Determination of critical indicators in efforts to improve performance of Indonesian chocolate SMEs with lean and agile approaches

Siti Aisyah*, Humiras Hardi Purba

1Polytechnic STMI-Ministry of Industry, Jakarta 10510, Indonesia
2Master of Industrial Engineering Program, Mercu Buana University, Jakarta
*aisyah@kemenperin.go.id

Abstract. Today Indonesian Chocolate SMEs are struggling to find the right strategy to improve their performance and to achieve competitiveness. Because the company's current performance is not only seen in terms of minimum cost and good quality. Since market requirements are continuously changing and unpredictable to requires SMEs to use other strategies that can be agile and quick to respond to market changes. This paper aims to determine critical indicators that can improve the performance of Indonesian chocolate SMEs in winning the market through lean and agile practice approaches. The results obtained are determined by 9 critical indicators consisting of 3 lean indicators (P_L3, P_L9, P_L10) and 6 agile indicators (P_A1, P_A2, P_A4, P_A5, P_A9 dan P_A10).

1. Introduction

Indonesia is a potential cocoa producing country in the world, so it has the opportunity to become a chocolate producer center that is economically profitable because it can increase competitiveness in the entire chocolate business chain from upstream to downstream industries. Product development with a technology approach that continues to grow enables Indonesia not only as a cocoa producer, but also as a chocolate producer that is globally competitive, especially in the manufacturing processes contained therein. Strengthening the chocolate industry SMEs is very important because of the potential growth of downstream industries with high competitiveness. Strengthening the downstream industry is very strategic for increasing the added value of national cocoa commodities. A business environment characterized by rapid change, diverse customer needs, and international competition, organizations must have the ability to explore new business processes in order to remain profitable in the long run [1].

The cocoa agro-industry has a long value chain with various processes in it. Understanding the supply chain characteristics and value chain of cocoa commodities will enable the company to be able to identify added value by a particular unit or function in order to satisfy customer needs [2]. The attention and development of the downstream cocoa sector is very necessary, because the value chain of cocoa business shows that the largest economic value is in the chocolate processing industry and industry by 33.3% while at the producer level, including farmers only reaches 3.3% [3].

The purpose of this study was to identify drivers of lean and agile by discussing a portfolio of competitive advantages that have emerged over time as a result of changes in manufacturing requirements in chocolate SMEs in Indonesia. Lean practice with a focus on reducing waste is not only done by large-scale industries, but SMEs are also required to do so in order to stay competitive in the...
midst of increasingly fierce business competition. Lean practices in the industry can be identified as [4]
(i) just in time (first-tier supplier → focal company), (ii) supplier relationships/long-term business
relationships, (iii) just in time (focal company), (iv) pull flow, (v) total quality management, (vi)
customer relationships, and (vii) just in time (focal company → first-tier customer). The lean principle
is not only practiced by the manufacturing industry, although the publication of research results
generally addresses lean practices in manufacturing. Although the word manufacturing is used with this
concept, the principles of agility can apply equally to other functions of the business and service
industry. Although the word manufacturing is used in lean concepts, lean principles can apply equally
to other functions of a business including service industries [5]. Agile approaches can answer the
industry's ability to adapt quickly to market needs [6]. Agility practices have four basic principles,
namely [7]. Sustainable competitiveness, the industry must understand its evolution in order to predict
changes and react strategically to those changes [8]. The Agile supply chain is an integrated business
enabling new competencies partners to respond to constantly changing and fragmented markets, where
the main support factor of supply chain is the structure dynamics and relationship configuration, end-
to-end information visibility, and event-based management and occurrence [9]. The agility is the
organization's ability to respond to unexpected market changes and convert those changes into business
opportunities [10].

2. Methodology

2.1 Method
The steps used in this study is the first step is knowing the level of importance of lean and agile indicators
based on expert judgment. The result of the analysis is the extent to which lean and agile indicators are
needed to improve the competitiveness of Indonesian chocolate SMEs. The second step is to find out
the level of implementation of lean and agile indicator practices on chocolate SMEs. The result can be
known to what extent SMEs practice lean and agile indicators. The final step is to find critical indicators
of both lean and agile practices that must be corrected to improve competitiveness.

2.2 Equation
To get a lean agile index (LA Index), a lot of equations are needed, including the equation to determine
the behavior of each of the SMEs in practicing lean and agile [11]. The LG Index is calculated in 2 ways,
that is LG Index for importance (experts judgement) and LG Index for practice (SMEs self assessment)
[12]. Equation LG index for importance level can be obtained from multiplication of lean and agile
behavior with importance weight to practice lean and agile. The behavioral value of SMEs in
aggregation towards lean and agile practices is multiplied by the weight of the practice of each indicator
of lean and agile is the equation to find LG index for the practice of SMEs.

3. Results and Discussion

3.1. Level of Importance of Each Indicator is Lean and Agile
From table 1 it can be seen that the most important indicator of lean practice is reducing cycle time and
setup time (Pl2). The ability to quickly reconfigure planning and production processes is the most
important indicator in agile practice (PA5). The LA Index value is based on the importance assessment
of 4.40 with lean behavior values of 4.41 and agile behavior values of 4.39 which means to increase the
competitiveness of SMEs only need to practice most of the lean and agile indicators.

| Table 1. Tingkat Kepentingan Praktik Lean dan Agile |
| Behavior  | Indicator | Description                                                                 | Value Average | Ranking | Weight |
|-----------|-----------|-----------------------------------------------------------------------------|---------------|---------|--------|
| **Lean**  | P_{L1}    | Building a quality system / independent inspection                          | 4.63          | 2       | 0.105  |
|           | P_{L2}    | Reduces cycle time and setup time                                           | 4.75          | 1       | 0.108  |
|           | P_{L3}    | Innovation in performance assessment                                        | 4.25          | 5       | 0.097  |
|           | P_{L4}    | Minimize resource inventory                                                 | 4.00          | 6       | 0.091  |
|           | P_{L5}    | Reduce leadtime                                                             | 4.25          | 5       | 0.097  |
|           | P_{L6}    | Increase resource utilization                                               | 4.38          | 4       | 0.099  |
|           | P_{L7}    | TQM                                                                          | 4.63          | 2       | 0.105  |
|           | P_{L8}    | JIT                                                                          | 4.63          | 2       | 0.105  |
|           | P_{L9}    | Reduce lot size                                                             | 4.00          | 6       | 0.091  |
|           | P_{L10}   | Multifunctional workforce                                                   | 4.50          | 3       | 0.102  |
| **Agile** | P_{A1}    | Use of IT to integrating/coordinating all industrial/ manufacturing activities| 3.75          | 6       | 0.085  |
|           | P_{A2}    | To increase the frequency of new product introductions                      | 3.75          | 6       | 0.085  |
|           | P_{A3}    | Using centralized and collaboration planning                                | 4.625         | 3       | 0.105  |
|           | P_{A4}    | Speed in improving customer service, delivery reliability and response to market changes | 4.750 | 2 | 0.108 |
|           | P_{A5}    | Ability to rapid reconfigure planning and production processes              | 4.875         | 1       | 0.111  |
|           | P_{A6}    | Ability to capture demand information immediately                           | 4.500         | 4       | 0.103  |
|           | P_{A7}    | Ability to maintain and develop relationships with suppliers and consumers  | 4.625         | 3       | 0.105  |
|           | P_{A8}    | Produce products with substantial added value for consumers                | 4.500         | 4       | 0.103  |
|           | P_{A9}    | Product design meets the consumer's requirement                             | 3.875         | 5       | 0.088  |
|           | P_{A10}   | Speed in reducing development and production cycle time                     | 4.625         | 3       | 0.105  |

3.2. **Level of Implementation of Lean and Agile Practices**
Table 2 shows the results of the integration of the assessment of the implementation of lean and agile practices on chocolate SMEs conducted by the leaders of each of the SMEs in Indonesia by self-assessment. In the lean practice indicator the first rank is an indicator of building a quality system / independent inspection (PL1), minimizing resource inventory (PL4) and TQM (PL7). Indicators using centralized and collaboration planning (PA3) and ability to maintain and develop relationships with suppliers and consumers (PA7) are ranked first in agile practices. The first rank means that these indicators have been mostly practiced in Indonesian chocolate SMEs. From the data in the table can be calculated the value of lean behavior of 3.85 and agile behavior value of 3.95 which will produce the LA index of 3.90, which means the new Indonesian chocolate SMEs partly practice lean and agile indicators.

| Behavior | Indicator | Description | Value Average | Ranking | Weight |
|----------|-----------|-------------|---------------|---------|--------|
| Lean     | PL1       | Building a quality system / independent inspection | 4.25 | 1 | 0.113 |
|          | PL2       | Reduces cycle time and setup time | 4.00 | 2 | 0.106 |
|          | PL3       | Innovation in performance assessment | 3.50 | 4 | 0.093 |
|          | PL4       | Minimize resource inventory | 4.25 | 1 | 0.113 |
|          | PL5       | Reduce leadtime | 3.75 | 3 | 0.099 |
|          | PL6       | Increase resource utilization | 4.00 | 2 | 0.106 |
|          | PL7       | TQM | 4.25 | 1 | 0.113 |
|          | PL8       | JIT | 4.00 | 2 | 0.106 |
|          | PL9       | Reduce lot size | 3.00 | 5 | 0.079 |
|          | PL10      | Multifunctional workforce | 2.75 | 6 | 0.073 |
| Agile    | PA1       | Use of IT to integrating/coordinating all industrial/ manufacturing activities | 4.00 | 5 | 0.085 |
|          | PA2       | To increase the frequency of new product introductions | 3.63 | 4 | 0.092 |
|          | PA3       | Using centralized and collaboration planning | 4.38 | 1 | 0.131 |
|          | PA4       | Speed in improving customer service, delivery reliability and response to market changes | 4.38 | 4 | 0.092 |
|          | PA5       | Ability to rapid reconfigure planning and production processes | 4.63 | 5 | 0.085 |
|          | PA6       | Ability to capture demand information immediately | 4.75 | 3 | 0.098 |
|          | PA7       | Ability to maintain and develop relationships with suppliers and consumers | 4.13 | 1 | 0.131 |
3.3. Critical Indicators That Must Be Improved

Critical indicators that must be improved in lean practices are the indicators Pa3, Pa5, and Pa10. Indicators Pa1, Pa2, Pa4, Pa5, Pa9, and Pa10 are critical indicators of agile practices that are priority improvements.

4. Conclusion

There is a difference from the LA index value between importance and implementation of SMEs of 11.36% that requires Indonesian chocolate SMEs to make some improvements to some indicators in critical areas so that competitiveness can increase.

5. References

[1] Vanhaverbeke W, Peeters N, 2005. Embracing innovation as strategy: corporate venturing, competence building and corporate strategy making. Creativity and Innovation Management, 14 (3): 246-257.

[2] Cáceres RGG, Perdomo A, Ortiz O, Beltrán P, López K, 2014. Characterization of the supply and value chains of Colombian cocoa. Dyna, 81(187): 30-40.

[3] Heijbroek AMA, Konijn. 1995. The cocoa and chocolate market: Utrecht, Rabobank Nederland.

[4] Azevedo SG, Govindan K, Carvalho H, Cruz-Machado V. 2012. An integrated model to assess the leanness and agility of the automotive industry. Resources, Conservation and Recycling, 66: 85-94.

[5] Katayama H, and Bennett D, 2001. Agility, adaptability and leanness: A comparison of concepts and a study of practice. In Gunasekaran A (Ed) “Agile manufacturing: The 21st Century Competitive Strategy”, Elsevier, 2001

[6] Faisal MN, Banwet DK and Shankar R, “Supply chain agility : analysing the enablers,” International Journal of Agile Systems and Management, vol 2, no 1, pp 76-91, 2007.

[7] Goldman S, Nagel R, Preiss K, 1995. Agile Competitors and Virtual Organizations. Van Nostrand Reinhold, New York.

[8] Porter ME, 1990. The competitive advantage of nations, Free Press, New York.

[9] Carvalho H, Azevedo SG, Cruz-Machado V. 2013. An innovative agile and resilient index for the automotive supply chain,”Int. J. Agile Systems and Management, 6(3): 259-283.

[10] Swafford PM, Ghosh S, Murthy N, 2008. Achieving supply chain agility through IT integration and flexibility. International Journal of Production Economics, 116(2): 288- 297.

[11] Azevedo, S.G., et al., An integrated model to assess the leanness and agility of the automotive industry. Resources, Conservation and Recycling, 2012. 66: p. 85-94.

[12] Azevedo, S.G., H. Carvalho, and V.C. Machado, The Influence of LARG Supply Chain Management Practices on Manufacturing Supply Chain Performance. 2015. 3(25): p. 26-27.