

Agile and Resilient Implementation on Small Medium Enterprises (SMEs) Chocolate Bean to Bar in Indonesia

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ABSTRACT

As the fourth largest cocoa producer in the world with increasing trend of domestic chocolate consumption, cocoa commodity and all related industry value chains in it become very strategic for Indonesia's economy. The development of chocolate downstream industry based on Agile and Resilient is very important to be implemented to respond to customer needs which is changing rapidly, with an increasingly competitive level of business competition. This study aims to identify drivers from Agile and Resilient by discussing the portfolio of competitive advantages that have emerged over time as a result of changes in manufacturing requirements. The results obtained from the data processing is that in the implementation of agile and resilient approaches in SMEs chocolate bean to bar industry, agile behaviour has higher score of 4.0 than the resilient behaviour of 3.8. The AR index score of the agile and resilient approaches in the SMEs chocolate bean to bar industry is 3.9 lower than the importance level according to the experts that is 4.33.

Keywords - Agile, Chocolate industry, Industrial development, Resilient, Small medium enterprises (SMEs).

1. Introduction

Cocoa is an important commodity for the global world because it is the main ingredient of chocolate products, cocoa has a flavor and aroma that can not be replaced by other commodities [1]. Indonesia is the world's fourth largest producer of cocoa beans after Ivory Coast, Ghana and Ecuador, but the national cocoa downstream industry is still constrained by various problems, thus it has not developed as expected. The availability of domestic cocoa raw materials and government policies as regulators have not been able to put local downstream industries at high level of competitiveness. The growing cocoa downstream

industries are now dominated by large industries, where the raw materials of cocoa beans are mostly imported cocoa beans from Ivory Coast, Ghana, Malaysia, and other countries. Indonesian cocoa raw materials are generally used only as support materials only, this is due to local cocoa quality problems that do not meet the established quality standards.

Several Small Medium Enterprises (SMEs) chocolate industries in some parts of Indonesia are working to improve their competitiveness amid the limited resources they have. The SMEs industry uses Indonesia's cocoa raw materials even up to 100%, known as the chocolate bean to bar industry. SMEs industries are looking for their own raw material sources to every part of Indonesia, even they are training cocoa farmers so they can produce cocoa beans which quality can meet international market standards. Generally, the chocolate products produced by SMEs industry have good quality and are not inferior to the outer products in. The problem is the SMEs chocolate production industry have not been widely known in the broad market. With relatively small market share, causing Indonesia's chocolate industry less competitive, in addition to many other causes. The industries that currently exist in Indonesia generally are big European and American industries that produce chocolate bars from intermediate raw materials of cocoa products namely cocoa powder added with vegetable oil derived from palm oil. In recent years SMEs chocolate bean to bar industry began to emerge which utilising cocoa beans from some areas to be used in chocolate industry. The SMEs industry carries the single origin of producing cocoa bars from cocoa beans from each cocoa beans producer region[2].

In order for the chocolate SMEs bean to bar industry to be competitively sustainable, the industry is required to have the ability to respond quickly to consumer desires, unpredictable market changes and remain resilient to various disruptions. Therefore the SMEs chocolate bean to bar industry requires the incorporation of two manufacturing approaches namely agile and resilient

approaches. The agile approach can respond to the industry's ability to adapt quickly to market needs [3], while continuing survival of various obstacles requires a resilient approach [4]. These two approaches will provide a means of improving the competitiveness and performance of the SMEs chocolate beans to bars industry [5], [6] causing the SMEs chocolate bean to bar industry to be more competitive [7]. Therefore the purpose of this paper is to assess the implementation of the agile and resilient approaches in the SMEs chocolate bean to bar industry by combining both agile and resilient indexes.

2. Literature Review

Manufacturing companies, even those operating in relatively stable conditions with good market positions, face rapid and often unpredictable changes in their business environment, where an agile manufacturing approach is proposed as a solution and is considered to be vital characteristic that manufacturers must have to maintain competitive advantage in the new order of world business [8]. The industry is required to pay attention to competitiveness amid the complexity of the problems that occur, thus increasing competitiveness is a demand for industry to survive in free market era. If at this time the industry generally seeks to improve its competitiveness is only oriented to increase output or profit alone, then in the future competitiveness must be based on economic (profit), social (people) and environment aspects, therefore industries can have competitive and sustainable advantage [9]. Sustainable competitiveness is defined as development that meets present requirements without compromising the ability of future generations to meet their own needs [10]. Research [11] confirms that to achieve sustainable competitiveness the industry must understand its evolutionary process in order to predict changes and react strategically to those changes. To have sustainable competitiveness the industry must look at all aspects of the economy, social, environment and technology, including the need to conduct comprehensive and integrated approach. The changes on customer requirements and technological forces manufacturers to develop Agile supply chain capabilities in order to compete, to achieve this, some companies emphasize flexibility and Agile to respond, real time as well as unique needs of customer and market [12]. Agile manufacturing is one of the operational strategies which organizations have adopted to address environmental uncertainty as result of the worldwide economic recession, shorter product life cycles, supplier

constraints and technological changes [13]. The Agile supply chain is the integration of business partners enabling new competencies to respond to constantly changing and fragmented market, where the main support factor of Agile supply chain is the structure dynamics and relationship configuration, end-to-end information visibility, and event-based management and occurrence [5], [14]. Supply chain agility is the organization's ability to respond to unexpected market changes and convert those changes into business opportunity [15]. There is a strong relationship between resilience and sustainability. The research [16] confirms two main objectives of resilience which are : (i) to recover to the desired state of the disrupted system, within acceptable time and acceptable cost, and (ii) to reduce the impact of disturbance by changing effectiveness level of potential threats. Industries that have good resilience will be able to quickly adapt and return to normal conditions when problems occur. To achieve sustainability, the company must be able to take advantage of current opportunities, while managing conditions that expand the possibilities in the future, which must ensure the company has adaptability as well as transformation and enable identification of factors that increase system resilience to achieve sustainability [17].

3. Methodology

In this section we will discuss about agile and resilient indexes aggregation which will be called AR index. The purpose is to assess the extent of agile and resilient approaches are applied to SMEs chocolate bean to bar industry. The expected condition is that the implementation level of these practices in each industry will shape overall industry behaviour. The first step in this paper is to calculate the behaviour of each SMEs chocolate bean to bar industry, in accordance to agile and resilient approaches. Fig 1 presents hierarchical relationship in the behaviour assessment of SMEs chocolate bean to bar industry, where this hierarchy follows the research hierarchy [15]

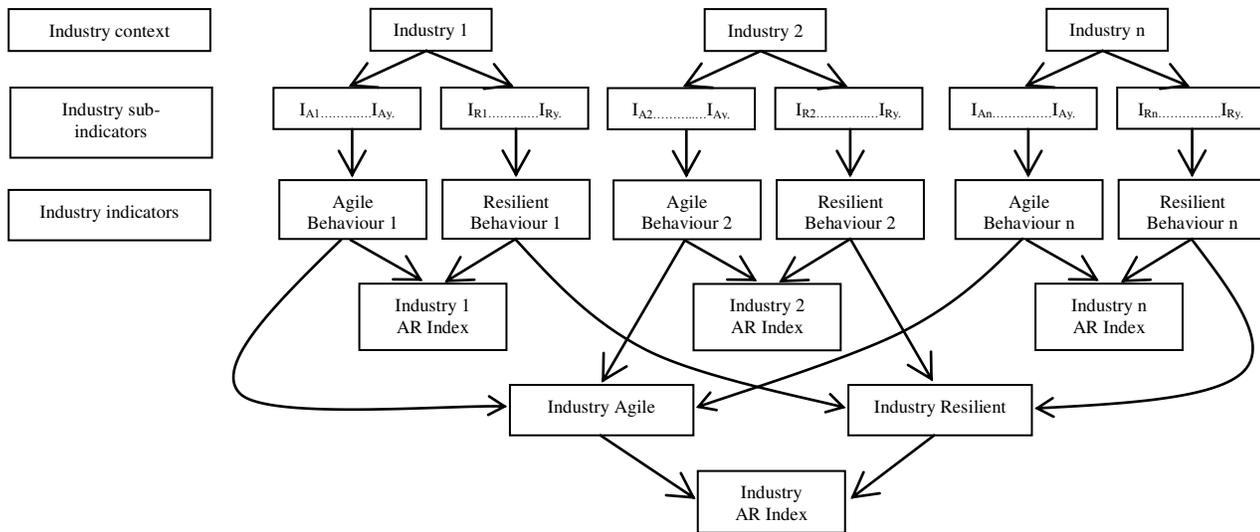


Figure 1. hierarchical related relationship in the behaviour assessment of smes chocolate bean to bar industry

The data used were the data collected through the distribution of questionnaires to experts in the field of chocolate bean to bar industry, academia and government, particularly related to the practice of agile and resilient approaches. Questionnaires distribution was done by 2 parts in an interactive way to reach consensus. The first questionnaire focused on the assessment of experts on the importance of agile and resilient practices on sustainable competitiveness improvement in chocolate bean to bar industry. Each practice was assessed using likert scale with scores between 1 to 5. Score 1 represents unimportant and score 5 represents very important. The respondents on the questionnaires were 8 experts from various fields (2 persons from government, 1 expert in chocolate industry, 1 person from chocolate industry association and 4 persons from SMEs chocolate bean to bar industry). The second questionnaire, to assess the extent of SMEs chocolate bean to bar industry practiced agile and resilient in their respective industries. The respondents in this second questionnaire were 4 persons, they were SMEs chocolate bean to bar industry owner in Indonesia. Each practice was assessed using likert scale with scores between 1 and 5. Score 1 represents no practicing at all and score 5 represents completely practicing. The result of each practice was calculated each variable average on agile or resilient practices, then determined its rank and weight. Followed by, performed data processing by testing the coefficient of Kendall W with the help of SPSS 20.

To obtain the index of agile and resilient practices in the SMEs chocolate bean to bar industry in Indonesia, first it must be known the agile and resilient index of each SMEs chocolate bean to bar industry. Two indicators to assess agile and resilient behaviours of each SMEs

chocolate bean to bar industry were calculated to determine the agile and resilient index of each industry. Agile behaviour (B_A) is an industry's ability to rapidly respond to unexpected changes, while resilient behaviour (B_R) is the industry's ability to overcome the effects of various obstacles. The equations for obtaining B_A and B_R are as follows:

$$(B_A)_j = \sum_{i=1}^y w_{Ai} \times (P_{Ai})_j \quad (1)$$

$$(B_R)_j = \sum_{i=1}^y w_{Ri} \times (P_{Ri})_j \quad (2)$$

Where :

- $(P_{Ai})_j$ and $(P_{Ri})_j$ are symbols representing each industry j in implementing practice i of agile and resilient. Some practices y are considered for both paradigms. The level of application of each practice is assessed on a 5-point Likert scale, where 1 means no practicing at all and 5 completely practicing.
- w_{Ai} and w_{Ri} are the weights of practice i of agile and resilient, respectively. Weight reflects the importance of every practice in the industry. The weight value between 0 (not important) to 1 (very important). Due to each approach is assumed to be equally important then the weight for each agile and resilient is 0.5 which is assessed for whole industry performance.

Assuming that the weight of the two approaches is equally important, the AR index of each industry (AR_j) is the summing indicator of the multiplication of agile and resilient behaviours weights in each industry.

$$AR_j = 0,5 \times (B_A)_j + 0,5 \times (B_R)_j \quad (3)$$

Where :

- $(B_A)_j$ and $(B_R)_j$ are symbols for the behaviour of each industry on agile and resilient approaches.

AR index in each industry between 1 (the industry does not develop agile or resilient) to 5 (the industry is highly developing agile and resilient). Once the AR index is known from each industry, the next step is to calculate the overall industry AR index, below is the equation to calculate AR index of the overall bean to bar industry for either agile or resilient :

$$AR_i = 0,5 \times I_A + 0,5 \times I_R \quad (4)$$

Where :

➤ I_A and I_R represent industrial behavior in relation to agile and resilient.

To calculate I_A and I_R can be seen in the following equation (5) and (6) :

$$I_A = \frac{\sum_{j=1}^n (B_A)_j}{n} \quad (5)$$

$$I_R = \frac{\sum_{j=1}^n (B_R)_j}{n} \quad (6)$$

Where :

- n is the number of SMEs chocolate bean to bar industry studied
- $(B_A)_j$ and $(B_R)_j$ are symbols for the behaviour of each industry on agile and resilient approaches

4. Result And Discussion

Assessment of implementation for agile and resilient indexes (model refers to [13]). The first step should be to determine indicators and sub indicators of agile and resilient practices relevant to SMEs chocolate bean to bar industry. Then, determining and assessing the weight of agile and resilient. Indicators and sub indicators used for SMEs chocolate bean to bar industry were obtained from several literatures. The indicators and sub indicators corresponding to SMEs chocolate bean to bar industry can be seen in TABLE 1 below

Table 1. Indicators And Sub Indicators For Assessing Agile And Resilient Behaviours Of Smes Chocolate Bean To Bar Industry

Indicator	Sub Indicator		Reference
B_A = Agile Behaviour	P _{A1} =	Use of IT to integrating/coordinating all industrial/manufacturing activities	[18], [19], [15]
	P _{A2} =	To increase the frequency of new product introductions	[18], [19], [15]
	P _{A3} =	Using centralized and collaboration planning	[19]
	P _{A4} =	Speed in improving customer service, delivery reliability and response to market changes	[19], [20], [15]
	P _{A5} =	Ability to rapid reconfigure planning and production processes	[15], [21]
	P _{A6} =	Ability to capture demand information immediately	[18], [19]
	P _{A7} =	Ability to maintain and develop relationships with suppliers and consumers	[18], [19]
	P _{A8} =	Produce products with substantial added value for consumers	[18], [19]
	P _{A9} =	Product design meets the consumer's requirement	[15]
	P _{A10} =	Speed in reducing development and production cycle time	[18], [20], [15]
B_R = Resilient Behaviour	P _{R1} =	Using sourcing strategies to allow switching of suppliers	[23], [20], [22]
	P _{R2} =	Commitment through contracts with suppliers	[22]
	P _{R3} =	Utilising flexible source	[23]
	P _{R4} =	Designing production system that can accommodate multiple products and real-time changes	[22]
	P _{R5} =	Developing strategy inventory of raw materials and finished goods	[24], [23],[6]
	P _{R6} =	Developing collaborative on all production activities to help mitigate risk	[6]
	P _{R7} =	Effort lead time reduction	[6], [23]
	P _{R8} =	Utilising flexible transportation system	[23]
	P _{R9} =	Utilising multi-skilled workforce	[22]
	P _{R10} =	Implementing demand based management	[24]

In this study TABLE 1 above is an assessment of implementation level in each agile and resilient practice that can assess the behaviour of each SMEs chocolate bean to bar industry.

A. Results of Interests Analysis According to Experts

The following TABLE 2 is result of interest assessment in agile and resilient practice in SMEs chocolate bean to bar industry according to the experts:

Table 2 Results Of Agile And Resilient Practice Interests

Variables		Statistics		
		Mean Rating	Rank	Weighting
Agile Practices	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	4.63	3	0.105
	P _{A4} = Speed in improving customer service, delivery reliability and response to market changes	4.75	2	0.108
	P _{A5} = Ability to rapid reconfigure planning and production processes	4.88	1	0.111
	P _{A6} = Ability to capture demand information immediately	4.50	4	0.103
	P _{A7} = Ability to maintain and develop relationships with suppliers and consumers	4.63	3	0.105
	P _{A8} = Produce products with substantial added value for consumers	4.50	4	0.103
	P _{A9} = Product design meets the consumer's requirement	3.88	5	0.088
	P _{A10} = Speed in reducing development and production cycle time	4.63	3	0.105
	Number of experts (n)	8		
	Coefficient of Concordance Kendall (W)	0.340		
	Significant Level	0.004		
Resilient Practices	P _{R1} = Using sourcing strategies to allowswitching of suppliers	4.00	5	0.094955
	P _{R2} = Commitment through contracts with suppliers	3.63	6	0.086053
	P _{R3} = Utilising flexible source	4.38	3	0.103858
	P _{R4} = Designing production system that can accommodate multiple products and real-time changes	4.38	3	0.103858
	P _{R5} = Developing strategy inventory of raw materials and finished goods	4.63	2	0.109792
	P _{R6} = Developing collaborative on all production activities to help mitigate risk	4.75	1	0.11276
	P _{R7} = Effort lead time reduction	4.13	4	0.097923
	P _{R8} = Utilising flexible transportation system	4.00	5	0.094955
	P _{R9} = Utilising multi-skilled workforce	4.13	4	0.097923
	P _{R10} = Implementing demand based management	4.13	4	0.097923
	Number of experts (n)	8		
	Coefficient of Concordance Kendall(W)	0.316		
	Significant Level	0.007		

Note :

- mean rating is the average score of 8 experts for each $(P_A)_i$ and $(P_R)_i$, where the score is at interval 1 = unimportant and 5 = very important.
- Weighting is obtained from the mean rating of each variable divided by the amount of mean rating for each $(P_A)_i$ and $(P_R)_i$

The Kendall concordance coefficient (W) is used to verify the response consistency of experts, [25]. TABLE 2 shows that all proposed practices are considered relevant to improve the agility and resilience of SMEs chocolate bean to bar industry. Agile practice that is considered less important is using IT in integrate/coordinate all industrial activities/manufacturing and increasing frequency of new product introductions with an average rating of 3.75

on a 5-point likert scale. For resilient practice indicators that are considered less important is increasing the frequency of new product introductions with average rating of 3.63. While others achieve rank equal to or greater than 4. It is confirmed that all the practices proposed in Table 1 are relevant and related to AR index construction of SMEs chocolate bean to bar industry. Kendall W test obtained by Asymp. Sig. is 0.004 and 0.007, it means with 5% error rate then there is enough evidence to assume that there is agreement on assessing the importance of agile and resilient practices in the SMEs chocolate bean to bar industry according to the experts. The AR index base on the opinion of the experts.

Table 3 Agile Behaviour, Resilient Behaviour And Ar Index

Agile Practices	Importance Degree $(P_A)_i$	Resilient Practices	Importance Degree $(P_R)_i$
PA1	4.00	PR1	3.75
PA2	3.63	PR2	3.75
PA3	4.38	PR3	4.63
PA4	4.38	PR4	4.75
PA5	4.63	PR5	4.88
PA6	4.75	PR6	4.50
PA7	4.13	PR7	4.63
PA8	4.00	PR8	4.50
PA9	4.13	PR9	3.88
PA10	4.13	PR10	4.63
Agile behaviour reference value	$(B_A)_j = \sum_{i=1}^y w_{Ai} \times (P_{Ai})_j = 4.24$	Resilient behaviour reference value	$(B_R)_j = \sum_{i=1}^y w_{Ri} \times (P_{Ri})_j = 4.42$
AR index reference value	$AR_j = 0.5 \times (B_A)_j + 0.5 \times (B_R)_j = 4.33$		

As can be seen in TABLE 3, the reference value for agile behaviour is 4.24 and the reference value for the resilient behaviour is 4.42 whereas the reference value of the AR index is 4.33. These values can be interpreted as experts argue that SMEs chocolate bean to bar industry

can practice most agile and resilient practices in order to improve performance and competitiveness.

B. Results of Analysis on Implementation in Industry

The implementation level of a set of agile and resilient practices collected in each industry can be seen in TABLE 4.

Table 4. Agile Implementation On Four Smes Chocolate Bean To Bar

Practices		Weight	Implementation level 1 (not implemented), 2, 3, 4, 5 (completely implemented)			
			Industry 1	Industry 2	Industry 3	Industry 4
Agile practice	PA1	0.085	2	4	4	3
	PA2	0.092	4	3	4	3
	PA3	0.131	5	5	5	5
	PA4	0.092	3	4	4	3
	PA5	0.085	3	4	3	3
	PA6	0.098	3	4	4	4
	PA7	0.131	5	5	5	5
	PA8	0.118	4	5	4	5
	PA9	0.078	3	3	3	3
	PA10	0.092	3	4	4	3
Resilient practice	PR1	0.135	5	5	5	5
	PR2	0.074	2	3	4	2
	PR3	0.128	4	5	5	5
	PR4	0.095	3	4	4	3
	PR5	0.108	4	4	4	4
	PR6	0.101	3	4	4	4
	PR7	0.101	3	4	5	3
	PR8	0.081	3	3	3	3
	PR9	0.095	4	3	4	3
	PR10	0.081	3	3	3	3

Note: the weight calculation is the same as in TABLE 2

In TABLE 4 it can be seen that in agile practice, the high implementation level in the four SMEs chocolate bean to bar industries is: using centralized planning and collaboration, ability to maintain and develop relationships with suppliers and consumers as well as produce products with substantial added value for consumers. While resilient practice, the high level of implementation in the four chocolate SMEs chocolate bean to bar industries is: using the raw material source

strategy for possible change of supplier, utilising flexible source of raw materials and creating a good inventory strategy of both raw materials and finished goods.

Based on further data processing, it can be obtained agile or resilient behaviours for each industry and also can calculate the AR index for all SMEs chocolate bean to bar industries. The results can be seen in TABLE 5

Table 5 Behaviour of Individual Industry

	(B_{xj})				Industry behaviour	Industry AR index
	Industry 1	Industry 2	Industry 3	Industry 4		
Agilebehaviour	3.7	4.2	4.1	3.9	4.0	3.9
Resilient behaviour	3.5	3.9	4.2	3.7	3.8	
AR index	3.6	4.1	4.2	3.8		

TABLE 5 shows the highest level of implementation in the agile approach with a score of 4.0 for all industries studied. The resilient approach has lower implementation score. From TABLE 5 it can be seen that the three industries have the highest level of implementation in the agile approach, while 1 industry has the highest implementation scores in the resilient

approach. The AR index of 4 SMEs chocolate bean to bar industries is 3.9 which means industries in this research have implemented part of agile and resilient approach.

The next step is to compare the implementation results of agile and resilient practices in the four industries

studied with the importance values of agile and resilient

practices from the experts shown in TABLE 6.

Table 6 Comparative Analysis of Importance Values With Implementation in Industry

	Importance Value	ValueCase Study
Agile behaviour	4.42	4.0
Resilient behaviour	4.24	3.8
AR index	4.33	3.9

TABLE 6 shows that the implementation value is still low compared to the interest assessment of agile and resilient practices. This means that in the industries studied, resilient practice has lower level of implementation. Therefore, so as to SMEs chocolate bean to bar industry to become more competitive, the suggested agile and resilient practices should be better implemented.

5. Conclusion

The integrated index of the agile and resilient approaches, called the AR index, in SMEs chocolate bean to bar industry is a way for industry to quickly respond to unpredictable market changes while enhancing industry's ability to cope with unexpected disruptions. From the results of data processing can be concluded there is a difference between the importance of agile and resilient practices with practices that have been implemented in SMEs chocolate bean to bar industry. Therefore, industry must improve its performance by implementing agile and resilient practices.

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