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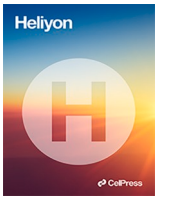

Indonesian agroindustry business agility: Enablers and challenges in the poultry industry based on ISM model

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ABSTRACT

The Indonesian agroindustry is a crucial sector for food security, comprising several platforms such as the poultry industry that play a role in providing animal protein. Despite the advantages portrayed by the poultry sector in the country, stiff competition is still encountered with business transformation situation. The rigid and static structures of the Indonesian poultry industry are also reflected in bureaucracy, fear-based cultures, the inefficiency of functional silos, and aversion to change, leading to the need for appropriate agility incorporation. Therefore, this study aims to identify and analyze the key challenges and enablers influencing the achievement of business agility, as well as construct a structural interpretation model for the process through ISM (Interpretative Structural Modeling). The results showed that the hierarchical structure establishment of the influential factors emphasized a logical linkage through ISM implementation. This structural level also identified the major challenges to attaining business agility, indicating the difficulties encountered in work culture transformation and mindset adjustment toward an agile orientation. Meanwhile, management response and knowledge deftness are key enablers in achieving business agility. These results are expected to help business professionals in implementing sustainable organizational model, due to the existence of business agility.

1. Introduction

Agroindustry is a crucial sector in food security, whose main components are derived from animals and plants [1]. In Indonesia, this sector is often underestimated compared to other manufacturing industries. This is due to the distinctive product features, production, and marketing processes that it involves, which start with a regular pattern of breeding/nursery, growth, and death [2]. Moreover, the features of the agricultural products are fresh, perishable, and sensitive to high production, processing, storage, and transhipment constraints [3]. From this context, agriculture production is a process emphasizing both the laws of nature and the structure of living, to overcome the limitations of the natural environment and climate [4]. Compared to other normal industrial production, commercial poultry products also have cyclical, seasonal, and geographical characteristics in agricultural productivity [5]. In this case, the wholesale-retail distribution model is a supply chain link or actor in the commercialization of agricultural products, due to having low efficiency, high prices, and risks [6].

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The poultry industry is an agroindustry sector commercially important as a labour-intensive organization, a provider of food needs and animal protein sources, as well as an economic catalyst [1,4]. From this context, sub-sector is observed within the industry, including feed, breeding, commercial broiler, layer, and slaughterhouse provided by smallholder farmers and enterprises. This sub-sector is supported by other industrial organizations, such as plantations, equipment manufacturers, pharmaceutical companies, logistics, processing industries, traders, retailers and customers, academia, communities, investors, government, and media. The poultry industry also plays a role in economic growth as a labour-intensive program, regarding the employment of 18,835 people in 2019 [5]. In this industry, technology and independence elevation are highly emphasized because of the involvement of large corporations. This indicates that approximately 60% of poultry production is managed by corporations, with the remaining 40% sustained by small and medium players [7]. According to Ref. [8], these large corporations contained 10% of massive conglomerates with integrated business process lines, with the remaining 70% and 20% being contractors, and independent elements.

In the Indonesian poultry sector, the complexity of problems originated from a government policy in 2010, regarding the double consumption of chicken (broiler) meat. This policy led to the encouragement of massive investment in the broiler farming industry, although no supportive consumption campaign was provided. Presently, the poultry industry is starting to develop rapidly asides from being unmatched by demand. Since Indonesia is predominantly Islamic, the per capita consumption of chicken meat is low compared to other countries. The nation also lags behind regional countries yearly at 7.8 kg per capita in 2019, significantly trailing Malaysia and the global average at 48.7 and 14.7 kg per capita per year, respectively [9]. This led to the problem of oversupply and other issues in the Indonesian poultry industry. On November 10th, 2020, Brazil won a case against the country through a lawsuit filed with the World Trade Organization (WTO). This indicates the need to futuristically anticipate the possibility of entry and flooding of chicken meat from Brazil. The industry's vertically integrated business model is also considered non-optimal in Indonesia. According to Refs. [10–12], this business model only benefitted the companies included in its integration circle and raised suspicions about the practice of chicken meat cartels. The absence of adequate data is also a problem in the country's poultry industry, with the existence of asymmetric information mainly emphasized [4]. Based on this existence, the uncertainty of market information commonly triggers rent-seeking economic behaviour, with nonlinear data leading to pressured farmer prices. However, the prices at the consumer level are high, especially in traditional market transactions with long distribution chains. Ambiguous attributes are also observed due to the complex situation causing the inability to predict the demand. In this case, the unavailability of accurate household and industrial consumption information impacts unclear pricing mechanisms at the final demand level [4].

Based on the COVID-19 outbreak, the importance of the global agroindustry sector to many people, communities, and nations has been observed. This was because the world was under a state of emergency due to the pandemic that rendered the global economy inert in every industry. Before the virus outbreak, business environment only encountered intense market competition with high uncertainty and complexity. These competitions became more intense and uncertain during the pandemic, without the exemption of agroindustry sector. From this context, technological disruption led to the adjustment of consumer behaviour, with COVID-19 forcing many companies to quickly transform their business processes toward adapting and responding to challenges through existing conditions. In business concepts, these changes and challenges are forcing agroindustry to adopt new strategies, regarding the enhancement of its capacity to react swiftly and affordably to unanticipated market developments [13]. These unpredictable changes are subsequently considered a threat and an opportunity for business sustainability. Moreover, many organizations have adopted a lean philosophy to meet the fluctuating market, demands, and needs of their products or services, with problems only originating from the acceleration of a more radical organizational market transformation. Although lean organizations are capable of increasing or decreasing production, insufficient efforts are still likely observed in the manufacturing process. When adjusting to present situations such as new technologies, business model, customer demands, sales or regulations, confusions are also commonly encountered.

The idea of adapting to unpredictable changes has led to the evolution of agility concept, which is a recent business strategy theory [14]. Agility is the establishment and innovation of services from software development [15] to other services and processes, toward helping and improving the "agile" orientation of various organizations. This concept is required for companies to respond and adapt to sustainability and development in an ever-changing and unpredictable business environment [16]. In this case, the methods of applying the agile orientation need to be futuristically emphasized to improve organizational sustainability [16,17]. The concept of deftness in an organization is known as business agility, which increases flexibility and responsiveness to change, enables learning, and delivers benefits through the provision of sustainable outputs [18]. From this context, the journey toward agile transformation is not easy for most organizations because the mindset embedded in well-established companies is generally more focused on the structures to increase efficiency [19]. This indicates a shift from functional to cross-functional agility, efficiency to effectiveness and flexibility, as well as being static to responsiveness with a primary orientation to the customers [20]. Furthermore, every organization needs to be agile, especially those involved in quickly changing markets. According to Ref. [16], three reasons were observed regarding the importance of agility. Firstly, agile companies often become faster and more efficient, due to being able to deprive their competitors of any benefit recently acquired. Secondly, most organizations should develop strategic decisions faster than their rivals because the firms with greater agility are capable of being ahead of others. Thirdly, the possession of greater agility occasionally serves as a competitive advantage, while being a weapon for thwarting competitors' strategic moves.

The organizations lacking agility are found to easily encounter challenging situations. In this case, the failure to be consistent with present market demands is likely to cause a gradual loss of business share. The inability to rapidly increase production is also capable of forcing the movement of customers to other suppliers. Subsequently, the failure to rapidly reduce costs during critical situations is likely to cause organizational financial hardship. From these descriptions, inadequate agility is found to be very destructive. This proves that the organizations without adequate deftness commonly experience sustainability difficulty until bankruptcy is encountered [16].

According to Ref. [21], the Indonesian poultry industry need to prioritize creativity, lifelong learning, responsiveness, and

adaptability, compared to scale and efficiency. This is because the prioritized elements are the rarest resources influencing value production. In this case, the poultry industry should possess responsiveness and adaptability, which constitute the method of organizationally igniting the creative and learning potential of employees. It also emphasizes the maintenance of an alignment objective in a turbulent business environment. Therefore, this study aims to identify the major problems and enablers influencing the achievement of business agility. This analysis is expected to be carried out by answering the following study questions:

i. What are the roles of business agility?
ii. What are the main challenges and enablers influencing business agility?

Based on the volatility, uncertainty, complexity, ambiguity, as well as the important role of the poultry industry in food security and the country's economy, the definition of the main challenges and enablers in the achievement of business agility is very necessary. This emphasizes sustainability in a tight business environment with high complexity and uncertainty. These challenges and enablers should subsequently be used to determine the suitable agility model for the industry. To achieve this organizational deftness, the development and evaluation of the minor components of the major difficulties and enablers are also considered. In addition, a structural interpretation model of these issues, Interpretative Structural Modeling (ISM), is developed for appropriate assessment.

2. Literature review

2.1. Business agility

According to Ref. [22], agility was summarized as sensing, securing, and shifting. This indicates that sensing (or sensitivity) was capable of detecting, identifying, and assessing the opportunities and challenges of the changing external environment, to support decision-making activities. For business sector with rapid technological development and uncertainty in consumer and social factors, sensing (*to sense*) is very important during effective transformation and where adaptation or innovation is needed. Furthermore, "securing" is the method of effectively managing the limited resources of an organization, to obtain various identified opportunities. This proves that larger company size leads to the encounter of more obvious challenges. From this context, great organizations with extensive assets often experience difficulty in supporting the establishment of new initiatives while emphasizing present critical issues. In this case, the access to resources or strategy changes is commonly restricted or avoided, respectively. "Shifting" also describes a company's ability to internally conduct changes toward adopting new requirements in the external environment. Therefore, agility emphasizes the transformation from old working methods to new job cultures. This confirms that the organization or companies having agile orientation are very open to changes and new developments.

Agility is defined as flexibility, regarding the simplification in developing fast-moving decisions. It is also the adoptability of market changes, emphasizing the provision of short-term high quality services and optimum costs in various product capacities, to develop the highest customer value [23]. From this context, business agility is the capability enabling an organization to regularly embrace operational and market transformation [24]. According to Ref. [25], this capability was a company's capacity to overcome its rivals through the transformation into a continuous learning organization. Business agility also enables an enterprise to carry out the following:

1. Recognize and rapidly address consumer and market requirements with cutting-edge goods and services before the movement of rivals.
2. Adjust the structure, process, and culture of the organization toward becoming the regular and best business champion.
3. Establish and build a collaborative work environment capable of inspiring a committed knowledge team.

2.2. Challenges and enablers to achieving business agility

According to previous reports, companies commonly encounter complexities and challenges when undergoing the processes of business agility practices. This indicates the concerns of the industry players due to the changes in macroeconomic conditions, geopolitics, and the prolonged impact of the COVID-19 pandemic on the domestic economy. In agroindustry sector, some limited studies on VUCA and business agility are observed, especially in the poultry industry. Besides this, other industrial reports are also relevant and used as references. Based on [26], agility in large companies caused sustainable and competitive business. In Ref. [27], the product and service firms with agile and dynamic capabilities also provided business opportunities internally. In this case, inadequate agile orientation often lead to adverse organizational situations [16]. Regarding the study on a software development company, agility was observed as the innovation driver [28]. From the perspectives of people, business agility analysis was also conducted by Refs. [29,30], where IT and other inanimate industries were emphasized. This indicated that agile orientations were needed to help the firms encountering the VUCA challenges. Although the identification of ISM-based challenges and enablers had been carried out in various industries by several experts, business agility was not considered. For example, the recognition of the main barriers affecting the complete implementation of reverse e-waste logistics in Brazil [31], the exploration of the key performance indicators of green supply chain management in agroindustry [32], and the identification of the constraints influencing agility in a large IT organization [33].

Organizational Change Theory is a viable agility approach introduced by Kurt Lewin, a pioneer in the areas relevant to business development. This theory emphasized the following, (1) the need for transformation in the unfreezing phase, (2) the movement toward

Table 1
The identified sub-elements of challenges (ch) and enablers (En) in achieving business agility in the Indonesian poultry industry.

Notation	Remarks	References
Challenges		
Ch 1	Leadership: Lack of buy-in and insufficient support for the agility	[33,37]
Ch 2	Inconsistent understanding of what business agility is	
Ch 3	The difficulties in moving away from established ways of working	[33,37–39]
Ch 4	Communication is often neither transparent nor timely	
Ch 5	The organization does not make conscious and deliberate steps to try to affect cultural changes	
Ch 6	Challenges to shift mindsets from the prior state to a more agile one	
Ch 7	Lack of alignment	
Ch 8	Culture: silos, layers of bureaucracy, unsuitable organizational structure	[37,38]
Ch 9	Leadership: agile mindset	
Ch 10	Leadership: lack of commitment	
Ch 11	Leadership: lack of clear vision	
Ch 12	Difficulty scaling: a shortage of skilled personnel	[38]
Ch 13	Difficulty scaling: inflexible funding models	
Enablers		
En 1	Management response agility	[40–42]
En 2	Supply chain agility	[41,42]
En 3	Technology agility	[40–42]
En 4	Human resources agility	[40–43]
En 5	Knowledge agility	[41]

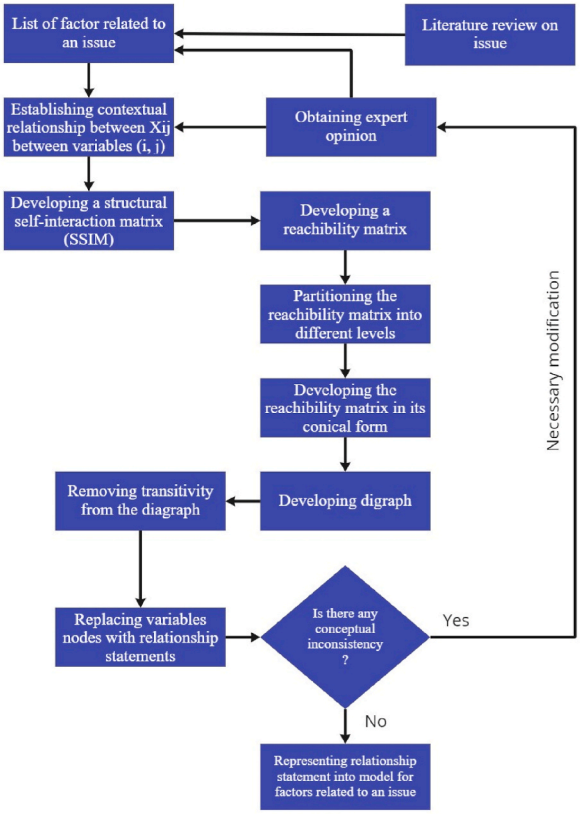

Fig. 1. ISM model flow diagram [46].

new behaviours and values, and (3) the solidification into new attitudes in the refreezing phase [34]. Furthermore, a force field analysis is a technique mainly used to determine driving and resisting forces. In this study, enablers and challenges involved in the achievement of business agility prioritizes the driving and resisting forces, respectively. From these descriptions, only a very few reports were observed on challenges and enablers influencing the achievement of business agility in agroindustry. Therefore, this pilot study aims to identify and model business agility in the Indonesian agroindustry, by using ISM approach. This approach is often used to

Table 2
The experts' profiles.

Experts	Position
Academics	Researcher & Professor of the Faculty of Animal Science
	Poultry Business Practitioners & Director of Management School
Agile Practitioner	Agile Practitioner & Co-founder of Agile Consulting Firm
	Agile Coach & Founder of Agile Consultant Firm
Business	Marketing Director
	Head of RnD-QA-QC and Technical Support
	Chief of Technical Service Development
Customer	Commissioner of Wholesaler
Association	Deputy Chairman for Food and Animal Industry
	Head of Legal & Public Relations
Government	Policy Analyst and Investment Sub-coordinator, Directorate of Animal Husbandry Processing and Marketing, Directorate General of Livestock and Animal Health
	Head of the Department of Food Security
Media	Editor of Asian Poultry Media
	President Director of News Media
Financial Institution	Group Head of Investor Relations

establish the relationships between identified challenges and enablers possessing high driving forces and demanding maximum attention from decision-makers. It also heavily depends on the perspectives of the various experts invited to the panel during analytical procedures.

The advantage of using ISM approach over other MCDM tools, such as analytical hierarchical and network processes, emphasizes its dominance degree requirements and non-demand for the correlation intensity between factors [32]. This helps to reduce the bias of the experts involved in the decision-making process, while increasing the reliability of the developed model [35,36]. During the attempt to the achievement business agility in the poultry industry, a total of 13 challenges and 5 enablers are observed, as presented in Table 1.

3. Method

This study used an ISM technique, which was initially applied to analyze the issue of a complex social economic system. It also demonstrated the advantages of degrading a complex system into subsystems or elements, through the experience and practical knowledge of experts, as well as software application. This subsequently developed a multilevel hierarchical structure model. Furthermore, ISM was used to categorize the factors affecting the achievement of business agility in the poultry industry into different levels, while presenting the interrelationships between them.

In this study, the identified structures within a system effectively contributed to the decision-making process significantly. ISM model also developed a structural model of group learning, which explained a system's complexity through a carefully thought-out pattern by using graphs and sentences [44]. Since the partial coefficient analysis and the relationship identification of the different sub-elements were prioritized by ISM, the influence of irrelevant components and subjective factors were avoided and eliminated, respectively. Some experts were also involved in data and information processing, to obtain a consistent matrix through predetermined procedures [45,46]. From ISM implementation, the development of a multilevel hierarchical structure model was carried out through the sub-element analysis of a system's relationship matrix [47]. Fig. 1 shows a flowchart for identifying challenges and enablers influencing the achievement of business agility in the poultry industry. Based on the study objectives, several analysis were conducted on all aspects or only a subset of elements in ISM simulation. To attain this organizational deftness, two factors, namely challenges and enablers, were comprehensively analyzed. These factors were subsequently divided into various sub-elements, regarding the opinions of expert judges. The contextual relationship between the selected sub-elements in this study is influential. By implementing a VAXO symbol, the contextual relationship was also formulated through a questionnaire, which was filled out by the involved experts serving as participants. In addition, ISM software was used to analyze the obtained data, accompanied by the suggestions of various management techniques in developing the contextual relationship between variable, such as brainstorming, nominal group approaches, etc [46].

The assessment of complex, problematic, and unstructured problems was also carried out through field and industry observation, as well as the in-depth interviews professionally validated. According to their competence regarding the experimental subject, the experts were purposefully allocated. In this case, the following two criteria were developed to identify the qualified experts, (1) possessing engagement in the poultry industry and/or study, and (2) possessing good knowledge and understanding of business agility with minimum experience of 10 years. From this context, only the experts that met the two selection criteria were capable of obtaining the most valuable outputs. This indicated that only qualified experts were capable of matching the proposed criteria. In Ref. [48], the selection of experts capable of balancing impartiality and interest in the topic was important. This indicated that academics, agile practitioners, business, community, government, media, and financial institutions were invited to be part of the experimental panel. According to Ref. [49], the number of experts in ISM should not be much, emphasizing at least two members. Other reports also stated that a panel of experts in ISM analyses should contain 15-30 homogeneous and 5–10 heterogeneous participants, respectively [50]. Therefore, this study employed 15 experts as the experimental sample whose profiles are shown in Table 2.

Table 3
Initial SSIM sub-elements of challenges in achieving business agility in the poultry industry.

Challenges Sub Elements	Ch 13	Ch 12	Ch 11	Ch 10	Ch 9	Ch 8	Ch 7	Ch 6	Ch 5	Ch 4	Ch 3	Ch 2	Ch 1
Ch 1	O	O	V	V	V	V	V	O	A	V	O	O	
Ch 2	A	A	A	A	A	A	A	A	A	A	A		
Ch 3	V	V	V	V	V	V	V	X	V	V			
Ch 4	V	V	A	A	A	X	V	A	A				
Ch 5	O	O	V	V	V	V	V	A					
Ch 6	V	V	V	V	V	V	V						
Ch 7	V	V	A	A	A	A							
Ch 8	O	O	A	A	A								
Ch 9	O	O	X	X									
Ch 10	O	O	X										
Ch 11	O	O											
Ch 12	V												

Table 4
Initial SSIM sub-elements of enablers in achieving business agility in the poultry industry.

Enablers Sub Elements	En 5	En 4	En 3	En 2	En 1
En 1	X	V	V	V	
En 2	A	A	X		
En 3	A	A			
En 4	A				

According to Ref. [44], the responses of ISM questionnaire were combined into a single phase emphasizing the principle of dominance, to develop a Structural Self Interaction Matrix (SSIM). To guarantee the apparent dominance of the survey, an odd number of experts were also allocated for the experimental process. By transforming the VAXO sign to a binary integer (1, 0), the developed SSIM was then transformed into a Reachability Matrix (RM) (0, 0), with V (1, 0), A (0, 1), X (1, 1), and O observed. Moreover, RM was examined to determine its compliance level with the transitivity requirements, regarding the development of a closed matrix. Based on the results, the transitivity rule prioritized the causal loop's completeness, for instance, when X = Y and Y = Z, X needs to subsequently influence Z [45]. In this case, the compliance of the emphasized cells with the transitivity requirements should be verified, regarding being equal or non-equivalent to 0. This activity was necessary to fix any cell not adhering to the transitivity requirements. Furthermore, the VAXO symbol was compared with the original matrix, to obtain the consistency percentage for the single interaction phase complying with the transitivity standards in binary form. The sub-elements were then organized at the same level as the correction phase in the canonical matrix. They were also categorized at a tier level emphasizing the iterations between reachability and antecedent. This was accompanied by the development of the matrix, with a graph showing correlation patterns of the driving and resisting forces. After these activities, the structural interpretation model of the difficulties encountered during the achievement of business agility was described. This indicated the ranking of challenges and enablers' sub-elements, as well as the identification of the driving force. The sub-elements' dependency on one another was also arranged from the highest to the lowest position. This process was accompanied by the articulation of the difficulties and facilitators influencing the achievement of business agility, through the power-dependence driving element diagram. A structural interpretation model of sub-element classification was also constructed at a tiered level, through a diagrammatic matrix.

4. Results and discussion

4.1. Application of ISM for achieving business agility

Based on the results, the encountered problem or issue was defined through the relationship between the sub-elements in ISM. This indicated that the closely related sub-elements were categorized into a thorough systematic model [43,47,51]. In this case, the developed model depicted the structure of a complex topic/problem, a system, or a study subject, through a carefully thought-out pattern possessing the mixture of words and images. The following steps are carried out during ISM analysis [51]:

Step 1. List the variables (criteria) to be considered by the system.

Step 2. Determine the contextual connections between the variables found in Step 1.

Step 3. Construct a SSIM to illustrate the pairwise correlations between the system variables.

Step 4. From step 3, examine transitivity after developing the RM. This indicated that ISM was responsible for developing the essential premise of transitivity. In this case, Variables A and C should be connected when B═C and A = B.

Step 5. The results from the previous step are continuously partitioned into different levels.

Step 6. Remove the transitive links to develop a digraph emphasizing the relationships in the RM.

Step 7. ISM is developed by substituting words for the digraph variable nodes from Step 6.

Step 8. ISM model developed in Step 7 should be examined for conceptual errors and appropriately modified.

Table 5
Initial Reachability Matrix (RM) for challenges in achieving business agility in the poultry industry.

Challenges Sub Elements	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8	Ch 9	Ch 10	Ch 11	Ch 12	Ch 13
Ch 1	1	0	0	1	0	0	1	1	1	1	1	0	0
Ch 2	0	1	0	0	0	0	0	0	0	0	0	0	0
Ch 3	0	1	1	1	1	1	1	1	1	1	1	1	1
Ch 4	0	1	0	1	0	0	1	1	0	0	0	1	1
Ch 5	1	1	0	1	1	0	1	1	1	1	1	0	0
Ch 6	0	1	1	1	1	1	1	1	1	1	1	1	1
Ch 7	0	1	0	0	0	0	1	0	0	0	0	1	1
Ch 8	0	1	0	1	0	0	1	1	0	0	0	0	0
Ch 9	0	1	0	1	0	0	1	1	1	1	1	0	0
Ch 10	0	1	0	1	0	0	1	1	1	1	1	0	0
Ch 11	0	1	0	1	0	0	1	1	1	1	1	0	0
Ch 12	0	1	0	0	0	0	0	0	0	0	0	1	1
Ch 13	0	1	0	0	0	0	0	0	0	0	0	0	1

Table 6
Initial Reachability Matrix (RM) for enablers in achieving business agility in the poultry industry.

Enablers Sub Elements	En 1	En 2	En 3	En 4	En 5
En 1	1	1	1	1	1
En 2	0	1	1	0	0
En 3	0	1	1	0	0
En 4	0	1	1	1	0
En 5	1	1	1	1	1

Table 7
Final Reachability Matrix for challenges in achieving business agility in the poultry industry.

Challenges Sub Elements	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8	Ch 9	Ch 10	Ch 11	Ch 12	Ch 13
Ch 1	1	1	0	1	0	0	1	1	1	1	1	1	1
Ch 2	0	1	0	0	0	0	0	0	0	0	0	0	0
Ch 3	1	1	1	1	1	1	1	1	1	1	1	1	1
Ch 4	0	1	0	1	0	0	1	1	0	0	0	1	1
Ch 5	1	1	0	1	1	0	1	1	1	1	1	1	1
Ch 6	1	1	1	1	1	1	1	1	1	1	1	1	1
Ch 7	0	1	0	0	0	0	1	0	0	0	0	1	1
Ch 8	0	1	0	1	0	0	1	1	0	0	0	1	1
Ch 9	0	1	0	1	0	0	1	1	1	1	1	1	1
Ch 10	0	1	0	1	0	0	1	1	1	1	1	1	1
Ch 11	0	1	0	1	0	0	1	1	1	1	1	1	1
Ch 12	0	1	0	0	0	0	0	0	0	0	0	1	1
Ch 13	0	1	0	0	0	0	0	0	0	0	0	0	1

Table 8
Final Reachability Matrix for enablers in achieving business agility in the poultry industry.

Enablers Sub Elements	En 1	En 2	En 3	En 4	En 5
En 1	1	1	1	1	1
En 2	0	1	1	0	0
En 3	0	1	1	0	0
En 4	0	1	1	1	0
En 5	1	1	1	1	1

From the literature and brainstorming session with experts in the poultry industry, thirteen challenges and five enablers affecting the achievement of business agility were considered. The questionnaire data obtained were also collated and used to develop the SSIM, as depicted in Tables 3 and 4. In addition, the implemented VAXO symbols showing contextual relationships were interpreted through ISM approach as follows:

V: Challenges/enablers i influenced j.
A: Challenges/enablers j affected i.
X: Challenges/enablers i and j impacted each other.
O: Challenges/enablers i and j were unrelated.

Table 9
Initial SSIM sub-elements of challenges in achieving business agility in the poultry industry.

Challenges Sub Elements	Ch 13	Ch 12	Ch 11	Ch 10	Ch 9	Ch 8	Ch 7	Ch 6	Ch 5	Ch 4	Ch 3	Ch 2	Ch 1
Ch 1	V	V	V	V	V	V	V	A	A	V	A	V	
Ch 2	A	A	A	A	A	A	A	A	A	A	A		
Ch 3	V	V	V	V	V	V	V	X	V	V			
Ch 4	V	V	A	A	A	X	V	A	A				
Ch 5	V	V	V	V	V	V	V	A					
Ch 6	V	V	V	V	V	V	V						
Ch 7	V	V	A	A	A	A							
Ch 8	V	V	A	A	A								
Ch 9	V	V	X	X									
Ch 10	V	V	X										
Ch 11	V	V											
Ch 12	V												

Table 10
Initial SSIM sub-elements of enablers in achieving business agility in the poultry industry.

Enablers Sub Elements	En 5	En 4	En 3	En 2	En 1
En 1	X	V	V	V	
En 2	A	A	X		
En 3	A	A			
En 4	A				

Table 11
Digraph matrix of the sub-elements of challenges in achieving business agility in the poultry industry.

Challenges Sub Elements	Ch1	Ch2	Ch3	Ch4	Ch5	Ch6	Ch7	Ch8	Ch9	Ch10	Ch11	Ch12	Ch13	DP	R
Ch1	1	0	0	1	0	0	1	1	1	1	1	0	0	**10**	**3**
Ch2	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**	**9**
Ch3	0	1	1	1	1	1	1	1	1	1	1	1	1	**13**	**1**
Ch4	0	1	0	1	0	0	1	1	0	0	0	1	1	**6**	**5**
Ch5	1	1	0	1	1	0	1	1	1	1	1	0	0	**11**	**2**
Ch6	0	1	1	1	1	1	1	1	1	1	1	1	1	**13**	**1**
Ch7	0	1	0	0	0	0	1	0	0	0	0	1	1	**4**	**6**
Ch8	0	1	0	1	0	0	1	1	0	0	0	0	0	**6**	**5**
Ch9	0	1	0	1	0	0	1	1	1	1	1	0	0	**9**	**4**
Ch10	0	1	0	1	0	0	1	1	1	1	1	0	0	**9**	**4**
Ch11	0	1	0	1	0	0	1	1	1	1	1	0	0	**9**	**4**
Ch12	0	1	0	0	0	0	0	0	0	0	0	1	1	**3**	**7**
Ch13	0	1	0	0	0	0	0	0	0	0	0	0	1	**2**	**8**
D	**4**	**13**	**2**	**9**	**3**	**2**	**10**	**9**	**7**	**7**	**7**	**11**	**12**		
L	**7**	**1**	**9**	**5**	**8**	**9**	**4**	**5**	**6**	**6**	**6**	**3**	**2**		

Table 12
Digraph matrix of the sub-elements of enablers in achieving business agility in the poultry industry.

Enablers Sub Elements	En1	Ch2	Ch3	Ch4	Ch5	DP	R
En 1	1	1	1	1	1	**5**	**1**
En 2	0	1	1	0	0	**2**	**3**
En 3	0	1	1	0	0	**2**	**3**
En 4	0	1	1	1	0	**3**	**2**
En 5	1	1	1	1	1	**5**	**1**
D	**2**	**5**	**5**	**3**	**2**		
L	**3**	**1**	**1**	**2**	**3**		

Based on the results, the RM was developed by using SSIM. In this case, the information of each SSIM cell (V, A, X, and O) was initially translated into an initial RM format, through the transformation into binary digits (i.e., 1 or 0). This transformation activity contained V (1,0), A (0,1), X (1,1), and O (0,0) signs [52], as illustrated in Tables 5 and 6.

From the results, the matrix was subsequently rectified to obtain a closed phase complying with the transitivity requirements, which required the entire completeness of the circular causal chain (causal loop). In this case, X need to influence Z when Y and Z are both impacted by X. More assessments were carried out to determine the adherence levels of the 0-value cells to the transitivity requirements. When these levels are not observed, changes need to be carried out for appropriate adherence to the transitivity criteria.

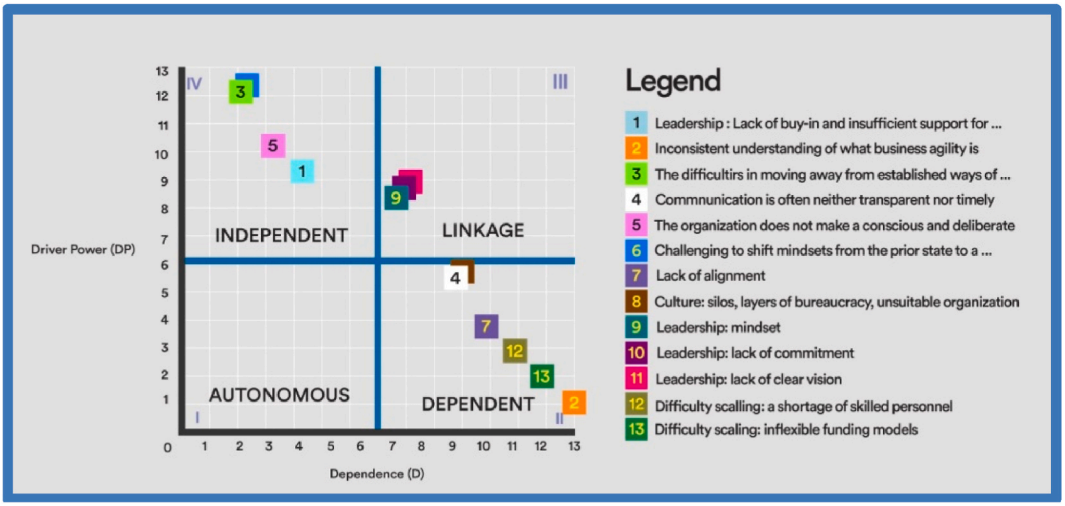

Fig. 2. MICMAC of challenges in achieving business agility.

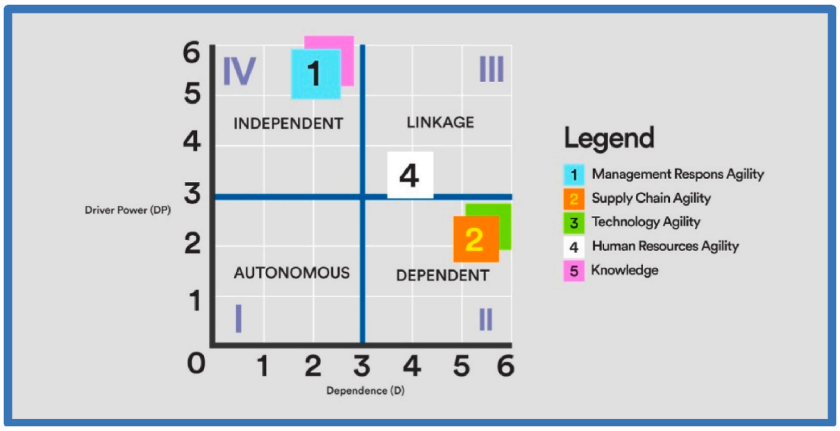

Fig. 3. MICMAC of enablers in achieving business agility.

The final RM is also improved based on the examinations in Tables 7 and 8.

To produce the final SSIM matrix, the enhanced RM was reconverted to VAXO notation, as shown in Tables 9 and 10.

Based on the results, the discrepancy between the original and final SSIM emphasized the inconsistent responses of the experts. Although 9% consistency error was eliminated for challenges, the transitivity condition was still within an acceptable range. In this case, the inconsistency for enablers accounted for 0%. From the modified RM matrix, the Driver Power (DP), Dependence (D), and partitioning level were obtained, as shown in Tables 11 and 12.

Fig. 2 shows the different challenges divided into four quadrants. This indicated that the following strong driving forces were identified as challenges hindering the achievement of business agility, (1) Lack of buy-in and insufficient support for the Agile [Ch 1], (2) The difficulties in avoiding established working cultures [Ch 3], (3) The organization not performing conscious and deliberate step toward affecting culture change [Ch 5], and (4) the difficulty of adjusting mindset from old to agile orientations [Ch 6]. Meanwhile, the forces observed in quadrant III included inadequate agile mindset, commitment, and clear vision [Leadership; Ch 9, Ch 10, and Ch 11]. Quadrant II also had more sub-elements, indicating high dependence and low driving force. From these results, the autonomous sector or quadrant I did not include any of the sub-elements.

Fig. 3 presents the sub-elements of management response (En 1) and knowledge (En 5) agility, which were found in quadrant IV. This was accompanied by human resources agility, which was contained in quadrant III. Meanwhile, supply chain (En 2) and technology (En 3) agility were located in quadrant II. From these results, the autonomous sector or quadrant I did not included any of the sub-elements.

The Digraph Matrix and the MICMAC graph are two pieces of information that enhance and enable systematic performance towards selecting the best business agility model for the poultry industry. Besides this, they also serve as very effective fundamental references. Figs. 4 and 5 show the structural interpretation model of challenges and enablers influencing the achievement of business agility in the poultry industry, respectively.

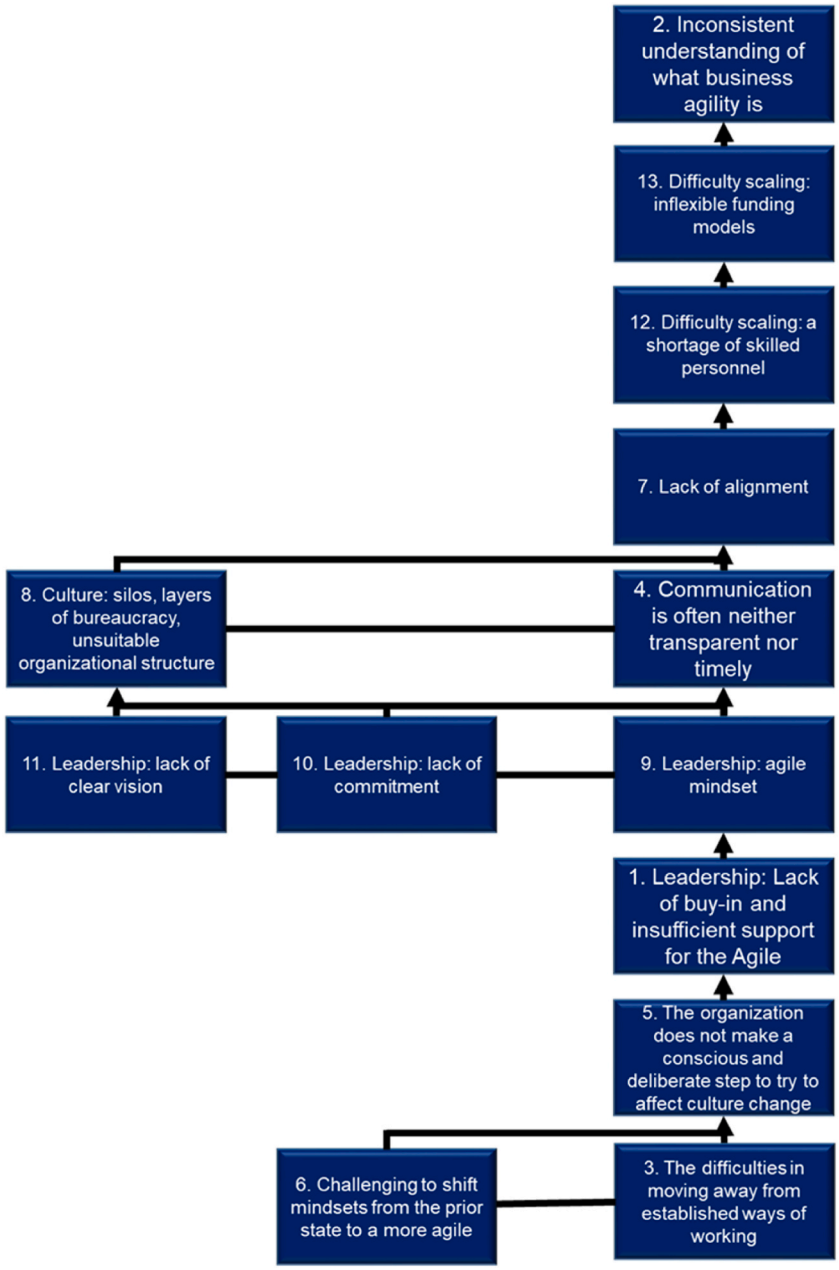

Fig. 4. ISM hierarchical structure of challenges in achieving business agility.

Based on Fig. 4, the sub-elements, *"The difficulties in moving away from established ways of working"* and *"The challenges to shift the mindset from the prior state to a more agile one"* were at the lowest level in ISM structure. This indicated that both elements were the key challenges affecting business agility. Although some modern digital-economy companies urgently need to be agile, their organizational culture and design were still strongly command-oriented. From this context, their top executives had industrial economic attitudes and skill sets, which were the largest barriers to an agile organization. Therefore, these senior leaders should be prepared to study and practice a whole set of new skills and mindsets, toward the development of completely fresh and agile organizational designs and cultures [53]. This was in line with the concept of the organizational culture built on an agile attitude. In this case, growth attitude, market experimentation, psychological safety, and continual value delivery are all characteristics of the agile mindset. The implementation of organizational change efforts by the leaders not consciously and intentionally promoting cultural changes are also likely to fail when the workforce returns to its previous modes of operation [38].

Based on the results, transformation fatigue caused regression in business agility progress in the poultry industry. This was because the leadership of the accounting, procurement and sales divisions did not understand the reasons the present (slow) methods should

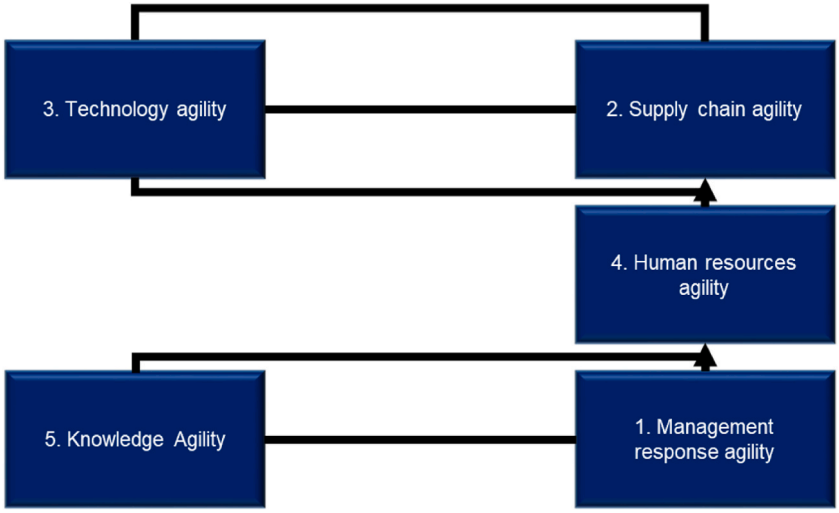

Fig. 5. ISM hierarchical structure of enablers in achieving business agility.

change, with operational units subsequently resisting the shift. From this context, the persuasion of the people working without agility and unwilling to adopt an agile mindset was the largest issue encountered by the poultry industry. Moreover, various leaders in the industry are at different stages of maturity, with those having less experience significantly and adversely influencing the achievement of business agility. This indicated that leadership development was unnecessary and not a top priority in the achievement of business agility transformation in the small-to-medium poultry organization. However, the teams new to agile methodologies in the big poultry industry were already familiar with fundamental deftness development principles, such as the iterative and incremental delivery model. This was because they frequently started by using many old working methods. Some people were also found to subside over time despite commonly opposing the transformation process.

In Fig. 5, the sub-elements, "*Management response*" and "*Knowledge Agility*" were at the lowest level in ISM structure, indicating that they were the key enablers in achieving business agility. According to Ref. [40], organizational structure emphasized the arrangement of business hierarchies and communication between each level. In this case, the devolution of authority focused on the responsibility and authority of the individual personnel within a company. The nature of management also determined the type of management's participation in team member benefits. Furthermore, the organizational structure, especially in a large poultry company, was actively against implementing business agility transformation, due to the complex nature of the value chain and the various industrial units. This prioritized the reasons the transformation process was not yet a company-wide priority in the industry.

Knowledge management also required organizational systems to support the experiments with accessible databases, for work teams to access, apply, and update understanding [41]. By combining organization, people, and technology into useful units, knowledge is capable of promoting the development of an agile poultry industry. This is carried out by using cutting-edge information technology and flexible organizational structures, to support highly competent and motivated people. Moreover, knowledge has great value due to being inherently unique for every organization. It also shapes and directs business activity, organization ability, and the patterns of being distinguished from competitors. Knowledge is subsequently responsible for supporting faster and better-informed decisions. From this context, stability is highly important between reaction/adaptation (ability to act) and knowledge management (understanding the action). In addition, a learning organization contains a bottom-up grassroots and top-down directed component, which emphasize collaborative learning and knowledge portfolio, respectively. For reuse in business seeking the advantages and goals of an agile firm, knowledge is also abstracted from a successful real-world example.

5. Conclusion and recommendation

Based on the results, agile values and principles were important due to guiding the approach patterns of business, processes, and everyone in an organization. These values and principles emphasized collaboration, customer focus, and continuous improvement, which are presently and helpful in ensuring the appropriate process of successfully performing jobs. This prioritized coping with highly competitive organizational environment and any changes correlating with business agility.

The analytical scope was limited to the poultry industry having an integrated business model asides from the positive results obtained. This indicates that industry's practitioners should focus on overcoming challenges of adjusting mindset from old to agile orientations and the difficulties in avoiding established working cultures. Meanwhile, management response and knowledge were identified as key enablers for achieving business agility. These are useful for business professionals in implementing sustainable organizational model. In this case, the management is capable of understanding the appropriate points to be considered, anticipated, encouraged, and improved. This is because the developed framework emphasizes input from an agile methodology and business-oriented experts. These results should be used as input for future studies, to develop business agility model through agile approach

and model-based management system.

Author contribution statement

Sukardi: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Erliza noor, Machfud and Dwi Purnomo: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Puti Retno Ali: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Analyzed and interpreted the data; Wrote the paper.

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