RESEARCH ARTICLE

Can the financial performance of the micro, small, and medium-sized enterprise production sector in Medan be a signal in the use of a leanness strategy? [version 1; peer review: 1 approved with reservations]

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Abstract

Background: Business actors need to take strategic steps to maintain and improve business performance. Studying and deepening the strategies used by micro, small, and medium-sized enterprises (MSMEs) to maintain their performance conditions are needed as a barometer of crisis resistance in the macroeconomic sector, especially those used by MSMEs in Medan, Indonesia. Thus, this research provides a real picture in the field of variables and indicators that affect the business strategy of MSMEs through the perspective of a lean approach.

Methods: The population in this region was 466 business actors of MSMEs in Medan. A random stratified sampling strategy is used, and 169 businesses in the MSMEs production sector were obtained as samples, which has exceeded the standard achievement of 80 percent in detecting an R^2 value of at least 0.10 (with a 5 percent probability of error). The research variables used consisted of one endogenous variable (use of a lean strategy), two exogenous variables (external lean practice and internal lean practice), and one mediating variable (financial performance). Seven hypotheses (inner models) were tested using structural equation modelling-partial least squares, nonparametric statistical data analysis techniques with mediation effects, assisted by Smart PLS 3.0.

Results: Based on the path coefficient, internal lean practice predominantly influences the financial performance of MSMEs in Medan compared to external lean practice. Internal lean practice is the primary signal for identifying the degree of lean strategy practice in the MSMEs production sector in Medan city.

Conclusion: These findings can be a map for practitioners, academics,

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and the government to improve the financial performance of MSMEs and assist them in their business strategies through internal business practices. Moreover, this study's impact can lead to an understanding of business strategies in operations that directly or indirectly affect the environment toward global warming and various environmental problems.

Keywords

Leanness Strategy, Financial Performance, External and Internal Practice of Leanness

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Introduction

Globally, the growth of micro, small, and medium-sized enterprises (MSMEs) is higher than that of large companies, especially in Indonesia. Based on MSME data,¹ the growth of MSMEs in Indonesia from 2017 to 2018 was approximately 8.98 percent compared to large enterprises, which only grew by approximately 1.64 percent. The discussion on microenterprises (MEs) is challenging compared to small and medium-sized enterprises (SMEs) in various studies. There is a lack of information and data on microenterprises in the field regarding the fluctuating and inconsistent actions of microbusinesses. Furthermore, based on data, the SME sector plays a crucial and significant role as a driving force for the economy in creating new jobs, increasing the number of new entrepreneurs, and creating innovations at relatively economical and efficient costs.² Additionally, data and facts show that SMEs contribute, on average, to developing countries in the range of 20 to 50 percent of total GDP.^{3,4} Based on Usaha Mikro Kecil Menengah (UMKM) data,¹ SMEs in Indonesia have contributed 23.21 percent of the total GDP. The city of Medan is the third-largest city in Indonesia.¹² It is the gateway to western Indonesia as a multi-cultural centre of trade, industry, and business since the Dutch East Indies era.^{11,12} If grouped by production characteristics, it contains eleven groups in the production sector (see data file 12).¹⁰ Based on the Office of Medan City Cooperatives and SMEs Service database in 2020, the majority of the production sector of the MSMEs from the 466 identified in Medan City are in the handicrafts production group with 95 businesses, followed by the fabric production group with 79 businesses (see data file 12).¹⁰ Therefore, the studying and deepening of MSMEs' strategies in maintaining their performance conditions are needed to act as a barometer of crisis resistance in the macroeconomic sector, especially concerning MSMEs in Medan.

There are various business strategies for improving business performance that can lead to environmental friendliness, one of which is the 'leanness production strategy'.⁵ The mechanism and standardization of lean production in seeing its effect on financial performance (company) are still in the early stages. Currently, the practice of lean production is considered the gold standard of modern operations and supply chain management.⁶ Lean refers to eliminating waste in operational practices regarding costs in obtaining resources.⁷ Additionally, Hofer *et al.*,⁶ revealed that the application of internal and external lean practises, such as a decrease in inventory, an increase in quality, and a shorter operating time, will increase operating income, which will improve financial performance. Nawanir *et al.*,⁸ defined lean as 'lean manufacturing', a manufacturing process without residue; however, there are not enough studies conducted in Indonesia that discuss lean manufacturing strategies.

The studies relating to MSMEs' strategic practices in Indonesia have not provided comprehensive information, as they lack a conceptual approach and do not consider the characteristics that exist in Indonesia in general. Additionally, the effect of the deepening of business strategy practices on MSMEs' financial performance in Medan city, the third-largest city in Indonesia, can be considered a novelty. This study empirically focuses on the leanness strategy used by MSMEs in Medan. External and internal leanness strategy practices are exogenous variables, and financial performance is a mediating variable. Thus, there are seven research hypotheses in this study:

- H1.** The external leanness strategy practices carried out by MSMEs in Medan city affect a company's financial performance.
- H2.** The internal leanness strategy practices carried out by MSMEs in Medan city affect a company's financial performance.
- H3.** The external leanness strategy practices carried out by MSMEs in Medan city affect or signal the leanness strategy's implementation or use.
- H4.** The internal leanness strategy practices carried out by MSMEs in Medan city affect or signal the leanness strategy's implementation or use.
- H5.** A company's financial performance, achieved by MSMEs in Medan city, affects or can signal the leanness strategy's implementation or use.
- H6.** A company's financial performance, internal leanness strategy practices, and external leanness strategy practices simultaneously influence or signal the implementation or use of a leanness strategy by MSMEs in Medan city.
- H7.** A company's financial performance is a mediating variable for the effect of internal and external leanness strategy practices on the implementation or use of a leanness strategy by MSMEs in Medan city.

Methods

Ethics statement

The research data was obtained based on permits and ethical approval from the Medan City Cooperative and SMEs Office with approval number 800/2538, and The Medan State University Research and Community Service Institute with

approval number 574a/UN33.8/LL/2020. Furthermore, written informed consent was obtained from the response of business owners or managers on the questionnaire that they returned through mail or online via google form at <https://forms.gle/KhWRGTYW6hSKBbbWA> (see Data file 9).¹⁰ The anonymity and confidentiality of business owners' information are maintained.

Study design

This research is in the form of exploratory research with quantitative descriptive and inferential properties. Both primary and secondary data are used. Therefore, this research designed a questionnaire instrument that replicates the previous instrument designed by Hofer *et al.*,⁶ and Shashi *et al.*⁵ Primary data were collected through a questionnaire distributed to businesses of all sizes of the Medan City MSMEs production sector in 21 districts (see data file 1)¹⁰ with a total of 466 respondents via mail, WhatsApp, and SMS based on the Office of Medan City Cooperative and SMEs database. The hardcopy form (see data file 10)¹⁰ of the questionnaire was sent to the respondent's address via postal mail. In this case, respondents who wish to fill in the questionnaire online could use the link <https://forms.gle/KhWRGTYW6hSKBbbWA> which is available on the hard copy questionnaire. The phone number that is mentioned on the database (secondary data) is not open to the public because it is restricted from being published publicly by the private data act or "Permenkominfo 20/2016".²¹ However, for the public who want to know the address and number of SMEs in Medan City, in general, they can access the website owned by the Ministry of Cooperatives and SMEs of the Republic of Indonesia.¹³ To access the Medan City MSMEs data through the database Ministry of Cooperatives and SMEs of the Republic of Indonesia, first, go to the website <http://umkm.depkop.go.id/>. Then on the provincial (Provinsi) selection menu, select "Sumatera Utara," and on the Regency (Kabupaten) selection menu, select "Kota Medan". At the time of this study, based on data from August 3rd, 2021, 259,812 business actors that operate in Medan City were available prior to participant screening for this study.

Questionnaire testing

The questionnaire as an instrument of research is a novelty on MSMEs in the production sector of Medan City, so testing the validity and reliability of the questionnaire was carried out before being used in the research target. The questionnaire testing was conducted in 23 districts in Deli Serdang Regency targeted at 100 MSMEs business owners in the production sector. The 100 MSMEs criteria to be selected for the testing of the questionnaires was that their businesses activities and factories were located in Medan City but their offices were located in the Deli Serdang Regency area. However, these 100 MSMEs were excluded from the main study. The main study only focused on the MSMEs which have their activities, factories, and offices located in Medan City. The results of the questionnaires testing had only 49 respondents return the instrument with complete answers. Deli Serdang Regency¹⁰ was selected as the location of the instrument testing due to its position as the nearest location or neighbouring regency to Medan and at the same time, a buffer zone from the city of Medan to reduce potential bias in this study. So, it can be judged that the MSMEs in the production sector in Deli Serdang Regency have similarities with Medan. The instrument validation test was carried out with convergence validation, and the reliability testing is done with Cronbach Alpha reliability.

From June 10th, 2020 to June 30th, 2020, testing the questionnaire instrument was carried out (see data file 7).¹⁰ Validation testing is based on convergence validation, and the result showed that all indicators in each latent variable obtain a loading factor value of ≥ 0.5 .^{9,10} This validity value can be interpreted that the statements in each latent variable in this study can be understood by respondents in the same way as intended by the researcher. Moreover, the instrument's reliability showed that the value Cronbach Alpha for all latent variables is above 0.81.^{9,10} These reliability results meant that all items in the instrument can be used several times to measure the same symptoms and provide relatively consistent measurement results. There was no modification to the questionnaires after this testing because all items had met the criteria of validity and reliability.

Participants and sample size

For the study, respondents included a total of 466 business participants in the production sector from August 1st, 2020 to October 25th, 2020. Based on the Medan City Cooperatives and SMEs Service database, there are 466 businesses who are actively operating with a valid location within the bounds of Medan city (see data file 1) as of June 2020. Although the number of Medan City MSMEs recorded in the database of the Ministry of Cooperatives and SMEs of the Republic of Indonesia is 259,812 business actors as of August 3rd, 2021, this number is a combination of various sectors, not only the production sector. Furthermore, the validity of their active businesses is not guaranteed. In this case, the researcher follows the Law of the Republic of Indonesia Number 16 of 1997 concerning Statistics, the second part of article 12 paragraph 1 (see data file 14),¹⁰ which states that sectoral statistics are carried out by government agencies according to their scope of duties and functions, independently or together with the Agency. Thus, based on this law, this study uses data released by the Medan City Cooperatives and SMEs Office, namely 466 businesses in the production sector, as a targeting sampling. Businesses that were not in the production sector were excluded from this study and the

inclusion criteria included that is the participant must be a MSME business, identified as active at the time of the data extraction, and were fostered by the Medan City Cooperatives and SMEs Office in 2020. A random stratified sampling strategy was used to ensure the size of the business (micro, small, and medium enterprises (MSMEs)) and districts are represented in this research. Reminders were sent through SMS and WhatsApp to all nonresponding businesses and a second reminder by phone. The minimum sample size technique was based on a statistical power analysis of 80 percent, according to Cohen's table,⁹ which is measured based on how many indicators that a latent variable has. External leans practice as a latent variable has four indicators, so the minimum observation (sample) is 41 respondents to get 80 percent in detecting R^2 at least 0.25 (with 5 percent probability of error). Furthermore, the internal leans practice as a latent variable has six indicators, so the minimum observation (sample) is 48 respondents to get 80 percent in detecting R^2 of at least 0.25 (with a 5 percent probability of error). As with the external leans practice, the financial performance as mediating and also as latent variable must have minimum observations (sample) of 41 respondents to obtain 80 percent in detecting R^2 of at least 0.25 (with a 5 percent probability of error). Finally, the latent variable use of leans strategy must have a minimum of 45 respondents to obtain 80 percent in detecting R^2 of at least 0.25 (with a 5 percent probability of error).

From the 466 businesses who were the target population, 169 businesses were willing to participate in the study and returned a completed questionnaire (see data file 11).¹⁰ In this case, five respondents returned the questionnaire through field interviews, 34 respondents returned the questionnaire via postal mail with all fields completed, and 130 respondents filled out the questionnaire online or from the link provided on the hardcopy questionnaire sheet. 89 respondents returned the questionnaire via postal mail with incomplete fields and were not included in this study, and 207 respondents were not willing to participate in the study and refused to fill out the questionnaire – non-participation was confirmed by a telephone call. Overall, only 36 percent of respondents from the total target population are participated in this study. This condition is the same as in the study of SMEs in Australia,¹⁵ Scotland,¹⁶ and South Africa.¹⁷

Data collection process

Data were obtained through mail and online which is utilizing a Google form with MSME business actors in Medan from the August 1st, 2020 to October 24th, 2020 by paying attention to the COVID-19 protocol,¹⁴ with a database formed using a Google form.¹⁰

Data analysis

The data analysis carried out in this study consisted of two sub-model tests, namely testing the measurement model or often referred to as the outer model and testing the structural model or often referred to as the inner model with 0.10 as its' significant level. Before testing the outer model and inner model, it is necessary to test whether the arrow direction in each construct is formative or reflective. In this case, a test will be carried out on each exogenous and endogenous construct whether there is an intercorrelation on the indicators owned. If there is an indication of intercorrelation between indicators, it can be concluded that the construct is reflective vice versa.⁹ Then testing the measurement model or outer model is carried out to determine which indicators have a significant role in explaining latent variables with the partial least square algorithm mechanism with the provisions of whether the construction is formative or reflective. This was done more than twice to obtain significant indicators in explaining the latent variables in each construct. After obtaining strong and significant indicators for each construct, the next step is to test the inner model. This test is helpful to see the strength of the influence between latent variables through the path or R-square value between latent variables. Testing the inner model will be carried out using the bootstrapping mechanism. After testing the inner model and outer model, the last step is testing the model fit of the built model, with each construct having significant indicators. Before it is known empirically whether the construct will be formative or reflective, this study assumes that all constructs are in a reflective position. Simultaneous equation modelling - partial least squares regression analysis, assisted by Smart PLS 3.0 and SPSS 18, was used. In this case, the constructs of two exogenous variables, one endogenous variable and one mediation variable along with each latent variable's manifest variable, are presented in [Figures 1–5](#).

Results

The intercorrelation results for all constructs do not show a strong relationship with each other.¹⁰ Therefore, empirically the indicators that build the four constructs are formative, starting from external leans practice, internal leans practice, financial leans practice, and use of leans strategy. This report shows that testing the outer and inner models must be in line with the standard formative construct testing. Furthermore, examining the outer and inner models with formative constructs can only be analysed based on the bootstrapping calculation mechanism.⁹

In this case, based on bootstrapping results (see data file 5),¹⁰ to see the value of the indicator in each construct with a significant or insignificant value based on P-Values is through the tabulation of outer loadings. Based on the tabulation of outer loadings, the indicators (manifest variables) LE₂ (inventory delivery) and LE₃ (business location) have no

Figure 1. Inner construct model. Notes: ξ_1 = external lean practice, η_1 = financial performance, γ_{21} = the power of ξ_1 in influencing η_2 , γ_{11} = the power of ξ_1 in influencing η_1 , ξ_2 = internal lean practice, η_2 = the use of lean strategy, γ_{11} = the power of ξ_1 in influencing η_1 , γ_{12} = the power of ξ_2 in influencing η_1 , and β_{21} = the power of η_1 in influencing η_2 .

Figure 2. Outer construct model for ξ_1 . Notes: X_1 = supplier feedback, X_2 = supplier just in time, X_3 = supplier development, X_4 = customer involvement λ_4 = the strength reflective power of X_4 in influencing ξ_1 , λ_3 = the strength reflective power of X_3 in influencing ξ_1 , λ_2 = the strength reflective power of X_2 in influencing ξ_1 , and λ_1 = the strength reflective power of X_1 in influencing ξ_1 .

Figure 3. Outer construct model for ξ_2 . Notes: X_5 = pull system, X_6 = continue flow, X_7 = setup time reduction, X_8 = statistical process control, X_9 = employee involvement, X_{10} = total productive maintenance, λ_{10} = the strength reflective power of X_{10} in influencing ξ_2 , λ_9 = the strength reflective power of X_9 in influencing ξ_2 , λ_8 = the strength reflective power of X_8 in influencing ξ_2 , λ_7 = the strength reflective power of X_7 in influencing ξ_2 , λ_6 = the strength reflective power of X_6 in influencing ξ_2 , and λ_5 = the strength reflective power of X_5 in influencing ξ_2 .

Figure 4. Outer construct model for η_1 . Notes: Y_{18} = return on investment, Y_{19} = return on assets, Y_{20} = sell growth, Y_{21} = total operating cost, λ_{11} = the strength reflective power of Y_{18} in influencing η_1 , λ_{12} = the strength reflective power of Y_{19} in influencing η_1 , λ_{13} = the strength reflective power of Y_{20} in influencing η_1 , and λ_{14} = the strength reflective power of Y_{21} in influencing η_1 .

Figure 5. Outer construct model for η_2 . Notes: LE_1 = pull production system, LE_2 = inventory delivery, LE_3 = business location, LE_4 = consumer needs, LE_5 = production time, λ_{15} = the strength reflective power of LE_1 in influencing η_2 , λ_{16} = the strength reflective power of LE_2 in influencing η_2 , λ_{17} = the strength reflective power of LE_3 in influencing η_2 , λ_{18} = the strength reflective power of LE_4 in influencing η_2 , and λ_{19} = the strength reflective power of LE_5 in influencing η_2 .

significant value in explaining the use of leans strategy, with their P-Values values being 0.808 and 0.493, respectively (see data file 5).¹⁰ Moreover, in the external leans practice construct, only X_4 (customer involvement) has no significant value to explain the latent variable with a P-Value value of 0.588.¹⁰ Thus, only indicators LE_2 , LE_3 , and X_4 should be eliminated from each construct. Bootstrapping calculations are performed again after eliminating LE_2 , LE_3 , and X_4 . Even though, the P-Value of LE_4 (consumer needs) on the outer loadings shows above 0.05, it can still be maintained because this study is exploratory with a significance level of 0.10 (see data file 5).¹⁰

The next step is to measure the strength of the inner model is through the path coefficient tabulation derived from the results of the bootstrapping calculation. In this case, it is known that the path between the external leans practice latent variable, and the use of leans strategy latent variable should be eliminated because the significance value is above 0.05 (see data file 13).¹⁰ Similarly, the latent variable financial performance on the latent variable use of leans strategy should be removed from the inner structural model because it has a significant value above 0.05 (see data file 13).¹⁰

After eliminating three indicators or manifest variables and two inner model paths that are not significant at the 0.05 level, the final bootstrapping result (see data file 5)¹⁰ is obtained with overall outer loadings (see data file 5)¹⁰ and path coefficients (see data file 5),¹⁰ which have a significance value below 0.05. Thus, from the path diagram figure²⁹ of the bootstrapping process, equation models can be made for this study's outer model and inner model.

Based on the results of the bootstrapping calculation, it is known that the P-Value values for hypotheses three (H3) and five (H5) are above 0.05, namely 0.529 and 0.932, respectively (see path coefficient data file 13),¹⁰ which means that they

Figure 6. Outer model evaluation.

are not significant at 0.05 and should be excluded from the study. Because H3 and H5 do not meet the 0.05 significance requirement, then hypothesis six (H6) automatically cannot be continued for analysis because it is clearly proven that the practice of external leans strategy does not affect or cannot be a signal for the use of leans strategy by MSMEs. Furthermore, hypothesis seven (H7) cannot be accepted or continued for analysis because H5 is actually excluded from the study, so it can be interpreted that empirically financial performance cannot be a mediating variable between internal and external practice of leans on the use of leans strategy. So, the final modification result of the bootstrapping (see data file 5)¹⁰ concludes that the first, second, and fourth hypotheses are empirically acceptable. Therefore, financial performance cannot signal the practice of leanness strategy in MSMEs in Medan's production sector. However, it was found that internal lean practice predominantly influences the financial performance of MSMEs in Medan city compared to external lean practice. Furthermore, internal lean practice is the primary signal of the lean strategy in the MSME production sector in Medan city. The mechanism for obtaining these research results can be seen in Figure 6, which presents a flow diagram of outer model evaluation, and Figure 7, which presents a flow diagram of inner model evaluation. From 169 respondents who returned the questionnaire with complete entries, it is known that 51 respondents are small-sized businesses, five respondents are medium-sized businesses, and 113 respondents are micro-sized businesses. Then, most of the production sector of MSMEs in Medan city are handicraft producers, followed by fabric producers, convection producers, shoe manufacturers, and household furniture manufacturers (see data file 12).¹⁰

Discussion

Based on the results of path coefficient analysis (see data file 13),¹⁰ it is proven that empirically the first hypothesis, second hypothesis, and fourth hypothesis are acceptable. Therefore, this study contributes to the theory of business strategy used by MSMEs in the production sector of Medan by highlighting and investigating the role of internal and external leans practice and financial performance. The study results obtained the importance of internal leans practice in influencing leans strategy and financial performance. In addition, external lean practice is known to affect the financial performance of MSMEs.

The first hypothesis has been proven to be acceptable that external leanness strategy practices carried out by MSMEs in Medan (production sector) affect the company's financial performance. In this case, the characteristics of external lean practice carried out by MSMEs in the production sector of the city of Medan validly consist of three indicators or characters, namely providing supplier feedback (X_1), suppliers just in time (X_2), and referred to as supplier development (X_3). So, based on the external leans practices character owned by MSMEs in the production sector, they can streamline and grow business financial performance. In contrast to the findings of the study conducted by Hofer *et al.*,⁶ that external

Figure 7. Inner model evaluation and final equation result.

leanness strategy practice is not significant in influencing business financial performance. Hofer *et al.*,⁶ states that financial performance will be good if cost reduction is realized, and cost reduction can be made if it is influenced by inventory leanness. However, some study results state that the external leanness strategy has a real significance in influencing financial performance.^{5,20}

The second and third hypotheses are empirically proven,¹⁰ where internal lean practice in MSMEs in the production sector has an influence value of 63.6 percent positively on financial performance and 77.6 percent on lean strategies.¹⁰ Furthermore, the six indicators of internal lean practice proved to be valid with P-Values < 0.10.¹⁰ Thus, the results of this study prove that the characteristics of MSMEs in the production sector of the city of Medan in running a business during 2020 are by the six indicators that build an internal lean practice, namely carrying out business in a pull system (X_5), continue flow (X_6), setup time reduction (X_7), statistical process control (X_8), employee involvement (X_9), and total productive maintenance. Furthermore, studies conducted by Hofer *et al.*,⁶ and Fullerton and Wempe¹⁸ prove that there is a positive influence between internal leans practice on financial performance. However, if between internal leans practice and financial performance the inventory leans variable or non-financial performance measures, there will decrease direct influence by 25 percent. Furthermore, a study conducted by Hallgren, M. *et al.*,¹⁹ and Chanegrih, T.²⁰ show that the effort to practice leans strategy will result in more efficient financial performance than companies with agile characteristics. Therefore, it is empirically and theoretically proven that internal lean practice will positively affect the effectiveness of financial performance efficiently, which consists of five indicators, namely, return on investment (Y_{18}), return on assets (Y_{19}), cell growth (Y_{20}), and total operating cost (Y_{21}). Furthermore, something that is a novelty from this research is the proven internal lean practice as a strong signal in showing whether a business has used a leans strategy or not. In this case, the use of the leans strategy by MSMEs is seen from five indicators. However, only three indicators have proven significant as a characteristic of MSMEs business strategy in the production sector of Medan, namely, the use of a pull production system (LE_1), based on consumer needs (LE_4), and the use of time production (LE_5).

The empirical proof of this study showed that financial performance could not signal using a strategy that the MSMEs production sector of Medan used (see path coefficient data file 13).¹⁰ However, internal and external lean practice empirically could be a signal on the financial performance of MSMEs production sector in Medan, which internal leans practice has a strong influence compared to external leans practice. Thus, based on the path coefficient, the financial performance of MSMEs cannot be a mediating variable between external and internal leanness practices toward the use of leans strategy. Therefore, based on path diagram figure (see data file 2)¹⁰ the prediction equation model (inner model equation) for the use of a leanness strategy in MSMEs production sector Medan is only influenced by the practice of internal leanness: with the model equation is as follows $\eta_2 = 0.776\xi_2$. Furthermore, empirically the equation model (inner model) for financial performance in MSMEs production sector in Medan is $\eta_1 = 0.155\xi_1 + 0.636\xi_2$. This study proves that the role of external and internal leans practice affects the financial condition and business strategy of MSMEs in the production sector of Medan.

This study can be categorized as a study of lean manufacturing practices because it combines the perspectives of just-in-time (JIT), total quality management (TQM), and total productive/preventive maintenance (TPM) to obtain productivity and quality levels through waste reduction.²² An emphasis on internal and external strategic leanness practices can improve financial performance and environmental protection because resources will be limited to what is needed and not to what is desired.⁵ These findings can act as a map for practitioners, academics, and the government to improve MSMEs' financial performance and assist MSMEs with their business strategies through internal business practices. Furthermore, this finding can be an entry point for investigating whether MSMEs in the production sector of Medan have characteristics of agile manufacturing. The characteristics of MSMEs with agile manufacturing are needed in the current situation; where the growth of transactions or trade globally is increasing, the environment is uncertain, the development of technology is rapidly getting faster, and the pressure of competition between manufacturers requires different practices and different tools to improve the process company operations. In this case, a study conducted by M. Khalfallah and L. Lakhal²² proves that lean manufacturing can explain whether a company has agile manufacturing practices where agile manufacturing is essential in viewing operational performance.

Limitations

The findings illustrate the business strategy carried out by MSMEs in the production sector in the city of Medan, where the regional and national economies are experiencing a decrease. The data obtained from this field research indicate that the financial performance of MSMEs cannot project the strategies used. However, internal business practices are the leading indicators in signalling the strategy used and financial performance.

Only one percent of the targeting sample was conducted with intensive interviews with the targeted business participants prior to the COVID-19 lockdown. The remaining (99 percent sample) used questionnaire by postal mail and online access because the Medan city government forbids us in conducting interviews directly due to the increase of COVID-19 infection from August 2020 to October 2020 with the lockdown policy enforced in Medan. Furthermore, the 1 percent (five respondents) who were willing to be interviewed were in the Medan Tembung district on the outskirts of the city.

Conclusion

These findings can act as a map for practitioners, academics, and the government to improve MSMEs' financial performance and assist them with business strategies through internal business practices. Moreover, this study's impact can lead to an understanding of operations business strategies that directly or indirectly affect the environment. Finally, in-depth knowledge of business actors' operational systems will assist regional, state, and international policies to fight global warming and various environmental problems through waste reduction.

Data availability

Underlying data

Figshare: Underlying data.

<https://doi.org/10.6084/m9.figshare.17004067>.

This project contains the following underlying data:

- Data file 1. (Map of city of Medan with its 21 Districts (Kecamatan))
- Data file 2. (Figure of path diagram from the final bootstrapping)
- Data file 3. (Final path coefficient)
- Data file 4. (Final outer loadings)
- Data file 5. (The third (final) bootstrapping result)
- Data file 6. (Validation and reliability result)
- Data file 7. (Dataset for questionnaire validation and reliability (49 respondents) in testing stage)
- Data file 8. (Intercorrelation testing result)
- Data file 11. (Anonymized dataset of leanness strategy of Medan MSMEs [169 respondents])

- Data file 12. (Groups in the Production Sector with 466 businesses identified for study)
- Data file 13. (Path Coefficient - explanation for exclusion of H3, H5, H6, and H7)

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

Extended data

Figshare: Underlying data. <https://doi.org/10.6084/m9.figshare.17004067>.

This project contains the following extended data:

- Data file 9. (Research questionnaire on Google form)
- Data file 10. (Research questionnaire – hard copy)
- Data file 14. Law of the Republic of Indonesia Number 16 of 1997 concerning Statistics

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

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References

1. Kementerian Koperasi dan Usaha Republik Indonesia. (UMKM KKD): **Data development of Micro, Small, Medium (UMKM) and Large Business (UB) Businesses**. 2018. [Accessed 10 5 2020]. [Reference Source](#)
2. Karadag H: **The impact of industry, firm age and education level on financial management performance in small and medium-sized enterprises (SMEs): Evidence from sTurkey**. *J. Entrep. Emerg. Econ.* 2017; 9(3): 300–314. [Publisher Full Text](#)
3. Doan AT, Le AT, Tran Q: **Economic uncertainty, ownership structure and small and medium enterprises performance**. *Aust. Econ. Pap.* 2020; 59(2): 102–137. [Publisher Full Text](#)
4. Sopha BM, Hestiani A: **A case study of Indonesian SMEs: an empirical evidence of SCM practices and their impact on firm performance**. *The International Journal of Services Technology and Management*. 2018; 24(5-6): 394–413. [Publisher Full Text](#)
5. Shashi CP, Cerchione R, et al.: **The impact of leanness and innovativeness on environmental and financial performance: Insights from Indian SMEs**. *Int. J. Prod. Econ.* 2019; 212: 111–124. [Publisher Full Text](#)
6. Hofer C, Eroglu C, Rossiter HA: **The effect of lean production on financial performance: The mediating role of inventory leanness**. *Int. J. Prod. Econ.* 2012; 138(2): 242–253. [Publisher Full Text](#)
7. Vidyadhar R, Kumar R, Vinodh S, et al.: **Application of fuzzy logic for leanness assessment in SMEs: a case study**. *J. Eng. Des. Technol.* 2016; 14: 78–103. [Publisher Full Text](#)
8. Nawani G, Lim KT, Othman SN: **Lean manufacturing practices in Indonesian manufacturing firms: Are there business performance effects?**. *Int. J. Lean Six Sigma*. 2016; 7: 149–170. [Publisher Full Text](#)
9. Joseph J, Hair F, Hult GTM, et al.: **A Primer On Partial Least Squares Structural Equation Modelling (PLS-SEM)**. Singapore: SAGE Publications Ltd; 2014.
10. Triono MAA, Ahmad ST, Ermia C, et al.: **Underlying Data**. figshare. Dataset. 2021. [Publisher Full Text](#)
11. Purwanto A: *Kota Medan: Paris van Sumatera*. 2021. [Accessed 13 7 2021]. [Reference Source](#)
12. Wikipedia Ensiklopedia Bebas: *Kota Medan*. 2021. [Accessed 13 7 2021]. [Reference Source](#)
13. Kementerian Koperasi dan UKM Republik Indonesia: 2021. [Accessed 26 7 2020]. [Reference Source](#)
14. Komite Penangan Covid 19 dan Pumlahan Ekonomi Nasional, “Protokol,” Government Republic of Indonesia, 2 8: 2020. [Accessed 4 8 2020]. [Reference Source](#)
15. Verreyne M-L, Williams AM, Ritchie BW, et al.: **Innovation diversity and uncertainty in small and medium sized tourism firms**. *Tour. Manag.* 2019; 72: 257–269. [Publisher Full Text](#)
16. Freel MS: **Perceived Environmental Uncertainty and Innovation in Small Firms**. *Small Bus. Econ.* 2005; 25: 49–64. [Publisher Full Text](#)
17. Oerlemans L, Pretorius M, Buys A, et al.: **South African Innovation Survey 2001 for manufacturing and services: Report on the South African Innovation Survey for the Period 1998-2000**. The Netherlands Eindhoven University of Technology Eindhoven Centre for Innovation Studies; 2003.
18. Fullerton RR, Wempe WF: **Lean manufacturing, non-financial performance measures, and financial performance**. *Int. J. Oper.*

- Prod. Manag.* 2009; **29**(3): 214–240.
[Publisher Full Text](#)
19. Hallgren M, Olhager J: **Lean and agile manufacturing: external and internal drivers and performance outcomes.** *Int. J. Oper. Prod. Manag.* 2009; **29**(10): 976–999.
[Publisher Full Text](#)
 20. Chanegrih T, Creusier J: **The Effect of Internal and External Lean Practices on Performance: A Firm-Centered Approach.** *Management International/International Management/Gestión Internacional.* 2016; **21**(1): 114–125.
[Publisher Full Text](#)
 21. Sekretariat Website JDIH BPK RI: *Perlindungan Data Pribadi Dalam Sistem Elektronik.* 2016. [Accessed 21 7 2020].
[Reference Source](#)
 22. Khalfallah M, Lakhali L: **The impact of lean manufacturing practices on operational and financial performance: the mediating role of agile manufacturing.** *Int. J. Qual. Reliab. Manag.* 2020; **38**: 147–168.
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