to explain the variance of the dependent variable influenced by the independent variables. Digital Financial Literacy has an R-Square value of 0.226, which means that the independent variables in the model can explain 22.6% of the variance in Digital Financial Literacy. This value indicates low to moderate predictive ability.

Financial Inclusion has an R-squared value of 0.598, indicating that the model's independent variables can explain 59.8% of the variance in Financial Inclusion. This value suggests good predictive ability, indicating that the model effectively explains financial inclusion. Fintech Use has an R-Square value of 0.139, which means that only 13.9% of the variance in Fintech Use can be explained by the variables in the model. This indicates low predictive ability and suggests exploring other factors influencing fintech use.

Table 7 shows that the SRMR value of the estimated model is 0.130, which is higher than the recommended threshold (0.10). This indicates a significant difference between the observed covariance matrix and the covariance matrix predicted by the model. With the SRMR value above the threshold, the model's fit to the empirical data can be considered less than optimal.

This model shows varying predictive ability for each dependent variable. Financial Inclusion has good predictive ability, while Digital Financial Literacy and Fintech Use show low to moderate predictive ability. High SRMR values indicate that the model needs to be refined to improve its fit with empirical data. Improvements can be made by adding relevant variables or re-evaluating the model specifications to improve the model fit. Overall, these results provide good insights into understanding the relationships between variables, but there is room for further refinement to enhance the model's overall validity.

Digital financial literacy (DFL) drives financial inclusion (FI), especially among college students. DFL includes an understanding of digital-based financial services such as digital wallets, banking applications, micro-investment platforms, and online payments, which make it easier for individuals to access formal financial services. This helps students manage their daily finances. Financial technology students have more confidence in these services because they know their benefits and risks, such as keeping data secure and preventing fraud. In addition, DFL educates students on how to face future financial demands. They can take advantage of services such as digital education loans, low-cost investment platforms, and digital wallet promotions if they can use financial technology. Students who understand financial concepts such as budget planning, investment diversification, and interest tend to make wiser financial choices. This increases financial efficiency and gives them access to formal financial products they previously did not have access to. Strategic steps, such as including digital financial education programs on campus and collaborating with Fintech, are needed to support the achievement of financial inclusion through DFL. In addition, it is important to promote digital security, which includes safeguarding personal data and preventing fraud. This method helps students become more financially aware and prepares them to face future financial problems. Therefore, digital financial knowledge is a significant factor that plays a role in building a financially inclusive society.

The use of Fintech (financial technology) is highly influenced by financial expertise. People with good financial knowledge may better understand fintech technologies like digital wallets, loan applications, and investment platforms. This understanding includes consideration of the costs, risks, and benefits of technology-based financial services to help people make smarter choices. Financial literacy also helps people trust financial technology because they know how Fintech works and how to deal with risks such as hidden fees and fraud. With this knowledge, they can use Fintech to improve their financial efficiency, such as using a digital wallet to record their expenses or investing strategically through a micro-investment platform. Financial literacy is essential to encourage students to use Fintech responsibly. Students who understand finance basics usually use Fintech to meet their daily needs, such as recording expenses, paying school fees, or getting loans for digital education. Conversely, a lack of financial knowledge about Fintech can lead to excessive and unwise use of Fintech, such as being trapped in debt by digital credit services. Therefore, financial literacy improvement programs are essential to ensure that students and the general public use fintech safely and responsibly, both through formal instruction on campus and collaboration with fintech providers. Good financial literacy drives wider adoption of Fintech and financial inclusion.

The use of Fintech can significantly impact digital financial skills (DFL) because of the practical experience that teaches people about digital financial services. By using fintech applications such as digital wallets, investment platforms, or app-based lending services, people learn firsthand about digital financial concepts, such as managing a budget, understanding financial risks, and making payments online. In addition, Fintech provides users with interactive learning services such as automated financial reports, instructions, and articles. In addition, the experience of facing risks such as hidden fees or data security threats through Fintech makes people more aware of the importance of being careful when making digital transactions. This causes them to understand digital finance better. Fintech can help students learn. For example, students who use digital wallets learn to record expenses and learn about the benefits of promotions such as cashback and transaction fee structures.

In the same way, micro-investment platforms teach them basic investment concepts such as risk management and diversification. However, using Fintech can also carry risks, such as impulsively taking on digital debt or a lack of understanding of service fees. Therefore, adequate financial education is needed to maximize the benefits of using Fintech on DFL. This can be achieved through the features offered by fintech applications and integrated educational programs. This way, Fintech can be a great learning tool to help people understand and master digital financial skills.

Fintech significantly impacts financial inclusion, which is the ability of people to obtain formal financial services quickly and cheaply. Fintech uses digital technology to provide services such as payments, loans, investments, and insurance to various levels of society, including those previously difficult to reach by conventional financial institutions. Fintech can reach low-income communities and people in remote areas who previously did not have access to formal financial services thanks to lower costs and ease of use. In addition, fintech products are often tailored to meet the needs of specific demographics, such as microloans for small businesses or small-dollar investments. Users can make transactions quickly and efficiently

through features such as QR payments, digital wallets, or application-based loans thanks to the convenience of fintech technology, which increases public trust in the formal financial system. Using Fintech increases students' financial inclusion by making it easier to access services such as paying tuition fees, managing expenses with digital wallet applications, or financing education through Fintech-based loan platforms. This success, however, requires financial training to reduce risks such as not understanding technology, maintaining data, or using excessive credit. Fintech can continue to drive sustainable financial inclusion and increase public access to formal financial services with strong regulations and adequate education.

Kesimpulan

This study concludes that digital financial literacy (DFL) and fintech use have a significant reciprocal relationship in driving financial inclusion. DFL plays a key role in helping individuals, including students, understand and wisely utilize digital financial services, such as digital wallets, micro-investment platforms, and educational loans. This literacy allows individuals to manage their daily finances and understand the benefits and risks of digital financial services, thereby increasing their confidence and ability to utilize financial technology. Conversely, the use of Fintech also has a positive impact on increasing DFL through practical experiences that provide direct learning about digital finance. Fintech offers easy access, low costs, and products tailored to various needs, expanding financial inclusion and encouraging users to increase their literacy in terms of security, risk management, and financial efficiency. However, using Fintech without adequate literacy can carry risks, such as poor debt management or a lack of understanding of hidden costs. Fintech significantly impacts reaching communities previously challenged by formal financial institutions, including students, by providing fast, efficient, and easily accessible services. However, financial inclusion's success through Fintech requires financial education support, strong regulations, and collaboration between fintech providers and educational institutions to ensure users can utilize financial technology responsibly.

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CHAPTER 10

Optimizing Digital Financial Literacy and Fintech for Student Financial Wellbeing

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ABSTRACT

This study aims to analyze the influence of digital financial literacy and the use of fintech on students' financial wellbeing, focusing on the relationship between unplanned purchase behavior and financial wellbeing. This research is vital because it provides insight into how consumption behavior and financial technology affect students' financial condition in the digital era. The Partial Least Squares Structural Equation Modeling approach used the quantitative method. Data was collected through an online survey using a Google Form-based questionnaire distributed to Accounting and Management students who are active in using fintech, selected through purposive sampling.

The study results show that digital financial literacy contributes significantly to financial wellbeing, emphasizing the importance of students' ability to manage digital financial information. Using fintech affects financial wellbeing, although the impact is less than financial literacy. In addition, the study found that an increase in unplanned purchases can improve student welfare. This may be the case because unplanned purchases often provide emotional satisfaction and short-term happiness, especially if the expenses are still under financial control. In the context of students, this consumption behavior can be considered a form of reward that supports a balance between academic pressure and personal life, thus having a positive impact on the perception of overall financial wellbeing.

This research provides insights for educational institutions and fintech service providers to develop financial literacy programs that focus on consumption behavior management. The implication is that students can use financial technology to optimize their financial wellbeing in the short and long term.

Keywords: Fintech, Digital Financial literacy, Financial wellbeing

1. INTRODUCTION

The rapid development of digital technology has brought about significant transformations in various sectors, including the financial industry. Financial technology or fintech refers to the innovation of combining technology with financial services to offer faster and more efficient solutions, ranging from digital payment investments to application-based loans. According to a report from *EY's Global Fintech Adoption Index*, the global adoption rate of fintech services in 2019 reached 64%, likely to have increased with the recent digital acceleration (Ernst & Young, 2019). In addition, technological advancements such as AI, *blockchain*, and cloud computing facilitate the creation of financial products and services. For example, AI enables more personalized banking and investment services, and blockchain provides a new level of transparency and security (Suryavanshi et al., 2023), While lay computing significantly reduces the cost and time required for transactions (Achar, 2021).

This study highlights that the use of fintech is now increasingly widespread in various circles, especially in developing countries, where this technology opens up opportunities to access financial services that were once difficult for some people to reach. Through the ease of digital transactions, fintech allows individuals to more efficiently manage their finances, save, invest, and protect themselves from various financial risks, thereby helping to improve overall economic stability and wellbeing. With more affordable and practical services, fintech positively impacts those never connected to formal financial services. Although this convenience sometimes triggers consumptive behavior, the benefits of fintech that strengthen financial inclusion and people's economic health remain a very valuable aspect and have the potential to improve living standards at large.

Digital financial literacy, the use of fintech, and impulse buying behavior have a significant influence on financial wellbeing. Adequate financial literacy allows individuals to make informed financial decisions, such as budgeting, investing, and debt management, thereby increasing financial satisfaction, reducing stress, and forming healthy financial habits. With good financial planning, individuals are also better prepared to face future needs, such as retirement, which positively impacts quality of life. Fintech strengthens financial literacy by providing easy and fast access to financial services, which helps financial management become more efficient and effective. This technology supports financial decisions through real-time planning, expense management, and investment, thereby minimizing the risk of financial management errors. On the other hand, impulsive buying behavior can hinder financial wellbeing because it leads to unplanned spending, reduced savings, and causes stress. Emotional purchases without careful consideration can lead to accumulated debt and hinder achieving financial goals, thus threatening an individual's financial stability.

A lack of understanding of financial literacy and the use of fintech can encourage a person to make unplanned purchases. With the rapid development of technology, people can easily access various financial services, such as digital payment applications, which also have attractive promos that make it easier for someone to buy goods that are not planned or can be called impulsive buying. Low digital financial literacy can cause a person to be more easily influenced by transactions. BNPL, or *buy now pay later*, is also one of the factors that can increase the tendency to shop because of easy access. Unplanned purchasing behavior has a

direct impact on a person's financial wellbeing. When a person has a poor understanding of literacy, it will result in poor self-control and can cause financial anxiety due to the inability to manage finances. A person with good financial literacy can control himself and manage his finances for planned things.

This research has a role in understanding how fintech can affect financial wellbeing in this era of digitalization, especially for the younger generation who use financial technology more often. Fintech is a financial service such as digital payments, online investments, or loans that can be done online through applications. Carlin, Olafsson, & Pagel (2019) concluded that decision-making can be improved by adopting fintech that uses bank accounts and can reduce high-interest unsecured loans and bank fees. Digital payments, Robo-advice, and other investment platforms impact financial wellbeing. Individuals with good financial literacy tend to use fintech services more often, including electronic money. Financial wellbeing is a condition in which a person has a sense of security in controlling the need to achieve financial goals. So that the higher the welfare financial seseorang maka semakin tinggi juga seseorang dalam memahami fintech.

This study aims to analyze the complexity of the relationship between digital financial literacy, fintech use, and unplanned purchases according to how they contribute to people's financial wellbeing. The study analyzes how digital financial literacy levels affect fintech usage patterns and influence a person's desire to buy goods unexpectedly, ultimately determining their relative wellbeing. In addition, buying decisions are often spontaneous and immature. According to the results of the research conducted (Kumar and Nayak et al. 2023), impulse buying is not only a specific non-personal transaction but an actual symptom of the entire power of a person who is emotionally challenged to make a purchase with limited self-control and without consideration of the consequences of the transaction that is substantially determined by the transaction itself. The phenomenon of impulse buying in this transitional digital era feels very complex. The distribution of various non-cash future products and services is many sellers with conditions exceeding the emotions of potential consumers. This may already be a driving factor for spontaneous purchases to address non-personal symptoms quickly. That is, the psychological dimension of the symptom appears here, and it is an emotional aspect whose view goes beyond the rational immunity of a person in the process of making decisions.

With an understanding of the relationship mechanism between these variables, this study is expected to provide in-depth insight into strategies to make fintech benefits more optimal, and the risk of unexpected purchases is still reduced so that financial stability always exists. The definition of this research is the financial status of the millennial generation, which includes income, spending patterns, budgeting planning, asset ownership, debt management, and emergency savings that are accompanied by the use of financial technology and fintech applications in and to improve financial health to help in and financial wellbeing. In addition, this study considers the relationship between digital knowledge, digital experience, digital awareness, and digital skills to the financial behavior of the millennial generation on the variables of their daily financial management. Anthony and Sabri (2021) said that the development of fintech, ranging from mobile payments, robo-advising, and application-based

investment platforms to online banking solutions, has significantly impacted financial planning, wellbeing, and economic inequality. Their research reveals concerns about young people's unpreparedness to face financial responsibilities that could affect their financial wellbeing.

Meanwhile, Aryan and Alsharif (2021) found that digital financial literacy positively impacts the saving and spending behavior of the millennial generation. They identified that all dimensions of digital financial literacy, including digital knowledge, experience, skills, and awareness, positively influence financial behavior. Furthermore, they emphasized the importance of developing financial education programs integrating digital financial literacy components, including practical skills and information related to digital technology, online security, budgeting, investment, and financial decision-making.

The research model is as follows:

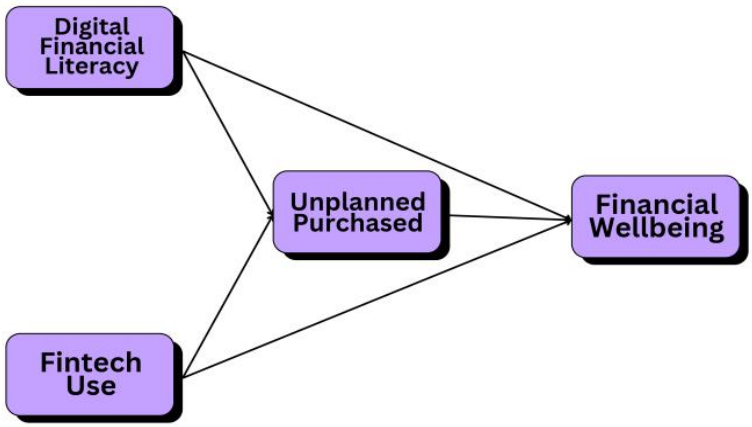

Figure1: Research Model

2. LITERATURE REVIEW

Digital Financial Literacy and Financial Wellbeing

Financial literacy is the ability to understand how money works in the world: how individuals manage the acquisition of money or make money, including how individuals earn and generate income, how individuals allocate it through investments, and how individuals donate it to help others, (Dr. Pramesh Chettri, 2024). According to (Niken Safitri, 2022), Financial wellbeing is where a person can fulfill his current and future obligations, prepare to meet his financial needs, and make choices that can be useful in his life. Digital financial literacy can be defined as an individual's knowledge and understanding of financial products and services related to digital technology (Rita Rahayu, 2022). According to Rachmaniar Myrianda Dwiputri et al. (2024), digital financial literacy mediates the relationship between financial skills and subjective financial wellbeing, meaning that when students have a good understanding of digital financial literacy, it will have a positive impact on their financial skills

and can indirectly increase their assessment of their subjective financial wellbeing. According to (Nazneen 2024) shows that financial literacy has a significant positive correlation with the financial wellbeing of employees in the banking sector, where increasing financial literacy directly affects better financial planning and behavior (Nazneen, 2024)

H1: Digital financial literacy affects financial wellbeing

Digital Financial Literacy and Unplanned Purchased

Digital Financial Literacy is the ability of individuals to understand, analyze, manage, and communicate information related to personal financial conditions that affect the material wellbeing of individuals. (Cude, 2006). According to Angelista (2024), digital financial literacy is the knowledge and understanding of financial management to achieve future prosperity, and financial literacy is very important for the future because a lack of financial literacy can result in improper financial planning and affect retirement. (Angelista, 2024). Byrne (2007) also states that low financial literacy will result in mistakes in financial planning and can ultimately hinder welfare when age is no longer productive. Impulsive buying is irrational because purchases occur quickly and unplanned because they are related to emotional conflicts and emotional impulses, according to Verplanken and Herabadi (2001). This is also supported by the statement of Pulungan (2024), which says that consumptive shopping occurs because people have a great desire to have objects or goods without thinking about their needs, and most people buy them because they want to satisfy their pleasure.

H2: Digital financial literacy affects unplanned purchased

Fintech Use dan Unplanned Purchased

The development of increasingly sophisticated and modern technology brings many benefits. Also, it forces everyone to continue to adapt to the latest innovations to meet the needs of life, especially financial technology, commonly known as fintech (Nurrohyani and Dariatno, 2020:13). Meanwhile, impulse buying is a buying process carried out by consumers without considering the need for the product and without going through the stage of searching for information about the product. According to Aprilia et al. (2017), it has a powerful emotional element. This statement is supported by Harmon and Novia (2016), where consumer behavior when buying products can be the same or different. Consumers have things that have been planned and not scheduled before buying a product. Consumer behavior without a purchase plan can trigger impulse buying behavior.

H3: Fintech use affects Unplanned Purchased

Fintech Use dan Financial Wellbeing

Mahfud et al. (2023) emphasized the importance of innovation in financial technology (fintech), which is growing rapidly and is an essential tool to facilitate and empower society. These innovations play a role in improving the quality of people's economic wellbeing and individual financial resilience, especially in developing countries. Fintech can help fight poverty and provide broader access to financial services, but its effectiveness depends on

adoption by society. Research by Dzogbenuku et al. 2023 examines the role of digital payment systems to support the financial wellbeing of economically vulnerable rural communities. The study specifically focused on consumers' perception of financial self-efficacy, the individual's belief that they can make the right financial decisions. The nature of providing these conditions is crucial because it can influence how consumers use and institutionalize their resources, both in the short and long term, determining their sense of financial security. According to Anthony, Sabri, Magli, et al. (2021), financial technology (FinTech) plays an essential role in supporting the economic health of young people. They argue that the intermediary of a financial service that is easily accessible to the eyes of peer-to-peer low-cost stock trading, FinTech clarifies financial access to production from the region of increasing every behavior needed of the younger generation in accessing or using technology

H4: Fintech use affects Financial wellbeing

Unplanned Purchased and Financial Wellbeing

Unplanned purchases refer to spontaneous desires, and they are immediately bought without thinking about future impacts, which can consequently increase financial losses (Fenton-O'Creevy et al., 2018). This statement is supported by Schiffman and Kanuk (2007), who say that emotional decisions a person makes back impulsive purchases. On the other hand, financial wellbeing is related to the ability of a person to meet their needs comfortably through stable finances to cover basic and emergency needs (Arifin, 2018). Financial attitude or financial wellbeing can be interpreted as an attitude shown by someone when facing financial problems. Someone with a good attitude who can restrain and limit their consumption will find it easier to achieve financial satisfaction. (Caronge et al., (2020); Boedker et al (2022)). Bruhn (2015) states that financial losses can have a negative impact on a person's wellbeing, hence the importance of planning and budgeting for financial income and expenditure.

H5: Unplanned purchases affect financial wellbeing

3. RESEARCH METHOD

This study uses a quantitative approach with a path analysis method based on Partial Least Squares Structural Equation Modeling (PLS-SEM). This method was chosen because it can test the causal relationship between complex latent variables and is suitable for exploratory and confirmatory research. This research involves the primary variables: Digital Financial Literacy, Fintech Use, Unplanned Purchases, and Financial Wellbeing. Data was collected through a questionnaire designed in the form of a Google Form (GForm), which was distributed online to respondents. The research sample was selected using the purposive sampling method with the criteria of active students from the Accounting or Management study program and actively using fintech services. In addition, the convenience sampling method is used to distribute questionnaires to ensure adequate distribution.

The distribution of respondents covers several regions, namely Bima, Waingapu, Manado, and Yogyakarta, which represent student populations with diverse geographical backgrounds. The data test began with an analysis of the validity and reliability of the

measurement model using Outer Loading, Composite Reliability, and Average Variance Extracted (AVE). The validity of the discrimination is tested through the Fornell-Larcker and HTMT criteria to ensure the uniqueness of each latent variable. Furthermore, hypothesis testing used path coefficients and p-values to evaluate the relationship between latent variables. In contrast, R-squared values assessed the model's predictive ability. The Standardized Root Mean Square Residual (SRMR) value evaluates the structural model fit. This approach is expected to provide comprehensive results on the influence of Digital Financial Literacy and Fintech Use on Financial Wellbeing through Unplanned Purchases.

4. RESULT AND DISCUSSION

Based on the respondents' data, the distribution by study program shows that the majority come from accounting (60%) and management (40%). By city, most of the respondents came from Bima (50%), followed by Yogyakarta (25%), Waingapu (15%), and Manado (10%). Regarding gender, female respondents dominated at 70%, while men dominated at only 30%. Based on age, the 21-year-old age group is the majority (30%), followed by 20-year-olds (25%), 22-year-olds (20%), 23-year-olds (15%), and other ages (10%). For the year of entering college, most of the respondents were students of the class of 2021 (35%), followed by 2022 (30%), 2020 (20%), and other batches (15%).

This profile reflects the diversity of respondents' characteristics in this study, with female respondents and students from the accounting study program dominating. The significant geographical concentration in Bima shows the importance of the regional context in this study. The relatively young majority age (21 years) and the distribution of college years focused on the new generation show the relevance of the data to the experiences and habits of the younger generation in the use of digital financial technology (fintech) and its impact on financial wellbeing. This analysis provides a solid basis for understanding the relationship between variables in research.

Evaluasi Model Pengukuran

The measurement model in this study consists of a reflective measurement model, where the variables DFL, FU, UP, and FW are measured reflectively. In Hair et al. (2021), the evaluation of the reflective measurement model consisted of loading factors >0.7 composite reliability >0.7 Cronbach's alpha and average variance extracted (AVE>0.5) as well as the evaluation of discrimination validation, namely the fornell and lacker criteria and HTMT (Heterotrait Monotrait Ratio) below 0.9 cross loading. Here is a table showing the evaluation of the measurement model.

Table 1. Outer Loading, Cronbachs Alpha, Composite Reliability, AVE

Variable	Item Pengukuran	Outer Loading	Cronbachs Alpha	Composite Reliability	AVE
Digital financial literacy	DFL2	0.857	0.821	0.893	0.736
	DFL3	0.854			

	DFL4	0.862			
Fintech Use	FU1	0.770	0.862	0.907	0.710
	FU2	0.876			
	FU3	0.903			
	FU4	0.814			
Unplanned purchased	UP1	0.769	0.895	0.923	0.705
	UP2	0.878			
	UP3	0.867			
	UP4	0.853			
	UP5	0.827			
Financial wellbeing	FW1	0.857	0.914	0.936	0.745
	FW2	0.865			
	FW3	0.900			
	FW4	0.821			
	FW5	0.869			

Based on the SEM PLS analysis results, the reflective measurement model has met most of the recommended evaluation criteria. All measurement items had an Outer Loading value above 0.7, such as DFL2 (0.857), FU3 (0.903), and UP3 (0.867), which showed a significant relationship between the indicator and the latent variable according to the recommendations of Hair et al. (2021) and Chin (1998). In addition, the Composite Reliability value for all variables, such as Digital Financial Literacy (0.893), Fintech Use (0.907), and Financial Wellbeing (0.936), is above the threshold of 0.7, indicating high internal consistency between measurement items. This is reinforced by Cronbach's Alpha score, which also meets the criteria of >0.7, such as Digital Financial Literacy (0.821) and Financial Wellbeing (0.914), which reflects good internal reliability.

The convergent validity of the model has also been met, as evidenced by the AVE values for all variables that exceed 0.5, such as Digital Financial Literacy (0.736) and Financial Wellbeing (0.745). This shows that the latent variable can explain more than half of the variance of the items. Nonetheless, data for evaluating the validity of discrimination, such as Cross Loading, Fornell-Larcker, and HTMT, are not available in this table. Therefore, additional analysis is needed to ensure the validity of the discrimination. Overall, the model shows good quality in terms of validity and reliability and does not require deleting measurement items. The next step is to conduct a discrimination validity analysis to complete the model evaluation.

Tabel 2. Validity of discrimination (Fornell-Larcker Criterion)

	Digital Financial Literacy	Financial wellbeing	Fintech use	Unplanned purchased
Digital Financial Literacy	0.858			
Financial wellbeing	0.458	0.863		
Fintech use	0.452	0.356	0.842	
Unplanned purchase	0.350	0.369	0.395	0.840

This model has met the required criteria based on the discrimination validity analysis results using the Fornell-Larcker Criterion. The square root value of AVE for each latent variable is more significant than its correlation with other latent variables, indicating that each latent variable is unique and can be distinguished. For example, Digital Financial Literacy has an AVE square root value of 0.858, which is higher than its correlation with Financial Wellbeing (0.458), Fintech Use (0.452), and Unplanned Purchase (0.350). Similar things were also seen in other variables, such as Financial Wellbeing with an AVE square root value of 0.863, which was greater than its correlation with different variables, as well as Fintech Use (0.842) and Unplanned Purchase (0.840), which showed a consistent pattern.

These results indicate that the validity of discrimination has been met, where each latent variable has a stronger relationship with its indicators than other latent variables. Thus, this model demonstrates a good ability to identify and measure the relationships between variables accurately.

Table 3. Validity of discrimination HTMT

	Digital Financial Literacy	Financial wellbeing	Fintech use	Unplanned purchased
Digital Financial Literacy				
Financial wellbeing	0.523			
Fintech use	0.536	0.394		
Unplanned purchase	0.406	0.404	0.450	

Based on the discrimination validity analysis results using the Heterotrait-Monotrait Ratio (HTMT), this model meets the recommended criteria for discrimination validity. The HTMT criteria require that the value between the latent variables be less than 0.85 or 0.90, depending on the study context. From the available tables, all HTMT values are below this threshold. For example, the relationship between Digital Financial Literacy and Financial Wellbeing has an HTMT value of 0.523, while the relationship between Digital Financial Literacy and Fintech Use is 0.536. In addition, the relationship between Financial Wellbeing and Fintech Use has an HTMT value of 0.394, and the relationship between Fintech Use and Unplanned Purchase is 0.450.

These results show that the model has sufficient discriminatory validity based on the HTMT approach. With low HTMT values among the latent variables, it can be concluded that each latent variable is quite different from the other and does not overlap significantly. This

supports the validity of the model for measuring conceptually distinct constructs. Based on these results, the model is reliable for further analysis, and the relationships between variables can be interpreted accurately without concerns about the validity of discrimination.

Structural Model Evaluation

Several tests are carried out to ensure the reliability and validity of the structural model when evaluating the structural model. First, the multicollinearity test shows that the VIF value on the model is below the threshold of 5, which indicates the absence of multicollinearity among independent variables so that the model is stable and free from redundancy problems between predictors. Second, the significant path coefficient test results showed that all relationships between variables had a p-value of < 0.05, indicating a significant relationship at a 95% confidence level. Third, the analysis of path coefficient confidence intervals at a 95% confidence level showed that all coefficients were in intervals that did not include zero, strengthening the evidence of the significance of the relationship. Finally, the size (F-square) effect measurement provides information regarding the magnitude of the direct influence and mediation between variables, where the effect can be classified as small, medium, or large, depending on the F-square value. This overall evaluation ensures that the structural model is not only significant but also able to identify the relationships between variables accurately and is relevant in the research context.

Table 4. Uji multikolinear VIF < 5

	Digital Financial Literacy
Digital Financial Literacy →FW	1.315
Digital Financial Literacy → UP	1.257
Fintech use →FW	1.367
Fintech use →UP	1.257
UP →FW	1.239

The results of the multicollinearity test showed that all VIF values were below the threshold of 5, such as Digital Financial Literacy against Financial Wellbeing (1,315) and Fintech Use against Financial Wellbeing (1,367). This indicates the absence of significant multicollinearity between independent variables, so the model can be considered stable and reliable for parameter estimation.

Table 5. Hypothesis Testing

Hipotesis	Path coefficient	p-value	95% Path coefficient Confidence Interval		F square
			Batas bawah	Batas atas	
H1: DFL →FW	0.330	0.000	0.220	0.436	0.113
H2: DFL → UP	0.216	0.000	0.109	0.325	0.046
H3: FU → UP	0.297	0.000	0.187	0.405	0.087
H4: FU → FW	0.126	0.032	0.011	0.240	0.016
H5: UP → FW	0.204	0.000	0.089	0.312	0.046

Hypothesis testing shows that all pathways in the model are significant at a 95% confidence level, as indicated by a p-value of < 0.05 for all hypotheses:

- H1: Digital Financial Literacy (DFL) has a significant effect on Financial Wellbeing (FW) with a path coefficient of 0.330 (p = 0.000) and a medium securities value (F-square = 0.113).
- H2: DFL has a significant effect on Unplanned Purchases (UP) with a coefficient of 0.216 (p = 0.000) and a small effect value (F-square = 0.046).
- H3: Fintech Use (FU) has a significant effect on UP with a coefficient of 0.297 (p = 0.000) and a medium effect value (F-square = 0.087).
- H4: FU significantly affected FW with a coefficient of 0.126 (p = 0.032), although the effect was small (F-square = 0.016).
- H5: UP significantly affects FW with a coefficient of 0.204 (p = 0.000) and a small effect value (F-square = 0.046).

Tabl3 6. R-Square Test

	R-Square
Financial wellbeing	0.266
Unplanned purchased	0.189

The R-Square value shows that the independent variables in this model can explain 26.6% of the variance in Financial Wellbeing (FW) and 18.9% of the variance in Unplanned Purchase (UP). Although this value is relatively moderate, the model shows quite adequate predictive power in the context of social research.

Table 7. SRMR Test

	Estimated model
SRMR	0.066

The SRMR (Standardized Root Mean Square Residual) value of 0.066 is below the threshold of 0.08, indicating that the model matches the empirical data and the proposed structural model. The analysis results show that this model meets the criteria of multicollinearity stability, model fit, and significance of the relationship path between variables. Digital Financial Literacy (DFL) and Fintech Use (FU) have a significant influence on Financial Wellbeing (FW) and Unplanned Purchase (UP), with the DFL pathway on FW showing the most substantial effect. The R-Square value shows that although the model can explain the variance quite well, there is an opportunity to improve the model's predictions by adding other variables. Overall, the model is powerful enough to justify the relationships between variables, and the results are relevant to provide practical and academic insights.

5. CONCLUSION AND RECOMMENDATIONS

This paper highlights the relationship between digital financial literacy, the use of fintech, unplanned purchases, and financial wellbeing in students. The study found that digital financial literacy significantly influences financial wellbeing and unplanned buying behavior. At the same time, using fintech also affects both aspects, although the impact on financial wellbeing is smaller than financial literacy. Interestingly, although often perceived as unfavorable, unplanned purchases can positively impact financial wellbeing if done under reasonable financial control, as they can provide short-term emotional satisfaction. This study emphasizes the importance of managing consumption and the wise use of financial technology to optimize the financial wellbeing of students. The results of this study offer practical insights for educational institutions and fintech service providers to develop more effective financial literacy programs.

Future research should explore further the mechanisms by which digital financial literacy and fintech use affect financial wellbeing through mediating variables, such as self-control, financial awareness, or consumption habits. Additionally, research can broaden the focus by involving more diverse populations, such as young workers or vulnerable community groups, to understand broader dynamics. Longitudinal studies can also be conducted to evaluate the long-term impact of unplanned purchases on financial wellbeing and how financial literacy and fintech can be used to mitigate their negative impacts. A qualitative approach can complement the quantitative findings by exploring individual experiences and perspectives in utilizing fintech to achieve financial stability.

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CHAPTER 11

The Impact of Fintech and E-Banking on Financial Inclusion and Resilience: A Study on Indonesian Students

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ABSTRACT

This study analyzes the relationship between financial technology (fintech), e-banking, financial inclusion, and financial resilience among students. Data were collected from 202 respondents through a questionnaire and analyzed using the Structural Equation Modeling-Partial Least Squares (SEM-PLS) method. The study results show that fintech positively affects financial inclusion, which in turn increases financial resilience. However, e-banking did not significantly affect financial inclusion or financial resilience. In addition, fintech also does not directly influence financial resilience, showing that the role of financial inclusion as a mediator is very important. These findings highlight significant differences between fintech and e-banking in encouraging financial inclusion and resilience, especially among digital-natives students. This article provides new insights into the importance of developing financial technology to improve financial access and coping with financial stress. Practical implications include developing collaborations between financial institutions and fintech providers to improve national financial inclusion and resilience. This study contributes to the literature by exposing the limitations of the role of e-banking in improving financial inclusion during digital transformation.
Keywords: Fintech, e-banking, financial inclusion, financial resilience, students

Background

Financial inclusion has an important role in reducing inequality in people's welfare, thus, it is correlated with economic growth (Kim *et al*., 2018). Financial inclusion also plays an important role as an enabler of economic recovery because it provides access to financing for the community so that all levels of society have the opportunity to increase their economic activities (Mugo & Kilonzo, 2017). A person's high level of financial inclusion can be characterized by the increasing ability and skill of the individual in managing his/her finances (Ozili, 2021). Therefore, financial inclusion can support financial resilience, so that people will be able to survive in the face of economic pressures and enable them to be better prepared to navigate current and future financial crises (Belayeth Hussain *et al*., 2019).

Individual financial resilience is very important both in normal and crisis situations. In normal situations, individual financial resilience is needed to maintain financial stability both to meet current and future needs (Hassan *et al*., 2018). Meanwhile, in a crisis situation, financial resilience will be able to mitigate bankruptcy or financial problems due to financial stability established since before the crisis. Financial resilience reflects a person's ability to survive in unfavorable financial conditions (financial stress) such as disability, health problems that have an impact on declining financial conditions, and unemployment (Salignac *et al*., 2019). With the economic crisis due to the impact of the Covid-19 pandemic since 2020, it is necessary to take a closer look at the relationship between financial inclusion and individual financial resilience.

The development of financial inclusion and financial resilience cannot be separated from technological developments, especially technology in the financial sector (Isukul & Tantua, 2021). The development of new technology and increasing digitalization in the financial sector has begun to spread not only in banking, savings and loan cooperatives, and other non-bank financial institutions, but also other technology-based financial services. Currently, there are many emerging technology-based financial services (financial technology) that offer various types of services such as financing, lending, fund-raising, asset and wealth management, investment, and digital payments by providing operational convenience for consumers. Like two sides of a coin, the development of financial technology can be a threat or opportunity for the banking industry and the financial industry, which is considered to be well established.

Several studies examining the effect of financial inclusion on financial resilience have been carried out using samples of households, women, and micro, small and medium enterprises. However, research on the relationship between financial inclusion and financial resilience for students is still minimal, especially in Indonesia, whereby students contribute a very large number of around 7,367,748 individuals (Ministry of Education and Culture, 2020). Thus, we developed this research by including aspects that encourage increased financial inclusion, namely financial technology and e-banking.

This study aims to investigate the effect of financial inclusion on financial resilience, specifically, investigating the effect of e-banking and financial technology on financial inclusion and financial resilience. We separate e-banking and fintech as two different variables. E-bank is one of the facilities of commercial banks while fintech is a digital-based financial transaction facility used for payments, insurance, investment and other financial transactions.

We use students as samples because at their age they tend to be more easily affected, so it is interesting to study their financial resilience (Hassan, Kassim, & Ma'on, 2018). Students have great potential as an economic driver in a country both in terms of population size, character, literacy level and financial inclusion. Students are also a community group with high technological literacy as well as a smart and innovative mindset. The ubiquitous presence of technology in the lives of the younger generation has led to the creation of the term "digital native", a term specifically coined for younger generation and their ability to use technology and devices appropriately (OECD, 2020). This is proven by the Indonesian Financial Services Authority (OJK), which stated that the level of financial inclusion in the youth category is 70% (OJK, 2019). The high level of financial inclusion among students is also supported by the widespread use of financial technology by the millennial generation. Indonesia Stock Exchange showed that 66.38% of them play an active role as lenders and 66.17% as borrowers. The urgency of this study is the need to understand how e-banking and financial technology can affect the financial inclusion of students, most of whom are relatively knowledgeable about technology. This study is conducted to determine whether financial technology and e-banking can directly improve student financial resilience, so that they can be taken into consideration in the development of financial applications by both banks and non-banking developers.

LITERATURE REVIEW

Financial resilience is the ability to survive and cope with events that impact income or assets owned (Bolt, 2019). The essence of financial resilience is the relationship between perceived vulnerability, the capacity to anticipate shocks or stresses, and the ability to cope with them (De Lima & De Aquino, 2019). A better understanding of individuals' financial resilience, such as how they bounce back from adverse financial events and the resources and support they use, can help determine how resources can and should be invested to help individuals overcome financial difficulties, assisting the development of effective policies. and, ultimately, improve financial well-being (Salignac *et al.*, 2019). Financial resilience is driven by financial inclusion. Financial inclusion is the availability of access to various financial institutions, products and services in accordance with the needs and abilities of the community to improve the welfare of the community. Financial inclusion is important firstly to increase resilience and investment in education, health and micro-enterprises, daily life, secondly, to increase efficiency in everyday life, thirdly, to transfer individual financial risks to the financial system, and fourthly, to support economy growth by expanding access.

Several studies have found that financial technology and e-banking affect financial inclusion. Financial technology (fintech) is the use of technology in the financial system to produce new products, services, and/or business models that impact monetary stability, financial system stability, and/or efficiency, smoothness, security, and reliability of the payment system. Cortina & Schmukler (2018) stated that fintech is a new financial industry that relies on innovative technology and business models to provide financial services outside the traditional financial sector. Feyen *et al.*, (2021) stated that financial technology contributes to 2 main areas in the financial industry, firstly, by increasing connectivity via the internet and mobile technology and thereby increasing efficiency and increasing access to services, and

secondly, through low-cost storage and computing and reducing the need for a physical form of an office or branch. The Financial Services Authority (OJK) divides fintech into 2 types, namely fintech 2.0, which is the technology for digital financial services operated by financial institutions such as banks in the form of applications or websites for customers to conduct online transactions, and secondly fintech 3.0, which are tech-startups with innovative financial products and services.

Electronic banking (e-banking) is a system that brings together banking products and services, both traditional and new, directly to customers through interactive electronic communication channels (Goi, 2005). Next, Mwiya *et al.* (2017) defined e-banking as using technology by banks to provide their products and services to clients from anywhere and anytime through various communication media such as the internet, cellular networks, ATM networks, and so on. E-banking includes mobile banking, internet banking, SMS banking, phone banking, and ATM . Meanwhile, Nustini & Fadhillah (2020) argued that e-banking is one of the bank services that allows customers to obtain information, communicate, and carry out any banking transactions through the network to increase the efficiency of operational activities and the quality of bank services to its customers.

RELATIONSHIP BETWEEN VARIABLES AND DEVELOPMENT OF HYPOTHESES

The relationship between financial technology and financial inclusion

Fintech provides convenience for the community, especially for the *unbanked* in terms of processing compared to conventional banks, because it can be accessed anywhere and anytime. The new habit of “branchless banking” as a form of digital transformation has increased access to financial services (Tsai, 2017). Financial inclusion becomes important, especially in developing countries, because it can improve people's lives. To provide access to financial services such as payments, savings, insurance, and credit loans, a solution is needed through a digital system that can be accessed through an application and connected to the internet network (AFI, 2018). The increasing development of the internet impacts the increasing growth of fintech, making it possible to take advantage of fintech to increase financial inclusion. According to Rahmi (2019) the existence of fintech provides an opportunity to increase financial inclusion and has a massive impact on the economy. Furthermore, the study by Emara & Said (2021) showed that having access to finance positively affects economic growth when supported by regulation. Financial technology can potentially increase financial inclusion through digital transformation and economic development. Research by Romadhon & Rahmadi (2020) showed that fintech significantly affects financial inclusion. This is the basis of the first hypothesis, as follows:

H_1: Financial technology has a positive effect on financial inclusion.

The relationship between e-banking and financial inclusion

In essence, banks are important institutions that can promote economic development with a major role in mobilizing funds. Technology-based financial services aim to reduce the constraints of limited access to financial services, which in turn can increase financial inclusion. Oteh *et al.* (2017) identified that there is a large gap between demand and supply for

technology-based and/or digital financial services that poses a threat to increasing financial inclusion. Therefore, it is important to intensify efforts in utilizing banking technology to bridge the gap and expand access and reach of financial services. However, access alone will not guarantee inclusion without efforts to address availability and use constraints. Mobile banking is expected to play an important role in responding to supply and demand constraints and in increasing financial inclusion (Nwude *et al.*, 2020). In the short term, digital finance negatively affects financial inclusion. However, in the long term digital finance has a positive impact on financial inclusion (Achugamonu *et al.*, 2019). Based on the explanations above, the second hypothesis is as follows:

H_2: E-banking has a positive effect on financial inclusion.

The relationship between financial inclusion and financial resilience

Chances of being financially resilient are 1.4x higher for people with financial accounts than those who don't (Hussain *et al.*, 2019). This indicates that financial inclusion has a positive effect on financial resilience. Pandin *et al.* (2021) found that financial inclusion has a significant positive effect on financial decisions. This suggests that financial inclusion is one solution to financial problems, meaning that good financial inclusion will positively impact financial decisions. Financial inclusion has a significant negative effect on the vulnerability of family financial resilience. The decrease in financial inclusion will impact increasing the vulnerability of financial resilience and vice versa. Adam *et al.* (2021) concluded that financial literacy and inclusion can potentially increase financial well-being resilience. This description is the basis for the third hypothesis, which is as follows:

H_3: Financial inclusion has a positive effect on financial resilience.

The relationship between financial technology and financial resilience

Financial technology (fintech) has advantages in terms of the convenience of accessing financial services for the community. Access to financial services is important because it will allow them to have financial resilience and control their daily lives through savings or investments. Financial inclusion is a strong framework for building financial resilience, and financial inclusion can be driven by digital financial services and supported by good financial literacy (Lyons *et al.*, 2021). Digital financial services will later be useful for saving money, securing loans, insuring risks, and providing emergency fund transfers. Thus, it will have an impact on financial resilience. Based on this description, we formulated the fourth hypothesis as follows:

H_4: financial technology has a positive effect on financial resilience.

The relationship between e-banking and financial resilience

Financial and digital literacy are key factors for building financial inclusion and resilience. Furthermore, the definition of financial literacy urgently needs to be redefined to include digital literacy, not only conventional financial literacy, as it is an important implication to consider both approaches to improve the long-term financial resilience of households.

Salignac *et al.* (2019) formulated the multidimensional financial resilience framework to include economic resources, financial resources, financial knowledge and behavior, and social capital. Access to bank accounts, savings, and others, are factors that increase financial resilience. Based on this explanation, the fifth hypothesis is as follows:

H_5: E-banking has a positive effect on financial resilience.

Analysis Model

Below is the analysis model of this research.

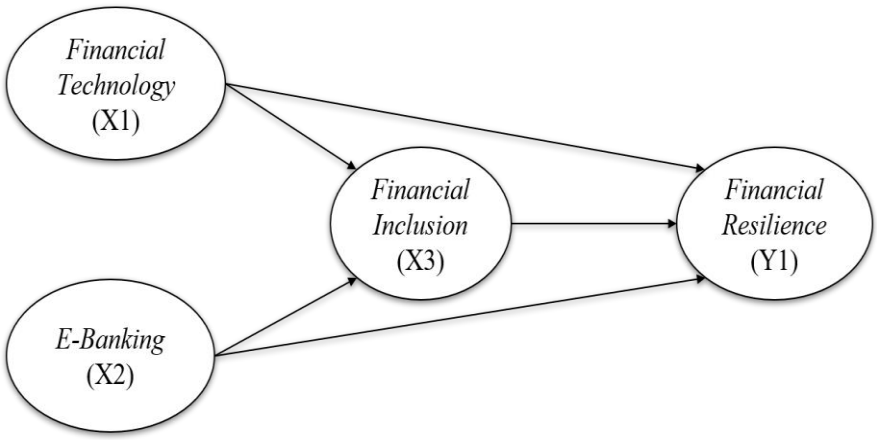

Figure 2.1 Analysis Model

RESEARCH METHODOLOGY

This study is conducted using a survey method by collecting primary data through a questionnaire. We sent questionnaires to active students who often use fintech and e-banking applications. We distributed 300 questionnaires and collected 202 questionnaires, so the return rate reached around 70%.

Conceptual and operational definitions of variables in this study are as follows. The concept of E-banking is adapted from Mwiya, et al. (2017), which is that it is an electronic media connected to the internet network to facilitate transactions and can be accessed anywhere and anytime, which includes internet banking, SMS banking, mobile banking, phone banking and ATMs. Ease of Use, Usefulness, Trust and Risk, and Attitude and Behavior are the indicators used. The concept of financial technology services is adapted from Pirdayanti et al. (2021), Chuang et al. (2016), and Hansen et al. (2017), namely, various financial services provided by technology companies (start-ups) through digital/internet and mobile technology platforms or facilities, such as digital payment systems, credit loans, fundraising, asset/wealth management/wealth management and blockchain. The indicators of fintech services are Ease of Use, Usefulness, Trust and Risk, Attitude and Behavior. The concept of Financial Inclusion is the availability of access to financial institutions, products and services (savings, deposits, current accounts, loans, etc.) in accordance with the needs and capabilities of the community in order to improve the welfare of the community. We adopted the concept of financial inclusion from Marginingsih (2021). Financial resilience is adopted from Suh (2021), which is the ability

to be able to survive events that have an impact on sources of income with indicators of Attitude and Behavior, Knowledge. All indicators use a Likert scale, whereby 1 indicates strongly disagree and 8 for strongly agree. We used Partial Least Square. Paratial Least Square is a powerful analytical method because it can illustrate the relationship between latent variables (Ghozali, 2013).

Data Analysis and Discussion

As previously mentioned in Research Methodology, there is a total of 202 data that can be processed and used as the final research sample. The distribution of the demography of the respondents' data is shown in Table 2.

Table 2. Distribution of Research Respondents Demography (n=400)

No	Category	Description	Quantity	Percentage
1	Sex	Male	62	31%
		Female	140	69%
2	Age	< 20 years old	50	24%
		20-21 years old	111	55%
		> 21 years old	41	21%
3	Monthly spending	< 1 million	55	27%
		1-2 million	70	35%
		2-3 million	43	21%
		>3 million	34	17%

Table 2 shows that there are 62 male respondents (31%) and 140 female respondents (69%). Whereas the age of respondents under 20 years are 50 people (24%), 111 people (55%) aged between 20-21 years and 41 people or 21% aged over 21 years were . The regular monthly expenditure for 55 respondents is one million, 70 respondents (35%) with expenditures between 1 million and 2 million, 43 people (21%) with expenditures of 2 million to 3 million, and 34 people or 17% with monthly expenditure of 3 million and above. Therefore, the respondents in this study are mostly women between the ages of 20 to 21 years, with expenditure of 1 million to 2 million every month. So from these characteristics it appears that the students who became respondents are students in the middle class.

Evaluation of the Measurement Models

The evaluation of the measurement model for the reflective variables consisted of: internal consistency, measured by the CR value; indicator reliability; convergent validity, measured by the AVE value; and discriminant validity (Hair et al., 2017). In PLS-SEM, individual reliability is more prioritized than the reliability measured based on the intercorrelation between the variables in the model. Thus, in PLS-SEM, measuring the composite reliability (CR) is more accurate than using Cronbach's Alpha (Hair et al., 2017).

Table 3 Composite Reliability and Average Variance Extracted

Variable	Dimension	CR ≥ 0.70	AVE ≥ 0.50
Financial Technology	Ease of Use	0.833	0.558
	Usefulness		
	Trust and Risk		
	Attitude and Behavior		
E-Banking	Ease of Use	0.853	0.702
	Usefulness		
	Attitude and Behavior		
Financial Inclusion	Knowledge	0.904	0.702
	Access		
	Usage		
	Welfare		
Financial Resilience	Attitude and Behavior	0.643	0.474
	Knowledge		

Table 3 shows the lowest composite reliability value is 0.643 for financial resilience and the highest value is 0.904 for financial inclusion. A Composite Reliability value of > 0.6 is still acceptable because it is explanatory research (Ghozali & Latan, 2015). The convergent validity test is met if the Average Variance Extraction (AVE) value is > 0.5 (Hair *et al.*, 2014). According to the table above, all AVE values exceed 0.5 except for the Financial Resilience variable. However, even though the AVE value of the Financial Resilience variable is < 0.5, Fornell and Larcker stated that when the AVE value is less than 0.5. Still, if the Composite Reliability (CR) value is greater than 0.6, then it is acceptable (Larcker & Fornell, 1981). Therefore, the CR value is entirely satisfactory because it is above 0.6. Next, the Goodness-of-Fit test was carried out, which showed the suitability test of the model as presented in the following table.

Table 4. Fit Indices for the path model

Model fit index	Expected Value	Result	Evaluation
RMSEA	≤ 0.08	0.097	Poor fit
GFI	≥ 0.90	0.881	Marginal Fit
CFI	≥ 0.90	0.921	Fit
TLI	≥ 0.90	0.895	Marginal fit
CMIN/DF	≤ 5.00	2.891	Good fit

Table 4. shows the model according to the conditions that have been determined. According to Hair *et al.* (2014) the model can be deemed feasible if at least some of the sizes meet the expected criteria. Therefore, the researcher concluded that the proposed model meets the Goodness-of-Fit test. Next, a hypothesis test was conducted with the following results.

Table 5. Hypothesis Testing

Path	Estimate	SE	CR	P	Result
Financial Technology→Financial Inclusion	.548	.114	4.789	***	Accepted
E-Banking→Financial Inclusion	.217	.131	1.659	.097	Not Accepted
Financial Inclusion→ Financial Resilience	.205	.051	3.995	***	Accepted
E-Banking→Financial Resilience	-.062	.069	-.895	.371	Not Accepted
Financial Technology→Financial Resilience	.032	.065	.489	.625	Not Accepted

The hypothesis will be accepted if the significance level (p value) is < 0.05. Thus, based on table 5, the hypotheses of financial technology affecting financial inclusion and e-banking affecting financial resilience are accepted. On the other hand, there are three hypotheses that are not accepted, namely the effect of e-banking on financial inclusion, the effect of e-banking on financial resilience, and the effect of financial technology on financial resilience.

Discussion

Financial technology affects financial inclusion

The hypothesis that financial technology (fintech) affects financial inclusion is accepted, indicating that the use of fintech affects the level of students' financial inclusion. The presence of fintech has become customary for the community, especially the millennial generation. This is due to the increasing use of the internet and a mindset that wants activities to be easy and practical. Therefore, the use of fintech has a positive influence on financial inclusion. Financial inclusion emphasizes the availability of access to financial services so fintech targets the needs of the users in the financial sector through platforms that can be accessed via mobile. Fintech not only targets people with bank accounts but also people with no bank accounts and Generation Z is one of the targets that can increase financial inclusion. Generation Z is one of the generations that has a great awareness of the importance of finance for life in the short and long term. Since the "digital savvy" characteristic makes them use digital financial services more, this gives potential to existence of fintech to increase financial inclusion.

This study found that fintech influences financial inclusion, this, it supports research conducted by Romadhon & Rahmadi (2020) which showed the influence of fintech on financial inclusion in students. Students in this study have a tendency to use fintech services because the majority of them understand how to operate and adjust according to their needs and as also seen from the diverse monthly allowances. This positive influence shows that fintech provides various types of products and features that can suit the needs of each user through advanced technology, cloud computing, big data, analytics, and blockchain, so that they will also have more knowledge about various products and features. The ease of using fintech products is also a major advantage, hence, knowledge and ease of access to services provided by fintech is an indication of financial inclusion, which is one of the master plans for the financial services

sector in Indonesia. The role of fintech in increasing financial inclusion is further strengthened by two aspects that become its advantages, namely reducing costs and improving service quality. The sustainable impact of financial inclusion is an increase in the community's economic growth because they have the alternatives in managing finances and getting funds to support the economy.

E-banking do not affect financial inclusion

The hypothesis of e-banking affecting financial inclusion is rejected, this is in accordance with research conducted by Oteh *et al.* (2017) and Achugamonu *et al*. (2019), which stated that there is a gap between the demand and supply of technology-based financial services and the relationship between the two is negative in the short term. This also suggests that e-banking has several challenges in its role to increase financial inclusion. Several strategies that the banking industry can take in its effort to increase financial inclusion, which is to implement Banking as a Service and Platform Banking. Banking as a Service describes a model in which licensed banks integrate digital banking services directly into other non-bank business products. The banking platform describes a bank integrating services from other fintechs to augment existing offerings. This result is also likely because the sample used is students. There are still not many students who use e-banking, as has been researched by Rizky & Yasa (2018) and Indiawati (2015). These two strategies can be the shining light for banking industry in expanding market coverage by utilizing technology, which then has an impact on increasing inclusivity, and further to affect national financial resilience. BaaS and banking platforms make collaboration easier and faster both in the financial industry and other industries. Basically, these two strategies seek to increase the scope of consumer coverage by paying attention to the market and consumer demand for integrated, easy, and fast financial services. This study contributes to pointing out the existence of other variables in the relationship between e-banking and financial inclusion, thus opening up new research opportunities to find these variables.

Financial inclusion affects financial resilience

The hypothesis of financial inclusion affecting financial resilience is accepted, this is supported by research conducted by Belayeth Hussain *et al.* (2019), Adam *et al.* (2021) and Pandin *et al.* (2021). This shows that by increasing financial inclusion, financial resilience will be more easily achieved. Increasing financial resilience is one of the strategies that can be implemented to realize the National Economic Recovery program. Setyorini (2021) stated that efforts to improve public financial resilience in the face of economic change can be done by increasing financial literacy and public knowledge to have good financial planning, hence leading to good household behavior, so that in the end it will increase the financial resilience of the community. The relationship between financial inclusion and financial resilience needs to be considered more carefully, because a strategy for financial inclusion will cause a ripple effect and affects financial resilience.

Currently, there are many collaborations between financial institutions and fintech that are mutually beneficial. Financial institutions with a high level of consumer trust, strong infrastructure and systems, experience in risk management, and adequate financial resources, and fintech with innovative solutions, agility in market penetration, disruptive mindset, and

maximum utilization of technology, can create beneficial and satisfactory results for both parties. In this regard, along with the increasing partnerships between financial institutions and fintech for the common goal of increasing financial inclusion, the success of the collaboration also depends on several factors, some of which can be controlled by the partnering entity (creativity, dedication and foresight, etc.) and some that are not, such as the regulatory process or the duration of transforming idea to implementation (Pessanha, 2019). Thus, it can be concluded that every collaboration requires a suitable and future-oriented consumer-centric strategy, taking into account market demands and existing regulations.

Financial technology do not affect financial resilience

The results show that financial technology does not affect financial resilience. This suggests that financial technology cannot directly affect a person's financial resilience, there is the indication that other factors are needed to be able to support the role of fintech utilization in one's financial resilience, namely financial inclusion. This is supported by research conducted by Lyons *et al.* (2021), which stated that the current financial inclusion strategy aims to improve the livelihoods of each individual and build an inclusive society so that financial resilience can be realized. The existence of financial technology cannot guarantee a person's financial resilience if it is not supported by knowledge of what financial products are suitable for their needs, regulations regarding the financial technology used, the risks faced, and if there is no understanding in terms of operating and access to financial technology.

Therefore, there is a relationship between literacy and financial inclusion, because when someone knows financial products and the how to operate financial technology, the aim of financial inclusion to create a more prosperous community and financial resilience can be realized. This can happen because the community has options and alternatives in managing their funds and obtaining funds (loans) in terms of supporting their financial resilience, so the important point that needs to be considered is that the use of financial technology can provide suitable access for the community to establish financial resilience.

E-banking do not affect financial resilience

The results show that e-banking do not affect financial resilience. Over the past few years, banks have been adapting and innovating with latest technologies continuously redefining how customers interact with them. One of the development strategies that can be carried out by the banking industry is to adopt Artificial Intelligence (AI) technology as an effort to utilize innovative and leading technologies. In relation to the function of banks in their operations, the role of technology is very important to accelerate and increase the effectiveness of the services provided by banks (Wirdiyanti, 2018).

AI can help increase revenue through increased personalization of services to customers and employees, lowering costs through efficiencies resulting from higher automation, reduce fare errors, better resource utilization, and uncovering new, previously unrealized opportunities through improved processing capabilities and insights generate from big data sets (Biswas *et al.*, 2020). Banks that fail to make AI the center of their strategy and operations can risk not being able to compete and being left behind by their customers. Furthermore, Biswas *et al.*

(2020) explained that this risk is reinforced by ongoing trends namely, increasing customer expectations as digital adoption by banks increases, the use of AI technology by leading financial institutions continues to increase, disintermediation between digital ecosystems and traditional financial services, and penetration of technology companies.

The adoption of technology must also be accompanied by the right and appropriate strategy. Wirdiyanti (2018) found the phenomenon that banks face challenges in expanding their capacity and ability to increase efficiency with the right amount of targeted investment. Investments that are too low in digital banking technology can lead to a decrease in funding efficiency and liquidity, but on the other hand, investments that are too high can harm the efficiency of banking performance. In terms of regulation, banking regulators have the perspective that digital banking technology will increase the efficiency of the bank's intermediation function, but from a banking perspective, a balance is needed between the positive effects of digital banking technology adoption on funding and liquidity efficiency, and its negative effects on bank financial performance efficiency. This study used a sample of students. Some studies have found that college students have not used e-banking much, so it is likely to affect the results of this study (Rizky & Yasa, 2018; Indiawati, 2015).

Conclusion

This research uses students as samples and produces several results. This study succeeded in proving two accepted hypotheses, namely students who use financial technology can affect financial inclusion and financial inclusion owned by students affects financial resilience. Meanwhile, there are three hypotheses that cannot be proven, namely that e-banking used by students has no effect on their financial inclusion and financial resilience. Furthermore, the use of financial technology by students does not affect their financial resilience.

Banks use digital financial platforms as a way to simplify and accelerate financial activities for the community, especially for certain groups of people with limited access. Efforts to develop digital financial services that can be carried out are collaborating with financial technology companies through system integration to improve service quality performance and expand market share, thus having an impact on inclusiveness. In addition, the adoption of the right technology through artificial intelligence (AI) can increase the effectiveness and efficiency of performance in the banking industry. AI opens up opportunities for banks to develop their products and services with a high level of personalization, which will then have an impact on people's financial resilience. This is because AI is able to provide alternatives, adequate financial information, as well as fund management recommendations that are in accordance with the circumstances, information, and historical data for each user. Therefore, the researcher suggests to the banking industry to focus on consumer-centric services with a high level of personalization, devise robust risk management, and strengthen operational systems for business processes by emphasizing the use of technology and digitization complemented by periodic audits.

On the other hand, digitalization in the financial industry not only provides benefits, but also presents risks that need to be anticipated quickly and appropriately, such as protection of user funds, potential system errors, violations of user privacy and security, and operational risks. The researcher proposes to the government and regulators to intervene in the collaboration

between financial technology startups and the banking industry to improve financial inclusion and national financial resilience by designing, formulating, adapting, and improving regulations. Regulation, in accordance with its function to regulate and manage, is the main basis for the implementation of economic and financial activities that are targeted, useful, safe and effective. Regulators are expected to be able to coordinate across sectors in understanding and considering the implementation of technology and its relationship and impact on all aspects of the financial industry in order to formulate appropriate regulations.

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CHAPTER 12

Mental Accounting and Financial Competence: The Key to Improving Startups' Financial Well-Being

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ABSTRACT

This research explores the role of mental accounting and financial competence in improving the financial well-being of startup owners. During the complex challenges of managing personal finances, it is crucial to understand how elements such as financial competence, financial satisfaction, and risk tolerance can impact an individual's financial well-being. This study adopts a quantitative method with a survey approach. The respondents were students who owned business startups in Surabaya, selected through purposive sampling, and the data was collected using a 7-point Likert scale questionnaire.

The study results show that mental accounting contributes significantly to financial competence, positively affecting financial well-being. In addition, risk tolerance was found to have a significant influence on financial satisfaction, which also had a direct impact on financial well-being. These findings confirm that a good understanding of mental accounting can improve financial management through more structured and strategic behaviors, such as wise allocation of funds and proper investment selection.

The implications of this study show that financial education needs to emphasize the development of financial competence and mental accounting-based financial management more. This training program can help individuals, especially startup owners, to overcome financial stress, increase financial satisfaction, and achieve better financial well-being. This research offers new insights into financial literacy and personal financial management relevant to academics, practitioners, and policymakers.

Keywords: Mental accounting, Financial competency, Financial satisfaction.

1. INTRODUCTION

Financial wellness is particularly important to measure personal financial health. Financial wellness ensures individuals to not experience any financial difficulties that can affect their psyche. Thus, to achieve financial wellness, the individuals must be able to manage finances well. People who have financial wellness are able to perform better at their jobs because they are not worried about financial problems (Joo & Grable, 2004; Pyron & Pettus, 2019). On the other hand, an individual who does not achieve financial wellness is characterized by their inability to managed debt, overspending, does not allocate emergency fund, unable to finance routine expenses, has a low salary, and has lower financial knowledge (Parcia & Estimo, 2017). Several factors can affect financial wellness, including salary, rewards, incentives, and employment (Heninger, Smith, & Wood, 2019).

Financial wellness is not only affected by one measurement, but is a combination of several aspects, which are financial satisfaction, financial situation, financial attitudes, dan financial behavior (Joo, 2008). Previous studies found a number of determinants of financial wellness, including financial stress, financial behavior, and financial literacy (Delafrooz & Paim, 2011; Ismail & Zaki, 2019); working environment (Zain et al., 2019); financial knowledge, internal locus of control, income, saving, debt, and gender (A. D. Prawitz & Cohart, 2016); education and age (Joo & Grable, 2004); and demographic characteristics (Delafrooz & Paim, 2011). We believe that it is not enough for an individual to have financial knowledge, financial behavior, financial attitude, and financial literacy to improve financial wellness, but also need to have an adequate financial competency in the financial sector. The more competent an individual is in managing finances, the more the individual will have a healthier finance. Therefore, we include financial competency as a novelty of this study. Financial competency is characterized by discipline in meeting the budget plan; the ability to choose the right investment, insurance, and savings (Prawitz et al., 2006). With this ability, it the individual will avoid any worries on not being able to meet the needs of life, increase the ability to fulfill emergency needs, and avoid financial stress. An individual who is competent in managing finances as well as feeling a satisfaction of their financial condition will mitigate financial stress and feel comfortable with their financial condition. This means that financial competency and financial satisfaction will improve financial wellness. We believe that an individual's financial competency will increase if it is based on their ability to control and manage finances, and to be discipline in their budget. Thus, we use mental accounting to encourage people to improve their financial competence. Meanwhile, an individual who has a risk tolerance are more likely

to manage their income, savings, and loans. Thus, risk tolerance also affects financial satisfaction (Aboagye & Jung, 2018; Joo & Grable, 2004).

The aim of this study is to examine the effect of financial competency towards financial wellness, examine the effect of financial competency towards financial satisfaction, examine the effect of financial satisfaction towards financial wellness, examine the effect of risk tolerance towards financial satisfaction, and to examine the effect of mental accounting towards financial competency. We obtain the data from university students who have business to test our proposed model.

2. LITERATURE REVIEW

Financial competency is individuals' ability to apply financial theories in real life practices, thus it is very important to achieve a financial prosperity. Someone who has financial competency will use their financial knowledge to achieve their financial goals. Financial competency allows individuals to manage their daily, make future financial plans, make financial decisions, such as in choosing certain products, and know here to seek for help related to finance or always have information related to financial decision making (Atkinson, McKay, Collard, & Kempson, 2007). Financial wellness describes an individual's financial health. The higher the level of financial health can be reflected in the level of financial wellness. Financial wellness is different compared to financial satisfaction as not everyone who is satisfied with their financial condition has a healthy financial condition. This means that individuals who have financial wellness are not necessarily satisfied with their financial situation and vice versa, people who are satisfied with their financial condition do not necessarily have financial wellness. Financial satisfaction is defined as a person's satisfaction level with their financial situation because they can manage their finances well. There are two measurements of financial satisfaction are objective and subjective. The objective measurement is observed through property and income owned. However, the objective measurement seems to be harder to be perceived because two people who have relatively the same assets do not necessarily have the same satisfaction level. While subjective financial satisfaction is individual's perception of their standard of living looking from the financial point of view (Prawitz et al., 2006). An individual's economic behavior in classifying their input and output of funds based on certain items or accounts as well as accounting model (Thaler, 1999). This is one of the concepts of mental accounting. Thus, mental accounting creates people's tendency to classifies money in different accounts based on subjective criteria, such as sources of funding and the purpose of using income (Angle, Konidala, Ujwal, Vishnu, & Misra, 2019). In consequence, mental

accounting limits people financial expenditure or spending (Silaya & Persulessy, 2017). Therefore, mental accounting acts as a financial controller as well as a financial monitoring tool because mental accounting comprises of mental budget and self-control (Olsen, Kasper, Kogler, Muehlbacher, & Kirchler, 2019; Zhang & Sussman, 2018). In this study, risk tolerance is several negative effects that an individual dares to take to achieve their goal. Risk tolerance is one of the most important aspect within individual as a consideration of making financial decisions. For example, due to risk tolerance, an individual will choose whether to invest in the capital market that has high returns and high risks or saves in bank with low returns and risks. Tolerance to financial volatility in the short term relatively does not affect decision making, but in the long term, it can affect financial decision making (Schooley & Worden, 2016).

Financial competency and financial wellness

Financial competency is characterized by financial knowledge in managing finances well. For example, paying off debt on time, setting up an emergency fun, holding a pension fund, and buying insurance (Atkinson et al., 2007). People who have an emergency fund will have a sense of security should they need to use the funds for urgent matters. People who hold pension funds will feel safe in the future as they have the fund, while insurance makes people feel secure because they have life and property protection. This shows that adequate financial management will encourage financial wellness, namely the fulfillment of current and future needs (Falahati & Fazli Sabri, 2015). There are three important components that affect financial wellness, namely the ability to manage expense, the ability to manage emergency funds, and the ability to invest. Good financial decision to set aside emergency fund will affect financial health. The ability to choose and manage the right investment for future is also an important factor of financial wellness (Ismail & Zaki, 2019). From this description, we created the first hypothesis, namely:

H1: Financial competency affects financial wellness.

Financial Competency and Financial Satisfaction

Financial competency is one's ability to apply financial theories to real-world practices, thus it is very important to achieve financial prosperity. People who have financial competency will use their financial knowledge to achieve their financial goals. Financial competency allows people to manage their daily finances, make financial planning for the future, make financial decisions such as choosing certain products, and knowing where to seek for help related to finance or always have information related to financial decision making (Atkinson, McKay,

Collard, & Kempson, 2007). Financial competency is influenced by knowledge, skills, self-confidence, and strong motivation (Sherraden & Curley, 2013). Financial knowledge together with self-confidence and a strong motivation allows people to have financial competency. Without financial competency, one cannot plan their finances for the present and the future (Kempson, Perotti, & Scott, 2013).

H2: Financial competency affects financial satisfaction.

Financial Satisfaction and Financial Wellness

Financial satisfaction has an important relationship with personal wellness where one of the most important factors of personal wellness is financial wellness. The more an individual feel satisfied with their financial condition, the more encouraged they are to increase financial prosperity (Diener & Biswas-Diener, 2002). Changes in financial satisfaction will affect financial wellness. Increased in financial satisfaction affects financial wellness. Ease in managing finances, making bank loans, and managing expenses are signs of financial satisfaction, reducing financial pressure, and reducing worries in meeting life necessities (A. D. Prawitz & Cohart, 2016). Likewise, the ability to fulfill emergency needs will also increase when financial satisfaction increases. Thus, financial satisfaction becomes the basis for the third hypothesis, which is:

H3: Financial satisfaction affects financial wellness.

Risk Tolerance and Financial Satisfaction

Risk tolerance is associated with a person's level of satisfaction in regards t their financial condition (W. Y. Jeong & D. H. Sherman, 2004). An adequate risk tolerance will make an individual choose which investments that are in accordance with their risk profile, thus will choose investments according to their ability to bear the risk. Therefore, if a loss occurs, the loss will not interfere with his financial condition. So, the better a person's risk tolerance is, the easier it is for them to manage their finances (Hira & Mugenda, 1999). Risk tolerance encourages people to easily manage their financial expense with the income they earn. The higher the risk tolerance is, the more financial satisfaction they get indicated by the ease of managing debt, current financial condition, and the ability to meet emergency and long-term needs (Hira & Mugenda, 1998). We argue that risk tolerance drives the level of financial satisfaction, thus the fourth hypothesis is:

H4: Risk tolerance affects financial satisfaction.

Mental Accounting and Financial Competency

An important concept of mental accounting is people think with accounting principles, which is to sort out their bank account based on their sources and uses (R. Thaler, 1980). This concept indicates financial knowledge on financial management, investment, savings, and insurance as an important part of mental accounting (Silaya & Persulessy, 2017). Mental accounting explores a persons' knowledge so that they can exercise financial control and improve the quality of financial decisions (Radianto, Efrata, Murwani, & Dewi, 2020). Financial control leads to financial expenditures of not exceeding the budget that has been made and ensures that the sources and use of funds are effective and efficient. Therefore, increasing financial competency requires good mental accounting. This means that the more mental accounting is used, the better financial competency will be (Huang, Nam, & Sherraden, 2013). This description underlies the fifth hypothesis, which is:

H5: Mental Accounting affects financial competency.

3. RESEARCH METHOD

This study uses survey method by distributing questionnaire to the respondents. The research population includes university students who are starting a business in West Surabaya, Indonesia. The sampling technique used is non-probability sampling, which is purposive sampling. The sampling selection criteria are: (1) Active university students who are still studying, (2) Have a business start-up, and (3) Domiciled in Wes Surabaya, Indonesia. The distribution of 350 questionnaires were addressed to university students who are also a business owner. Here were 288 questionnaires (82%) returned and processed.

From the 288 respondents, we obtained the following respondents' data profile. The respondents of this study are dominated by men as many as 177 out of 288 respondents or 61.5%, while the remaining 38.5% are female. The age of the respondents is dominated by ages between 20 to 21 years old as many as 267 from 288 respondents or 58%, while the second age characteristics of respondents are those age 22 to 23 years old amounting 60 respondents or 21%, and the third is respondents age over 23 as many as 34 respondents or 14%, and the remaining are those age below 20.

The measurement of each construct is adapted from past studies and is based on 7-point Likert scale. We adopted research variable of risk tolerance from W. Y. Jeong and D. H. Sherman (2004) and Joo and Grable (2004) based on five questions, which are "In terms of investing, safety is more important than returns", "I am more comfortable putting my money in a bank account than in the stock market", "When I think of the word ''risk'' the term ''loss'' comes

to mind immediately", "In terms of investment, I see myself as having sufficient knowledge about it", and "Investing is too difficult to understand".

Financial competency is based on eleven questions developed by Dew and Xiao (2011) and Atkinson et al. (2007), as follow: "Comparing several stores before buying products/ services", "Paying bills on time", "Recording and keeping financial records every month", "Always spend money according to the planned budget", "Saving for emergency needs", "Saving for long-term needs (car, education, house, etc.)", and "Start setting aside funds for when I am older (retirement)".

Financial wellness is based on five questions developed from Strömbäck, Lind, Skagerlund, Västfjäll, and Tinghög (2017) and A. D. Prawitz and Cohart (2016) which are: "Not feeling stressed from financial pressure", "Satisfied with financial condition", "Comfortable with financial condition", "Not worried about meeting the necessities of life", and "Confident of being able to pay emergency needs".

Financial satisfaction is based on six indicators adopted Hira and Mugenda (1998) including "Confident to manage finances", "Easily manage financial expenses", "Easily plan finances in the future", "Has the convenience of borrowing money at the bank", "Can easily borrow money from the bank", and "Have what it takes to manage finances in order to achieve financial goals".

While mental accounting uses eight indicators developed from (Huang, Antonides, & Nie, 2020; Strömbäck, Lind, Skagerlund, Västfjäll, & Tinghög, 2017). The indicators are as follow: "I have a hard time breaking bad habits"; "I get distracted easily"; "I'm good at resisting temptation; "I do things that feel good in the moment but regret later on I often act without thinking through all the alternatives"; "I have reserved money (budget) for different expenses, such as food, clothing, transportation, etc.; "I never spend more than a fixed amount on food, clothing, transportation, etc."; "If I spend more on one thing, I economize on other expenses"; and "If in one month I spend more than normal on something, then next month I spend less on this".

This study uses Structural Equation Modeling analysis (Hair, Black, Babin, Anderson, & Tatham, 2019).

4. RESEARCH FINDINGS AND DISCUSSION

Goodness-of-Fit test is conducted to see how fit a model is compared to the research data obtained. According to the study, the results of the output obtained is as follow:

After deleting the indicator and carrying out the goodness of fitness test, thus the result of the test can be seen as follow:

Table 1. Fit Indices for the path model

Model fit index	**Expected Value**	**Result**	**Evaluation**
RMSEA	≤ 0,08	0,108	Poor fit
GFI	≥ 0,90	0,977	Fit
AGFI	≥ 0,90	0,913	Fit
CFI	≥ 0,90	0,956	Fit
TLI	≥ 0,90	0,890	Marginal fit
CMIN/DF	≤ 5,00	4,325	Good fit

Based on Table 1, Marginal fit is a condition of conformity of the measurement model under the criteria of absolute fit, as well as incremental fit, but still need to be further analyze because it is too close to the criteria of good fit (Hair *et al.*,1998). Furthermore, Hair *et al.* (2014) affirm that a model is said to be feasible if at least one of the model suitability tests is met. Therefore, based on the overall goodness of fit measurement of this research model, it can be concluded that the proposed model is acceptable with sufficient feasibility. The goodness of fit criteria of the estimated structural model is met, thus the next step is an analysis of the structural model relationship (hypothesis testing).

The hypothesis testing is conducted after the goodness of fit criteria of the estimated structural model is met. The relationship between constructs in the hypothesis is shown by the value of regression weights. The hypothesis is accepted if the significance level of the relationship between variables on the regression weight and estimate maximum likelihood has a p value of <0.05 (Cooper dan Schindler, 2014). The hypothesis is accepted if the influence of the construct on other constructs has an estimated parameter value, namely a critical value greater than 1.96 at a significance level of 0.05. The below is the test results with the updated model:

Table 2. Results of Hypothesis Testing

Regression Weight	***Estimate***	**S.E.**	**C.R.**	**P**	**Description**
Financial Competency → Financial Wellness	0,139	0,091	2,077	0,038	Accepted
Financial Competency → Financial Satisfaction	0,557	0,061	11,406	0,000	Accepted
Financial Satisfaction → Financial Wellness	0,334	0,72	5,076	0,000	Accepted

Risk tolerance → Financial Satisfaction	0,192	0,06	3,927	0,000	Accepted
Mental Accounting →Financial Competency	0,436	0,45	8,206	0,000	Accepted

Table 2. Shows that the research hypothesis is proven to have a significant effect because the P value is less than 0,05. H1 to H5 show a positive significant effect.

Discussion

The effect of *financial competency* towards *financial wellness*

Financial wellness is a learning process on how to successfully manage finances. Money plays an important role in life and has a direct effect on physical health. Financial stress often found to be a negative cause of unhealthy financial condition. Learning how to maximize financial wellness will help individuals to be prepared to handle potentially stressful financial situations in the future. The importance of learning about financial health will also increase one's ability on financial management skills or financial competency. Financial competency can be achieved by learning various financial understanding both formally and informally. Financial knowledge in the context of financial literacy is individual's skills to understand budget, savings, credit, and investment (Remund, 2010). Thus, financial knowledge is an important part of financial competency. Hasler & Lusardi (2017) measured financial competency according on the ability to calculate interest, compound interest, inflation, and risk diversification. In addition, financial knowledge can be seen from information published by companies operating in financial sectors, such as banks, insurance, pension funds, financial institutions, pawnshops, capital market, and other sectors. Financial competencies should be taught and owned by all people from an early age, staring from early school years so that financial awareness can be implanted early and failures during the early age can be avoided. Howlett et al. (2008) observed that in general, individuals who have understandings on finances have better understanding on financial management and are able to manage finances efficiently. This shows that financial competency cannot be separated from financial knowledge. In general, someone who has financial competence will try their best in finding information on finances, so they have the necessary skills in preparing short term and long-term financial planning (Palameta et.al, 2016).

An optimal financial planning will be done well if an individual has a proper financial management skill. A person with a proper financial competence will make better decisions in in accordance with their financial planning, on the contrary, if the individual does not have

sufficient financial competence, they tend to make bad financial decision because of the lack of financial planning (Robb & Woodyard, 2011). The level of financial understanding will be used to make appropriate short-term and long-term financial planning decisions. This means the more competence the person is in managing personal finances, the better their financial wellness will be. This means that personal finances management planning can be obtained if someone has sufficient financial competence, and this will result in financial wellness.

The effect of *financial competency* towards *financial satisfaction*

F*inancial competency* has a relationship with *financial satisfaction*. This can be seen from its positive and significant effect on financial satisfaction. If financial managers do not have the adequate competence in financial sector, including economic, effective, and efficient ways of working, thus the financial management will be less likely to run well in accordance with the plans that has been made (Mardiasmo, 2004: 146). Brahmayanti, Subaedi (2010) stated that competency is a basic nature of people's effort who achieve success where the implementation is caried out in an effective and efficient manners. Thus, financial competency can be concluded as a person's basic competency or ability to do a job in an effective and efficient manner based on a good financial management planning.

Hira and Mugenda (1998) stated that *financial satisfaction* is individual's evaluation towards their personal financial condition. In this research, financial competency has an effect towards financial satisfaction, which shows the importance of having financial management skills because a good financial management skill will lead to financial satisfaction. In this study, financial satisfaction means that people are happy and free from anxiety from personal financial conditions. Financial satisfaction is part of satisfaction domain. Satisfaction domain is related with individual's satisfaction that vary in form, such as health, financial situation, and work. Hira dan Mugenda (1998) suggested that life satisfaction van be pursued through financial management. Accuracy in managing finances will trigger financial satisfaction, which also one of the triggers of life satisfaction.

Individuals who can manage their financials well will achieve financial satisfaction. Financial competency behaviors can be a benchmark towards financial satisfaction, such as comparing prices and qualities of product when buying goods or services, paying bills on time, recording, and keeping financial records monthly, spending money according to the planned budgets, saving for precautionary needs, saving for long-term needs, start setting aside funds for older age, investing in several financial aspect, and having insurance. Financial competency that leads to satisfaction will be strengthen by attitudes towards behavior. Attitudes will

strengthen one's thinking about something. Attitudes associated with one's way of thinking about their finances is referred to as financial attitudes (Radianto, Kristama, & Salim, 2021). Financial attitude is someone's state of mind, opinion, and judgment about finances. If the individual's thinking about finances is good, then they will have the desire to save, invest, and plan finances for a better future. If the individual's thinking treats money as something valuable and must be accounted for, then the attitude will make the individual to have a healthy finance so that it can improve their quality of life and will increase financial satisfaction. Financial satisfaction can also be resulted from good financial knowledge. Joo (2008) stated that financial knowledge is an element of one's financial health along with financial competency and financial behavior.

The effect of *risk tolerance* towards *financial satisfaction*

The result of the study shows that the effect of *Risk tolerance* towards *Financial Satisfaction* as positive and significant. According to Hira and Mugenda (1999), *financial satisfaction* is one's expectation to achieve life satisfaction, as a measure of subjective well-being. Financial satisfaction cannot be separated from individual's income. The main purpose of earning income is to meet the needs of both the individual and the family to achieve happiness. The amount of income will also affect the pattern on meeting household needs (Adiana dan Karmini, 2016).

Zimmerman (1995) stated that *financial satisfaction* involves feeling of being healthy, happy, and not needing to worry about financial conditions. *Financial satisfaction* shows that a person's financial condition I good, happy, and free from anxiety about their personal financial conditions. Financial satisfaction can also come from individuals' perception of their current financial situations. Draughn et al. (1994) stated that financial satisfaction consists of three components: (1) financial adequacy related to income adequacy to meet economic viability, (2) perceived economic well-being, which is a subjective assessment of economic viability, and (3) satisfied with their standard of living, which is the perception of individuals' ability to meet their financial demands.

In general, r*isk tolerance* means how much their investments is concerned, meaning that on every investment, there is always a risk, but the level of risk tolerance will measure how much risk they are able to tolerate. Risk tolerance is individuals' ability to psychologically bear the potential of losing money on an investment. Individuals' risk tolerance and types of investment can change throughout their life. Not all people can tolerate risks well. For some, higher risk associated with certain investments, such as stocks, is often worth the higher rewards

that the investment will bring. Risk tolerance is not static, it can change from time to time, according on the person's financial position. For example, younger investor who saves for their retirement may be more willing to buy risker assets because he has more time to recover the losses.

Risk tolerance in this study is indicated well in its measurement, which includes of the most important types of investment, the most comfortable, the risk that may occur, and an understanding of investment. If an individual has a low risk tolerance, thus the person does not have enough courage to take a risk. This will certainly have an impact on financial satisfaction because a large risk will certainly produce a large return. Individuals who do not dare to take risks will not be able to have a lot of income, which is in accordance with the theory of high risks high return, where when the greater the risk that is borne, the greater the income earned, because the individual will certainly take decisions with low risk which will affect his income to be lower too. Low income will also bring an impact on the individuals' financial satisfaction. If their income is low, thus their financial satisfaction will also be low. This also applies equally to people who dare o take high risks; they will have higher income, which will also lead to higher financial satisfaction.

The effect of *financial satisfaction* towards *financial wellness*

The results of this study on the impact of financial satisfaction towards financial wellness shows a positive impact. Financial wellness is an aspect of a person's financial situation on their adequacy of their financial resources as a form of satisfaction on material and non-material aspects in achieving prosperity. Having a good financial wellness comes from a good financial management, however this is often overlooked by many individuals. To achieve financial wellness, they need to have the most appropriate financial planning to analyze their short-term and long-term needs. Therefore, personal financial management is needed to manage ones' finances well. Personal financial management is important in supporting the realization of individual goals, as when an individual does personal financial management, they will better understand their desires and needs from the goals they want to achieve. This can lead to the individual in carrying out an optimum financial management according to their respective goals, so that these goals can be achieved. With personal financial management, thus the individuals can train themselves to be more responsible and can control themselves against desires that can later hinder their main goals.

In general, in everyday life, many people have implemented accounting functions. This is made possible in form of making records with the intention of knowing and controlling

finances or making a budget to help in ensuring income and expenses within a certain period, then the budget needs to be adapted to ensure that the needs are in accordance with the goals. Therefore, financial wellness needs to be understood by every individual so that the needs made by individuals are in accordance with the previously planned financial goals. This is also supported by the function of accounting application as a mean to provide quantitative information about financial and is appropriate in its function for decision making as well as the selection of alternative actions.

This matter is also confirmed by Klontz and Klontz (2009) who stated that there are characteristics of an unhealthy financial health, namely avoidance of money disorders, which includes financial denial, financial refusal, and being too frugal and too afraid to take risks. Second, worshiping money disorder, when the individuals take pleasure of hoarding money, taking too much unreasonable risks, gambling addiction, workaholism, extravagance, and compulsive shopping. The third is financial disorder relating to financial infidelity, lazy to utilize finances, and dependance on money.

Financial wellness has various aspects but does not guarantee that individuals' financial wellness will experience financial satisfaction. This is due to the possibility of people getting criticized for their financial management, which makes them feel dissatisfied with their financial wellness. For example, an individual is satisfied with their finances, but has unhealthy debt and does not prepare pension fund, thus the individual has directly described their future financial condition where their income will be mainly used to pay the debts and will not have pension funds. In other words, financial wellness covers an entire human life cycle related on ways to manage financial resources leading to prosperity. This is in accordance with a statement by Joo and Grable (2004) who defined that financial wellness can be affected by lower credit levels, habits of savings or planning installments, and good expenditure management. Personal financial literacy demonstrates ones' capability to know and understand about personal financial management. Personal financial literacy is expected to be a real financial basis on people's social life.

The effect of *Mental Accounting* towards *financial competency*

The results of study on the effect of mental accounting towards financial competence shows that mental accounting has a positive and significant effect towards financial competency. Mental accounting refers to different values that people have on the same amount of many based on their subjective criteria that often result in losses. Individuals classify funds differently, and therefore are vulnerable to irrational decision making in their spending and

investment behavior. Mental accounting often causes people to make irrational decisions on investment and behave in ways that are financially counterproductive or detrimental, such as funding a low-interest savings account while having a large credit card balance. To avoid mental accounting biases, individuals should treat money in fungible, including allocating money to different investments, be it budget accounts (daily living expenses), expenses accounts, or wealth accounts (Thaler, 1990).

Mental accounting explains that money that comes from individual's' hard work will be used more wisely and carefully. While money that does not come from hard work tend to be spent quicker. Damayanti and Supramono (2011) explain that this nature happens because there is a difference in the sense of belonging when the money comes from hard work or not. When someone wants to quickly spend their money unwisely, the person may be exposed to mental accounting bias. Someone who has grouped their needs and is not flexible in using their money, the person may also experience mental accounting bias (Prelec & Loewenstein, 1998). Each individual needs to make financial planning, as with dividing their money they have into items of needs. Oftentimes, the behavior is not accompanied by the same action. If the purchase may not be followed by what is needed, thus it is difficult to distinguish between needs and wants. Financial planning by sorting out needs is often not performed. Individuals need to consider many factors in making financial decisions.

Mental accounting has an effect towards financial competency due to the existence of relationship between people's mental accounting and financial competency (Radianto, Efrata, & Dewi, 2020). A good mental accounting is when an individual understands well that money has many benefits and can be invested in different kinds of investments. Mental accounting indicators also discuss about good arrangements in financial management, starting from cash recording, recoding income and expenses incurred, making financial budgets, and discussing about good financial plans. A person with a good mental accounting often has an adequate financial competency; they tend to have good habits about how they use and invest their money, which is wiser and more careful in accordance with their financial competency.

The effect of *mental accounting* towards *financial wellness* mediated by *financial competency*

In this study, the results found that financial competency partially mediates the relationship between mental accounting and financial wellness. Mental accounting is how people treat their money in a certain portfolio. Mental accounting focusses on how one show respond and evaluate the possibility that may occur. Mental accounting greatly influences

people in making decisions, especially those related to finances. According to Thaler (1985), mental accounting is a series of cognitive operations used by individuals or households to organize, evaluate, and maintain the flow of their financial activities. Mental accounting refers to the tendency for investors to classify their investments according to the portfolios they create. The allocation of different functions to each of these accounts can have an irrational impact on the decisions taken. The irrational decisions is based on the perception of value placed by each individuals on their assets. Financial wellness is an aspect of individuals' financial situation experienced by them for the adequacy of their financial resources as a form of satisfactions with their material and non-material aspects in achieving prosperity. To achieve financial wellness, people need to have appropriate financial planning to analyze their financial needs, both short-term and long-term needs. Therefore, personal financial management is needed in good financial management. Persona financial management is very important in supporting the realization of individual's goals, this is because when someone does personal financial management, they will better understand their desires and needs from the goals to be achieved. This can cause individuals to carry out financial management optimally according to their respective goals so that their goals can be achieved. With personal financial management, thus individuals train themselves to be responsible and control themselves against desires that can later hinder their main goals.

Mental accounting towards *financial wellness mediated by financial competency* shows that a good m*ental accounting* is when a person understands well that money has many benefits and can be invested in various kinds of investment, which then will affect financial wellness., namely a financial situation faced by individuals on the adequacy of their financial resources as a form of satisfaction in form of material and non-material aspects in achieving prosperity. However, this cannot be achieved without financial competency. A person's mental accounting can affect their financial health, if the person has a good financial competency Ranyard, Hinkley, Williamson, & McHugh, 2006). For example, a person who believe and can manage their finances well, including in managing their income and expenses will have lower financial stress compared to people who are less able to manage their finances. However, a good financial management must be balanced with good competence, so that the individual understands well about their financial management. They will not be able to achieve financial wellness, or they may feel pressured by their financial conditions, is not satisfied with their financial condition, is not comfortable with their financial condition, is worried that they will not be able to fulfill their needs and is not sure that they can afford emergency needs. If a person does not have a good financial competency, thus they are not able to achieve financial wellness, even though

the person has a good mental accounting.

The effect of *financial competency* towards *financial wellness* mediated by *financial satisfaction*

This study found that financial satisfaction partially mediated the relationship between financial competency and financial wellness. In this study, financial competency affects financial wellness through financial satisfaction which shows the importance of financial management skills because good financial management skills will lead to financial wellness through financial satisfaction (Parrotta & Johnson, 1998).

Financial competency affects on *financial wellness* through *financial satisfaction.* For example, someone's competency in comparing prices and quality of products when buying goods or services, paying bills on time, recording and keeping financial records every month, always spending money according to the planned budget, saving for precautionary needs, and saving for long-term necessities, setting aside pension funds, investing on several financial aspects, and having insurance will definitely effect on financial wellness because a good financial planning will effect on the overall financial health, such as reduced stress on financial conditions, reduced dissatisfaction on financial condition, and reduced their worry about the inability to meet their life necessities. Financial competency can affect financial wellness through financial satisfaction will result in satisfaction that can be strengthen by attitudes towards behaviors (Delafrooz & Paim, 2011). Attitudes will strengthen individual's way of thinking about something. Attitudes associated with one's financial way of thinking are referred to as financial attitudes. Financial attitude is a state of mind, opinion, and judgement about finances. If individuals' way of thinking about finance is positive, they will have the desire to save, invest, and plan finances for a better future. If someone's thinking is to treat money as valuable and something that must be accounted for, then their attitudes will lead to healthy finances, so that it can improve their quality of life and will increase financial satisfaction. Financial satisfaction can also result from a good financial decision process for good financial knowledge. Joo (2008) stated that financial understanding is one of the elements of one's financial health together with financial competency and financial behavior. This means that financial competency has an effect towards financial wellness through financial satisfaction. If an individual has a good financial competency, it may lead to financial health. If the individual is satisfied with their finance. If an individual has a good financial competence, then they cannot have a health financial health if the person is not satisfied with their financial condition.

The research implications from this study are that business startups should consider improving their competence in financial management. Financial competency of business startup is driven by a way of thinking on mental accounting that makes a person has a qualified financial competency. Mental accounting will encourage business startups to improve financial competency, namely the disciplines in making financial records, setting aside funds for savings, reserving funds, and preparing for the future. This will not be possible if there is no self-control manage finances. This study contribution is that financial competency is one of the most important factors in improving financial health. The next contribution is hat mental accounting also plays an important role in encouraging people to have adequate financial health.

5. CONCLUSION

This study concludes that financial competency and mental accounting play an important role in promoting financial health of business startups. Financial competency along with financial satisfaction and mental accounting increases financial wellness, where financial satisfaction is influenced by the level of risk tolerance. The better a person's mental accounting mindset is, then it will increase the person's competence in managing their finances and will further increase the person's financial wellness. This study also concludes that financial competency encourages people to reach financial satisfaction. The more a person is satisfied in their financial condition, the better their financial health will be. This study concludes that mental accounting affect financial wellness, either directly or indirectly through financial competency. This means that when a person's mental accounting will increase their financial competence in managing finances. Previous studies have found that financial attitudes, financial literacy, and financial knowledge affect financial wellness. This study enriches previous studies, namely discovering that financial competency, mental accounting, and financial satisfaction affect financial wellness, thus adding to the determinants of financial wellness.

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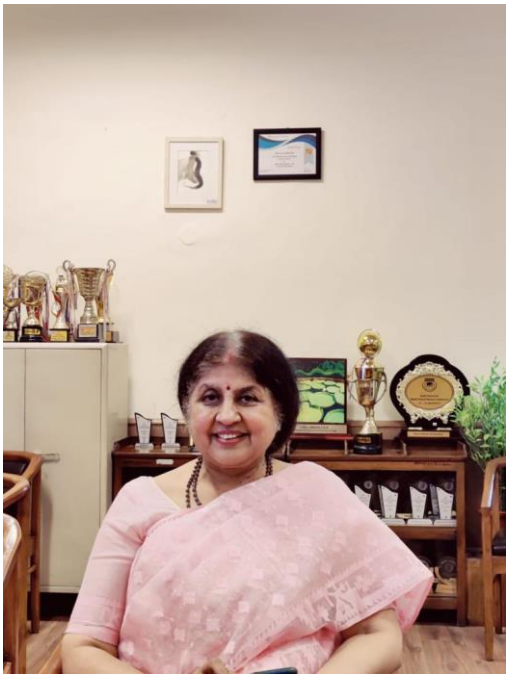
EDITOR'S BIOGRAPHY

Prof. (Dr.) Sunaina Sardana



Professor (Dr.) Sunaina Sardana superannuated as Professor of Commerce at Lady Shri Ram College for Women University of Delhi in June 2023. She completed her graduation, post-graduation M.Phil. and Ph.D. from University of Delhi. She has taught in University of Delhi for over 44 years out of which 42 years were in Lady Shri Ram College for Women. She has been actively involved in the academic, co-curricular and administrative activities in LSR including the Bursarship for two terms. She had been a visiting faculty to the post graduate students of Delhi University, Department of Commerce and Department of Finance & Control intermittently.

She is currently teaching and heading the department of Human Resource Management in New Delhi Institute of Management, New Delhi.

She completed an innovation project namely 'Reverse Logistics - An Innovative Approach to a Sustainable Environment', sponsored project by UGC. She has authored several books in addition to the Articles published in various National and International Journals. She has been actively involved in the evaluation of Ph.D. thesis of different Universities of India. She has been on the Panel of several workshops and seminars in academic as well as Industrial Organisations. She has also been the Resource Person for the Faculty Induction Programme in Universities like JNU. She has been actively involved In the making and revision of courses at the University level.

Prof. (Dr.) Sunaina Sardana

Ms. Parveen Kaur

Prof. Parveen Kaur is a distinguished academician and trainer with a robust career spanning 19 years, combining expertise in teaching, training, academic administration, and coordination. She holds an MBA, UGC NET qualification, B.Ed., Diploma in Training and Development, and is currently pursuing a Fellowship Program in Management. Additionally, she is CTET-certified, further underscoring her dedication to professional excellence in education and training.

Prof. Kaur's extensive experience includes designing and delivering impactful training modules. Key achievements include developing and facilitating the "Know Thyself" training module for India Thermite Ltd., Kanpur, as part of a Management Development Program on Personality Development. She has also coordinated and organized programs such as a "Stress Management" workshop in collaboration with the Stress Management Research Institute, Noida.

Her expertise in academic administration is reflected in her excellence in curriculum design, faculty coordination, and workshop organization.

A committed educator and trainer, she is passionate about empowering individuals with practical skills, fostering academic growth, and contributing to meaningful organizational and personal development.

Ms. Parveen Kaur
HR & OB Department

Mr. Praveen Malik

Praveen Malik is an experienced professional with over 20 years of expertise in Data Modeling, Data Analytics, and Business Intelligence. He is currently a Faculty Member and Deputy Registrar at the New Delhi Institute of Management (NDIM), New Delhi. Mr. Malik is also a skilled trainer, teaching Microsoft Power BI, Tableau, and Advanced MS Excel. As a Microsoft Certified Power BI Data Analyst, he has helped many individuals and organizations use data effectively to make better decisions and improve business results.

In addition to practical expertise, he is Ph.D scholar at the Indian Institute of Management (IIM) Jammu, further advancing knowledge in data-driven strategies. In addition to a robust academic background, Praveen Malik has contributed to the literature on data analytics by authoring a book on Tableau and reviewing various publications for renowned publishers.

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