

ANALYSIS OF THE INFLUENCE OF TECHNOLOGY AND LENGTH OF BUSINESS ON INCOME THROUGH LABOR AS AN INTERVENING VARIABLE IN MSMEs COFFEE SHOPS IN MEDAN CITY

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ABSTRACT

This research aims to analyze the influence of technology and business duration on the income of micro, small, and medium enterprises (MSMEs) coffee shops in Medan City, with labor as an intervening variable. The rapid growth of the coffee shop industry in Medan has intensified competition among business owners, making the adoption of technology, business experience, and labor effectiveness crucial factors for increasing income. This study employs a quantitative approach using Structural Equation Modeling (SEM) based on Partial Least Square (PLS). The research sample consists of MSME coffee shop owners selected through purposive sampling. The variables include technology (X1), Length of a business (X2), labor (Z), and income (Y). The findings reveal that technology has a positive and significant effect on income and also influences labor. Business duration positively affects both income and labor. Moreover, labor significantly affects income and mediates the relationship between technology and income, as well as between business duration and income. These results indicate that optimal technology utilization, longer business experience, and sufficient labor quality are key determinants of income improvement among MSME coffee shops in Medan City. This research is expected to serve as a reference for business owners and policymakers in formulating strategies for sustainable MSME development.

Keywords: *Technology, Length of a business, Labor, Income, MSMEs Coffee shop, Kota Medan*

INTRODUCTION

The coffee shop industry is characterized by diverse cultural, social, and economic factors across various international contexts. In particular, some countries exhibit distinct characteristics in their coffee shop scenes, influenced by local consumer preferences, lifestyle choices, and the presence of local and international coffee brands.

In the ASEAN region, particularly in Indonesia, the coffee shop industry has witnessed tremendous growth, driven by changing consumer behaviors and preferences. The proliferation of coffee shops in urban areas is driven by the increasing popularity of coffee consumption as a social activity. Coffee shops in Indonesia serve not only as places to drink coffee but also as venues for various social interactions, including meetings and casual gatherings. This trend is further supported by the rapid expansion of coffee shops, which has tripled in recent years, indicating strong market demand.

MSMEs in Medan, particularly in the culinary sector such as coffee shops, are increasingly focusing on product quality and innovation. Businesses strive to offer customers a unique experience, both in terms of taste and atmosphere. This has become a unique attraction

amidst intense competition. Despite their growth, MSMEs in Medan also face various challenges, such as increasing competition, fluctuating raw material prices, and limited access to capital. Therefore, it is important for MSMEs to continue to adapt and seek innovative solutions to survive and grow.

Revenue is a key indicator of business success, including for Micro, Small, and Medium Enterprises (MSMEs) like coffee shops in Medan. In recent years, coffee shop growth has accelerated in line with changing lifestyles, which have made coffee a part of daily activities. This has led to increasingly fierce business competition, requiring MSMEs to implement effective production and marketing strategies to maintain and increase revenue.

Theoretically, business revenue is influenced not only by capital and labor, but also by technology and innovation. According to Solow, technological advancement is a crucial factor in long-term economic growth because it increases productivity beyond the contributions of capital and labor (the Solow residual). In coffee shop MSMEs, the use of digital technologies such as cashless payments, point-of-sale (POS) applications, and online ordering platforms can

expand the market and improve operational efficiency. This is supported by research by Yosephine, Sulaeman, and Raharja (2025), which found that ICT adoption in coffee MSMEs significantly contributes to market access, efficiency, and brand visibility.

Furthermore, Schumpeter emphasized that innovation is key to business sustainability. Innovation can take the form of menu variations, service concepts, digital promotional strategies, and even improved customer experience. A study of coffee MSMEs in Purworejo showed that internal innovation significantly impacts business performance, potentially increasing revenue.

The workforce also plays a crucial role, as service quality and barista skills can increase customer satisfaction and repeat purchases. However, research specifically examining the influence of technology, innovation, and the workforce on the revenue of coffee shop MSMEs in Medan is still limited. Therefore, this study is crucial to fill the research gap and provide scientific contributions and practical recommendations for the development of coffee shop MSMEs in Medan.

LITERATURE REVIEW

Income

According to (Mankiw, 2018, pp. 290–291), revenue is the result obtained from a business. Revenue is the most important factor in a company's financial statements. Revenue has a significant impact on a company's profit and loss. The greater the revenue a company earns, the greater the opportunities to manage and develop its activities. The number of goods produced and the price of each product are factors that influence the level of revenue. In this study, the revenue referred to is total revenue (TR), which can be calculated as the number of goods sold and the selling price. Zulpania et al., (2022) defines revenue as the income obtained from other business-related activities during a given month. Alifiana et al., (2021) defines revenue as the amount of money earned from sales during a given period. Bari (2017) defines revenue as the value of all finished goods and services produced during a given period. It can be concluded that revenue is all receipts obtained from operational activities during a given period.

Technology

Technology is a key component of Schumpeter's theory. He argued that technological innovation is a key driver of economic growth and income growth (Su et al., 2022). New technologies not only improve production efficiency but also create new markets and new products, which can

increase income for both companies and workers. In this context, Schumpeter argued that companies capable of adopting and developing new technologies will have a competitive advantage that will contribute to their revenue growth (Augier, 2006).

Length of a business

Length of a business is closely related to a company's ability to innovate. Schumpeter argued that companies that have been operating for longer typically have more resources and experience in managing innovation (Fritsch, 2017). They can leverage the knowledge they have gained over time to increase efficiency and productivity, which in turn can increase income.

Labor

In the Solow-Swan theory, the Capital Output Ratio (COR) is dynamic, meaning that producing a given level of output requires a balanced combination of capital and labor. If capital use is high, labor use will be low, and vice versa. Another key idea in the production function is the augmentation of technology into production factors such as capital and labor, as seen in the model below:

$$Y = f(K, L, T)$$

Where, (Y) is the economic growth rate, (K) is the capital growth rate, (L) is the population growth rate, and (T) is the technological growth rate.

Labor is a crucial factor in the production process because it plays a role in mobilizing and optimizing other inputs. Without labor, neither capital nor technology can be utilized effectively. Increasing labor productivity drives increased output, market expansion, and business revenue, ultimately creating significant impacts in the form of increased employment and economic growth for MSMEs. In the context of MSMEs, the implementation of digital technology is a key driver in increasing the productivity and competitiveness of small and medium enterprises.

This is supported by a recent international study conducted by Dimoso and Utonga (2024) through a systematic review of the literature on digital technology adoption among MSMEs in developing countries. The study's results indicate that the use of digital technology significantly improves business performance, reflected in improved operational efficiency, increased labor productivity, higher innovation capacity, and strengthened relationships with markets and customers. These findings confirm that digitalization plays a crucial role as a catalyst in increasing MSME productivity and competitiveness.

Conceptual Framework

From the background and theoretical basis above, a conceptual framework is formed in which

there are independent variables and dependent variables, as explained below:

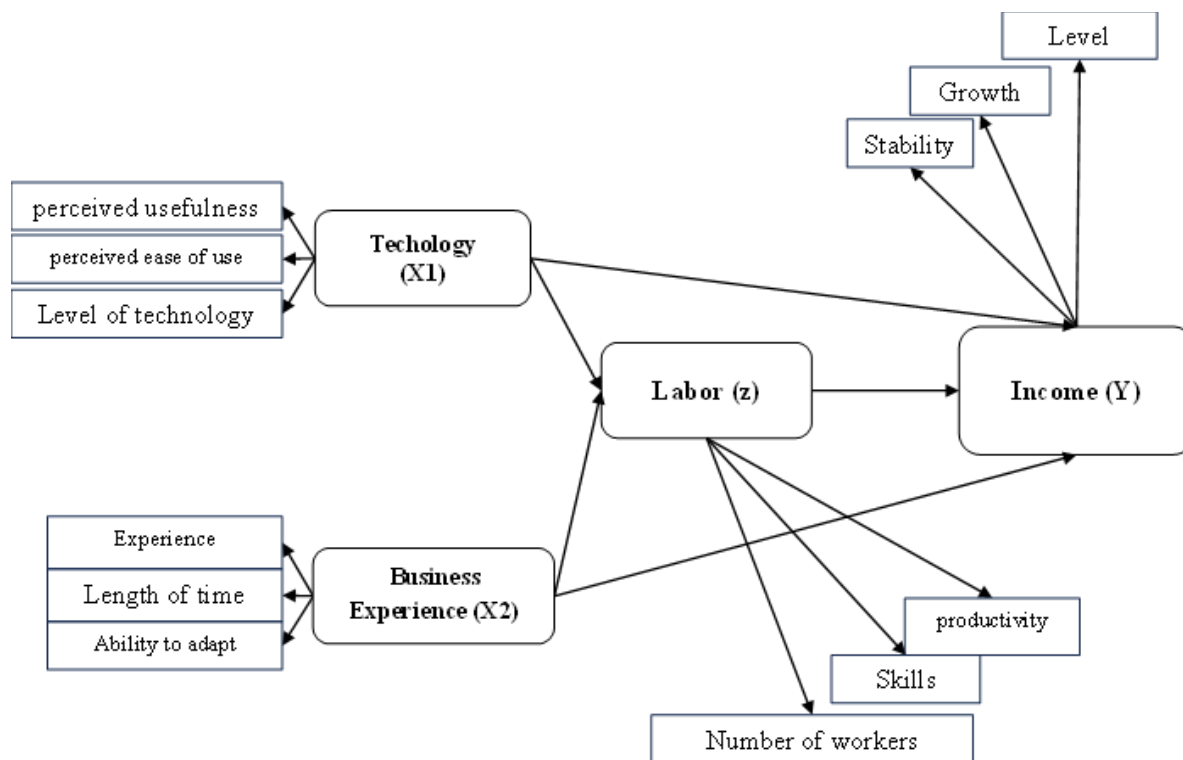


Figure 1. Conceptual Framework Model *Structural Equation Modelling* (SEM)

Hypothesis

The hypothesis in this study is:

1. Technology has a positive effect on the income of coffee shop MSMEs in Medan.
2. Length of business has a positive effect on the income of coffee shop MSMEs in Medan.
3. Labor has a positive effect on the income of coffee shop MSMEs in Medan.
4. Technology has a positive effect on the labor force of coffee shop MSMEs in Medan.
5. Length of business has a positive effect on the labor force of coffee shop MSMEs in Medan.
6. Technology has a positive effect on income through labor force of coffee shop MSMEs in Medan.
7. Length of business has a positive effect on income through labor force of coffee shop MSMEs in Medan.
8. Labor has a positive effect on technology in coffee shop MSMEs in Medan.
9. Labor has a positive effect on income through technology in coffee shop MSMEs in Medan.

RESEARCH METHODOLOGY

This study employed both descriptive and quantitative approaches. Descriptive analysis was used to describe the condition of MSME coffee shops in Medan City based on respondent responses and field observations. Meanwhile, quantitative analysis was conducted to test the relationships between variables using the SmartPLS 4.0 statistical tool to identify variables that significantly influence MSME revenue through capital, technology, and labor. All indicators used a Likert scale.

The study population consisted of all coffee shop owners in Medan City, an unknown number of whom were identified. The sample was determined using accidental sampling, selecting respondents based on who they encountered and who met the research criteria. Referring to Kerlinger's recommendations, the sample size was 100 respondents, taking into account time and field conditions.

Data collection was conducted through a questionnaire containing statements related to the research variables, along with documentation to supplement the supporting data. Data analysis was then conducted using Structural Equation Modeling (SEM) with the Partial Least Squares

(PLS) approach. This method was used because it can test the relationships between variables while assessing the validity and reliability of the instrument. The measurement model, or outer model, is used to assess convergent validity, discriminant validity, and instrument reliability using AVE, Composite Reliability, Cronbach's Alpha, and VIF values to detect multicollinearity. Meanwhile, the inner model is used to establish relationships between variables using R-square and Q-square values, as well as the Goodness of Fit test.

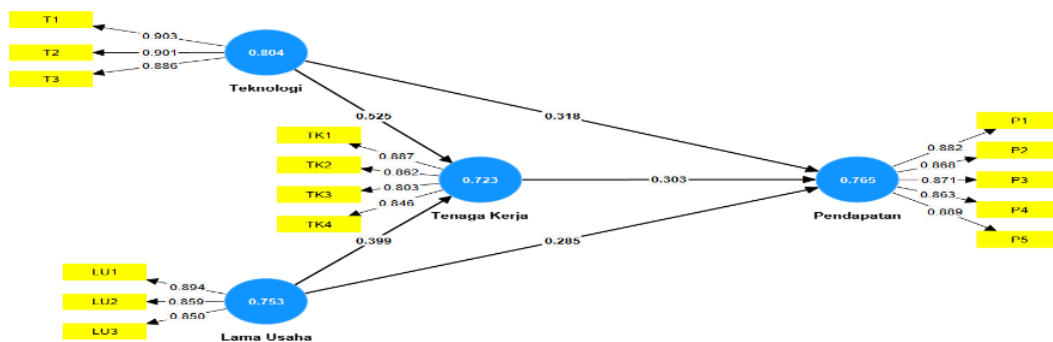
Bootstrapping testing, which involves testing hypotheses by examining the t-statistic and p-value, is used. A hypothesis is accepted if the t-statistic is >1.96 or the p-value is <0.05. The analysis is conducted to examine the direct and indirect (mediation) effects between variables, such as the influence of technology and business tenure on income, both directly and through labor.

RESULTS AND DISCUSSION

The development of coffee shops in Medan over the past decade has shown a very rapid trend.

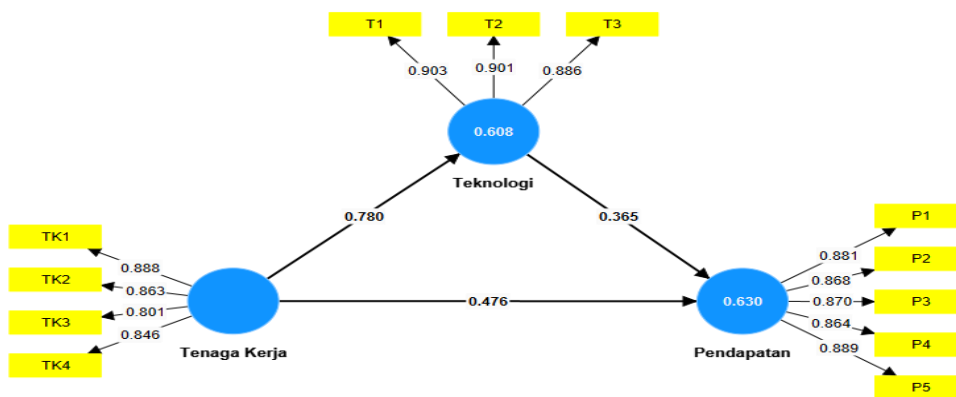
As the third-largest metropolitan city in Indonesia after Jakarta and Surabaya, Medan has a socio-economic dynamic that drives the growth of the micro, small, and medium enterprise (MSME) sector, including coffee-based culinary businesses. This growth is inseparable from the increasing urban lifestyle, which has seen coffee shops become more than just a place to enjoy a drink, but also a social space, a place to work (co-working space), and a place for recreation.

Modern coffee shops, with their minimalist concept and digitalized services, encourage coffee shop businesses to innovate in product presentation, service, and the use of digital technology for marketing. Overall, the presence of coffee shops in Medan makes a significant contribution to both the economic and social aspects. This is because they create new jobs and encourage the growth of MSME businesses. Therefore, coffee shops in Medan are not just places to drink coffee but also socio-economic phenomena worthy of further study within an academic context.



Source: SmartPLS 4.0 Output Results

Figure 3. Results of Evaluation of Measurement Model I (Outer Model)



Source: SmartPLS 4.0 Output Results

Figure 4. Results of Evaluation of Measurement Model I (Outer Model)

Table 1. Outer Loading Results of Measurement Model I

Variables	Indikator	Nilai Outer Loading	Average Variance Extracted (AVE)	Information
Technology	T1	0.903	0.804	Valid
	T2	0.901		Valid
	T3	0.886		Valid
Length of Business	LB1	0.894	0.753	Valid
	LB 2	0.859		Valid
	LB 3	0.850		Valid
Income	I1	0.882	0.765	Valid
	I2	0.868		Valid
	I3	0.871		Valid
	I4	0.863		Valid
	I5	0.889		Valid
Labor	L1	0.887	0.723	Valid
	L2	0.862		Valid
	L3	0.803		Valid
	L4	0.846		Valid

Source: SmartPLS 4.0 Output Results

Table 2. Outer Loading Results of Measurement Model II

Variabel	Item	Outer loadings	AVE	Information
Income	I1	0.881	0.765	Valid
	I2	0.868		
	I3	0.870		
	I4	0.864		
	I5	0.889		
Technology	T1	0.903	0.804	Valid
	T2	0.901		
	T3	0.886		
Labor	L1	0.888	0.723	Valid
	L2	0.863		
	L3	0.801		
	L4	0.846		

Source: SmartPLS 4.0 Output Results

Based on the table above, we can see that the value of each indicator, or outer loading, is greater than 0.7, and the AVE value for all variables is greater than 0.5. These results indicate that each variable has good discriminant validity.

Therefore, all indicator items can be considered valid because they meet the requirements for convergent validity and can be further analyzed.

Table 3. Results of the Validity Test of Measurement Model I

Variabel	Technology	Business Years	Income
Length of Business	0.744		
Income	0.815	0.802	
Labor	0.887	0.852	0.844

Source: SmartPLS 4.0 Output Results

Table 4. Results of the Validity Test of Measurement Model II

Variabel	Income	Technology
Technology	0.815	
Labor	0.844	0.887

Source: SmartPLS 4.0 Output Results

The results of the discriminant validity measurement using the heterotrait-monotrait ratio (HTMT) can be seen in the table above. All HTMT

values are <0.9, meaning all variables are considered valid.

Table 5. Reliability Test Results of Measurement Model I

Variabel	Cronbach's alpha	Composite reliability (rho_c)	Keterangan
Technology	0.878	0.925	Reliabel
Length of Business	0.837	0.901	Reliabel
Income	0.923	0.942	Reliabel
Labor	0.872	0.912	Reliabel

Source: SmartPLS 4.0 Output Results

Table 6. Results of Reliability Test of Measurement Model II

Variabel	Cronbach's alpha	CR (rho_a)	CR (rho_c)
Income	0.923	0.924	0.942
Technology	0.878	0.879	0.925
Labor	0.872	0.878	0.912

Source: SmartPLS 4.0 Output Results

Based on the Composite Reliability value, all variables have exceeded 0.6 and the Cronbach's Alpha value is above 0.7, which means that it has

met the reliability assumption highest cross loading.

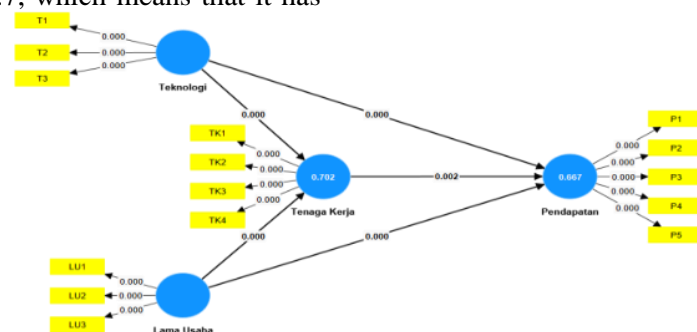


Figure 5. Evaluation of Structural Model I (Inner Model Analysis)

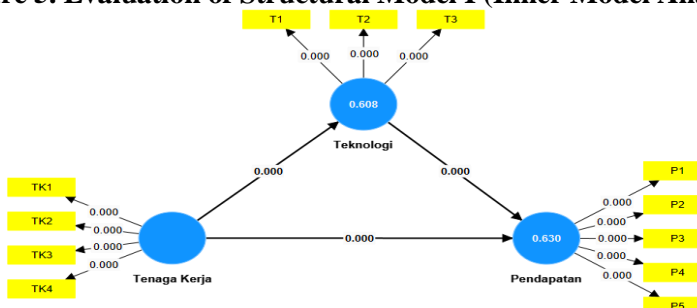


Figure 6. Evaluation of Structural Model II (Inner Model Analysis)

Table 7. Results of the R-square Test for Measurement Model I

Variabel Dependent	R-square adjusted
Income	0.656
Labor	0.696

Source: SmartPLS 4.0 Output Results

Table 8. Results of the R-square Test of Measurement Model II

Variabel Dependent	R-square adjusted
Income	0.623
Technology	0.604

Source: SmartPLS 4.0 Output Results

Based on the results of the processing of measurement model I, the R-square value for the Labor variable was 0.702. This value indicates that the strength of technology and business tenure in predicting labor is 0.702, or 70.2%, within the moderate criteria. Meanwhile, the R-square value for the Income variable was 0.667. This value indicates that the strength of technology, business tenure, and labor in predicting income is 0.667, or 66.7%, within the moderate criteria.

Based on the results of the processing of measurement model II, the R-square value for the Income variable was 0.630. This value indicates that the strength of labor and technology in predicting income is 0.630, or 63.0%, within the moderate criteria. Meanwhile, the R-square value for the Labor variable was 0.608. This value indicates that the strength of technology in predicting labor is 0.608, or 60.8%, within the moderate criteria.

Table 9. Results of the Direct Effect of Measurement Model I

Connection	Original sample	Sample mean	STDEV	T statistics	P values
Length of Business → Income	0.285	0.287	0.079	3.601	0.000
Length of Business → Labor	0.399	0.400	0.071	5.651	0.000
Technology → Revenue	0.318	0.322	0.084	3.767	0.000
Technology → Labor	0.525	0.524	0.071	7.385	0.000
Labor → Income	0.303	0.297	0.099	3.066	0.002

Source: SmartPLS 4.0 Output Results

Table 10. Results of the Direct Effect of Measurement Model II

Connection	Original sample	Sample mean	STDEV	T statistics	P values
Labor → Technology	0.780	0.780	0.042	18.406	0.000

Source: SmartPLS 4.0 Output Results

Based on the table above, the relationship between the research variables can be explained as follows:

1. The first hypothesis (H1) is accepted: Technology has a positive and significant effect on income, with a path coefficient of 0.318 and a p-value of $0.000 < 0.05$. Each increase in technology will also increase income.
2. The second hypothesis (H2) is accepted: Length of Business has a positive and significant effect on income, with a path coefficient of 0.285 and a p-value of $0.002 < 0.05$. Each increase in Length of Business will also increase income.

3. The fifth hypothesis (H3) is accepted: Labor has a positive and significant effect on income, with a path coefficient of 0.303 and a p-value of $0.002 < 0.05$. Each increase in labor will also increase income.
4. The third hypothesis (H4) is accepted, namely that technology has a significant effect on labor, with a path coefficient of 0.525 and a p-value of $0.000 < 0.05$. Each increase in technology will increase the labor force.
5. The fourth hypothesis (H5) is accepted, namely that business duration has a positive and significant effect on labor force, with a path coefficient of 0.399 and a p-value of

0.000 < 0.05. Each increase in business duration will increase the labor force.

6. The eighth hypothesis (H8) is accepted, namely that labor force has

a positive and significant effect on technology, with a path coefficient of 0.780 and a p-value of 0.000 < 0.05. Each increase in labor force will increase the technology.

Table 11. Indirect Effect of Measurement Model I

Connection	Original sample	Sample mean	STDEV	T statistics	P values
Length of Business → Labor → Income	0.121	0.121	0.049	2.455	0.014
Technology → Labor → Income	0.159	0.154	0.053	3.009	0.003

Source: SmartPLS 4.0 Output Results

Table 12. Indirect Effect of Measurement Model II

Connection	Original sample	Sample mean	STDEV	T statistics	P values
Labor → Technology → Income	0.284	0.288	0.069	4.150	0.000

Source: SmartPLS 4.0 Output Results

7. The sixth hypothesis (H6) is accepted, namely that labor can mediate the effect of technology on income, with a path coefficient of 0.159 and a p-value of 0.003 < 0.05.
8. The seventh hypothesis (H7) is accepted, namely that labor can mediate the effect of business tenure on income, with a path coefficient of 0.121 and a p-value of 0.014 < 0.05.
9. The ninth hypothesis (H9) is accepted, namely that technology can mediate the effect of labor on income, with a path coefficient of 0.371 and a p-value of 0.000 < 0.05.

and the Cobb–Douglas production function, where technology acts as a productivity-enhancing factor that shifts the production function upward. Compared to traditional inputs such as labor quantity or business age, technology allows coffee shops to increase output and revenue without a proportional increase in physical inputs. In the urban context of Medan, where consumer behavior is increasingly digital-oriented, technology becomes a critical determinant of competitiveness. This explains why its effect size is relatively strong compared to other variables. These findings reinforce previous empirical evidence by Komang Ayu and Suasih (2023) and Ulfa Mardhatillah et al. (2022), while emphasizing the strategic role of digitalization in service-based MSMEs such as coffee shops.

DISCUSSION

Model I

1. The Influence of Technology on Coffee Shop MSME Revenue

The results indicate that technology has a positive and significant effect on coffee shop MSME revenue ($\beta = 0.318$; $t = 3.767$; $p = 0.000$). This finding suggests that technology is not merely a supporting tool but a strategic production factor that directly enhances revenue generation. The use of POS systems, digital ordering applications, cashless payments, and online marketing enables coffee shops to improve transaction speed, reduce operational errors, and expand market reach beyond physical store limitations.

From a theoretical perspective, this result is consistent with the Solow–Swan growth model

2. The Influence of Business Years on Coffee Shop MSME Revenue

Business years have a positive and significant effect on revenue ($\beta = 0.285$; $t = 3.601$; $p = 0.000$), indicating that accumulated experience plays an important role in income generation. Longer business operation periods enable owners to better understand consumer preferences, manage costs, stabilize supply chains, and build customer loyalty.

This finding aligns with the learning by doing concept and human capital theory, which emphasize that experience enhances managerial efficiency and decision-making

quality. However, when compared to technology, the influence of business years is relatively more structural and incremental. Experience improves performance gradually, whereas technology provides faster scalability and market expansion. In Medan, long-established coffee shops tend to have more stable revenue streams, but without technological adaptation, their growth potential may be limited. This result supports findings by Wulandari and Subiyantoro (2023) and Ihya Ulumuddin (2023).

3. The Influence of Labor on Coffee Shop MSME Revenue

Labor has a positive and significant impact on revenue ($\beta = 0.303$; $t = 3.066$; $p = 0.002$), highlighting the importance of workforce quality and productivity in service-oriented MSMEs. Skilled baristas, effective customer service, and the ability to operate digital systems directly affect customer satisfaction and repeat purchases.

This result is consistent with neoclassical production theory and the Solow–Swan model, which recognize labor as a core input in generating output. However, in comparison with technology, labor effectiveness increasingly depends on its ability to complement digital systems. In modern coffee shops, labor productivity is no longer determined solely by manual skills but also by digital competence. Thus, labor contributes more strongly to revenue when combined with technology adoption. These findings are in line with Mutia and Susantun (2023) and Mardhatillah et al. (2022).

4. The Influence of Technology on the Coffee Shop MSME Workforce

Technology shows a strong positive effect on the workforce ($\beta = 0.525$; $t = 7.385$; $p = 0.000$), indicating that technological adoption significantly reshapes labor structure and skill requirements. Digital systems require workers to improve competencies, adapt work patterns, and perform multitasking roles.

This result supports the Solow–Swan model and the Schumpeterian perspective, which emphasize that technological change transforms labor demand toward higher skill levels. Compared to business years, technology has a more immediate and transformative impact on labor quality. In

Medan, coffee shops adopting digital systems tend to demand more skilled and adaptable workers, reinforcing findings by Novarina Belly (2019) and Adachi et al. (2019).

5. The Influence of Business Length on the Coffee Shop MSME Workforce

Business length positively affects the workforce ($\beta = 0.399$; $t = 5.651$; $p = 0.000$). This indicates that longer operational experience contributes to more structured work systems, clearer job allocation, and better training mechanisms.

This finding aligns with human capital theory and learning by doing, suggesting that experience strengthens an organization's ability to manage human resources effectively. However, compared to technology, the effect of business length on labor is more organizational than transformational. Established coffee shops in Medan tend to have stable labor structures, but technological adaptation determines whether this stability translates into higher productivity.

6. The Effect of Technology on Revenue Through Labor

Technology has a significant indirect effect on revenue through labor ($\beta = 0.159$; $t = 3.009$; $p = 0.003$), indicating that labor partially mediates the relationship between technology and revenue. This implies that technology generates optimal revenue gains only when supported by a capable workforce.

Theoretically, this finding reinforces the Cobb–Douglas and Solow–Swan frameworks, which emphasize complementarity between technology and labor. Technology alone does not automatically increase income; its effectiveness depends on labor's ability to operate and maximize it. In Medan, many coffee shops adopt technology, but limited workforce competency reduces its potential benefits, highlighting a critical managerial challenge.

7. The Effect of Business Length on Revenue Through Labor

Business length also has a significant indirect effect on revenue through labor ($\beta = 0.121$; $t = 2.455$; $p = 0.014$). Long-term experience contributes to a more trained, disciplined, and efficient workforce, which subsequently increases revenue.

This finding supports human capital theory and confirms previous studies by Mutia and Susantun (2023) and Ulumuddin (2023). Compared to technology-mediated effects, the mediation role of labor in this relationship is more gradual, reflecting the cumulative nature of experience-based learning.

Model II

8. The Influence of the Workforce on Technology Adoption

The workforce has a strong positive effect on technology adoption ($\beta = 0.780$; $t = 18.406$; $p = 0.000$), indicating that labor quality is a dominant determinant of digital transformation in coffee shop MSMEs. This result highlights that technology adoption is not purely a capital decision but a human-centered process.

This finding strongly supports Schumpeterian theory, which emphasizes that innovation requires skilled human resources. Compared to Model I, this result reverses the causal direction and confirms that workforce readiness is a prerequisite for successful technology implementation. Coffee shops in Medan with digitally literate employees adopt technology more effectively, consistent with Novarina Belly (2019).

9. The Influence of the Workforce on Revenue Through Technology

The workforce has a positive and significant effect on revenue through technology ($\beta = 0.284$; $t = 4.150$; $p = 0.000$), indicating partial mediation by technology. This suggests that labor increases revenue not only directly through service quality but also indirectly by enabling effective technology utilization.

This result integrates Schumpeterian innovation theory with the Solow–Swan growth model, emphasizing that technology amplifies labor’s contribution when human resources are capable of operating it. Compared to direct labor effects, the mediated effect highlights the strategic importance of aligning workforce development with digital adoption. This finding strengthens the argument that human resource readiness is a key success factor in MSME digitalization.

CONCLUSION

This study highlights that technology adoption and workforce quality are the most decisive drivers of revenue growth in coffee shop MSMEs in

Medan, both directly and through their interaction. Among all relationships tested, the strong reciprocal link between technology and the workforce emerges as the most critical finding, indicating that digital transformation and human resources cannot be separated in explaining MSME performance.

The results confirm that technology significantly increases revenue, primarily by improving operational efficiency, accelerating transactions, and expanding market reach. However, this impact is not autonomous; it becomes optimal only when supported by a competent and digitally literate workforce. This is evidenced by the strong mediating role of labor in the relationship between technology and revenue, as well as the reverse pathway where workforce quality significantly drives technology adoption. These findings reinforce growth and production theories (Solow-Swan and Cobb-Douglas), while also extending Schumpeterian perspectives by emphasizing human readiness as a prerequisite for technological effectiveness in MSMEs.

Business experience also plays an important role by strengthening managerial capability and workforce stability, which indirectly contributes to higher revenue. Nevertheless, compared to technology and workforce variables, business length functions more as a reinforcing factor rather than a primary growth engine.

Main Implications

The study implies that digitalization policies for MSMEs should not focus solely on providing technology, but must be accompanied by systematic workforce development, including digital skills training and operational capability building. For MSME owners, investment in employee competence is as critical as investment in digital tools. For policymakers, strengthening human capital is essential to ensure that MSME digital adoption translates into real economic gains.

Limitations

This study is limited by its cross-sectional design, which restricts causal inference over time, and its geographical focus on coffee shop MSMEs in Medan, which may limit generalizability to other sectors or regions. Future research is encouraged to apply longitudinal approaches, include external factors such as market competition or institutional support, and test the model across different MSME industries.

Overall, this study contributes to the MSME literature by demonstrating that revenue growth is the result of an integrated system of technology, experience, and workforce capability, with human resources acting as the central mechanism that

transforms digital adoption into tangible economic outcomes.

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