Eduvest – Journal of Universal Studies
Volume 4 Number 05, May, 2024
p- ISSN 2775-3735- e-ISSN 2775-3727

INDUSTRY 5.0 READINESS ASSESSMENT: A MATURITY MODEL FOR INDONESIAN COMPANIES

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ABSTRACT

As times have evolved, there have been significant advancements in various fields, particularly in technology and industry. Rapid progress in the industrial sector has been marked by the phases of the revolution that started from Industry 1.0 to the latest Industry 5.0 which had been introduced in 2019. However not every company is ready to adapt industry 5.0 into their system and behaviors. There is still lack of matrix development to assess company maturity level in industry 5.0. In this paper, three development matrix is developed so it is easier to assess company maturity level from industry 5.0 perspective. The quantitative data is collected by giving questionnaires to several sectors. From the analysis that has been conducted, it is concluded that automotives industry it the most ready sector to adapt with industry 5.0.

KEYWORDS *Industry 5.0, Maturity Level, Human-centered Design, Resiliency, Sustainability, Kruskal-Wallis*

INTRODUCTION

As times have evolved, there have been significant advancements in various fields, particularly in technology and industry. Rapid progress in the industrial sector has been marked by the phases of the revolution that started from Industry 1.0 to the latest Industry 5.0 which had introduced in 2019. The Industrial Revolution began with the use of linear programming and geometry mathematics in Industry 1.0, which still had many shortcomings, especially in terms of pollution and the time required for implementation (K. Vinitha, 2020). Industry 2.0, which began in the 19th century and was marked by achievements in electricity, combustion engines, and the first communication devices such as telephones and telegraphs, still

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E-ISSN: 2775-3727
Published by: https://greenpublisher.id/

had a disadvantage in terms of high electricity consumption costs (K. Vinitha, 2020). In the 20th century, the Industrial Revolution continued into the era of Industry 3.0, which focused on the development of automation, the semiconductor industry, wireless communication, and renewable energy. However, the complexity and high operational costs were deemed impractical and hindered many organizations (Erik Skov Madsen, 2016). In the 21st century, companies began to enter the era of Industry 4.0, where industries strive to focus on developing intelligent and fully automated systems (Malte Brettel, 2014). The implementation of Industry 4.0 is not without obstacles and challenges as traditional systems will be eliminated and cause serious changes within organizations. This also certainly has weaknesses such as determining appropriate infrastructure and standards, ensuring data security, and educating employees (Rüsch, 2017).

As a refinement of Industry 4.0, Industry 5.0 is expected to create a system in which humans, as the main component, can work in harmony with technologies (Nahavandi, 2019). Industry 5.0, which was initially proposed by Michael Rada (Rada, 2015), not only enhances productivity and efficiency, it also promotes a safer and more gratifying work environment for human workers (Adel, 2022). In addition, the latest technologies such as advanced IT, IoT, AI, and Augmented Reality are actively implemented to enhance the capacity and comfort of workers (Yu, 2017). While Industry 4.0 aims to achieve smart manufacturing and system optimization, Industry 5.0 focuses on sustainability, environmental stewardship, social benefit, and human-centricity (Aditya Akundi, 2022).

This new phase of industry requires highly skilled workers in the development of the latest technology and capable of adapting to industrial changes (Kiss, 2022). As a developing country, Indonesia must prepare itself for the implementation of Industry 5.0. However, with the demands of the changing industrial systems, many challenges are faced by organizations in Indonesia to survive and adopt the new industrial phase, Industry 5.0. Skilled workers and latest technology are needed to handle the process changes in the effort to prepare for this new industrial phase. Many aspects such as education and facilities is not yet sufficient to support the readiness of human resources in Indonesia is certainly a major challenge for the successful implementation of Industry 5.0 (John Burgess, 2020).

The continuous changes brought on by the industrial revolution must now be faced by businesses in Indonesia. Now, the development in Industry 4.0 has impacted businesses through some advantages on improving efficiency, agility, innovation, customer service, and also results in cost reduction. Businesses must, however, anticipate the dynamics of Industry 4.0 so that they are prepared for Industry 5.0. Industry 5.0 not only enables utilization of available big data, but also incorporates robotics technology into the manufacturing process (Aries Kurniawan, 2019).

This study aims to discuss the readiness of business sectors in Indonesia for transitioning from Industry 4.0 to Industry 5.0. Maturity level of each business sector will be analyzed through maturity level calculation and presented via maturity report and radar chart to measure the readiness and to define which aspect that have to be improved to succeed in the Industry 5.0 implementation.

According to the problem background, there are several problem statements which are: a. Which business sector is most ready for the implementation of Industry 5.0? b. What are the skills that each business sector still needs to develop in order to be ready for the implementation of Industry 5.0? From the problem

statements, there are several objectives of this research which are: a. To identify the readiest business sector for the implementation of Industry 5.0. b. To identify the skills that each business sector still needs to develop in order to be ready for the implementation of Industry 5.0.

RESEARCH METHOD

Method

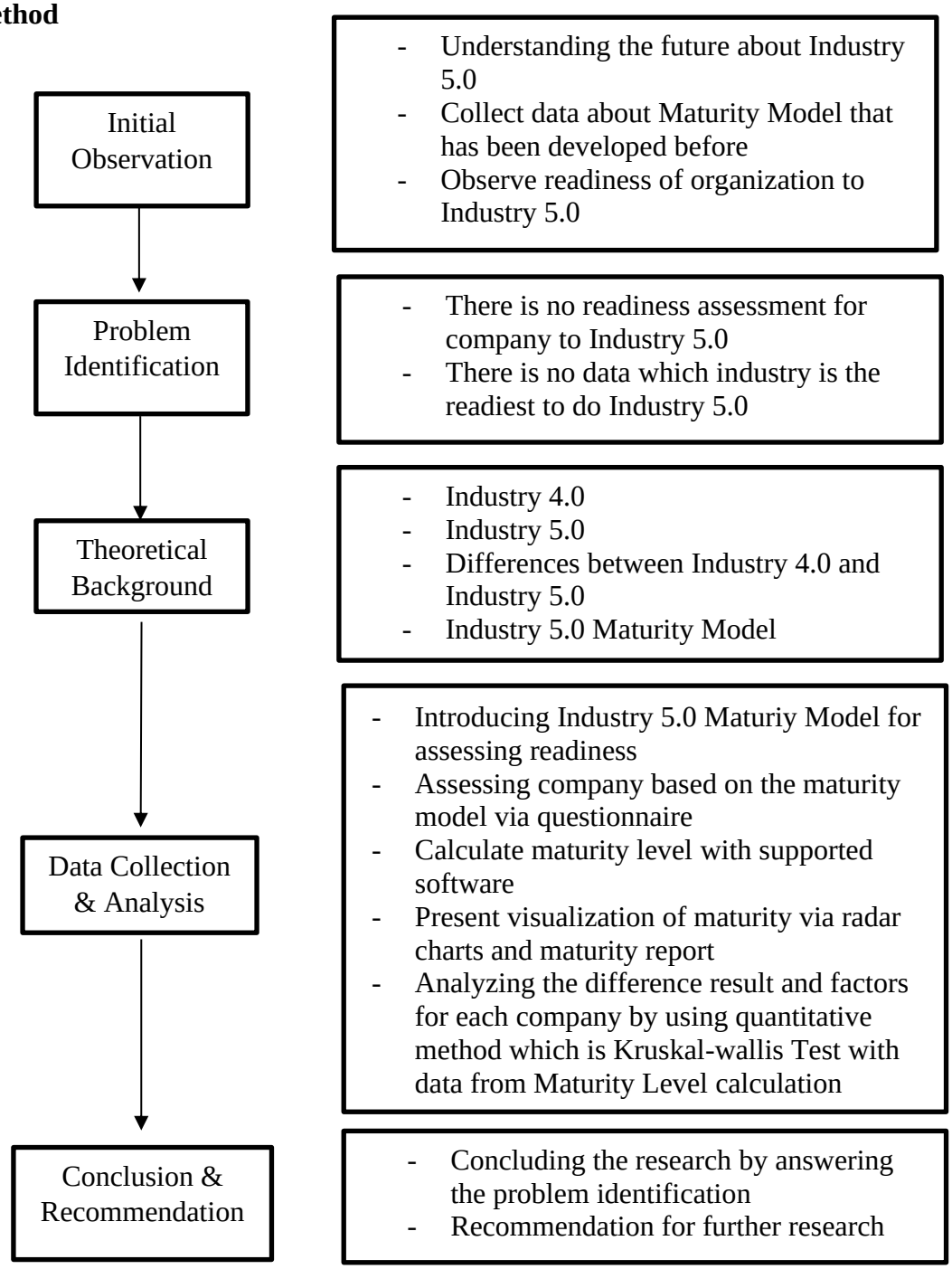

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Figure 3.1 Research Method

This research begins with understanding the future about Industry 5.0 and then we try to collect the data about Maturity Model that has been developed before. Therefore, we know what maturity model is like and how to develop it. The last step is to observe the readiness of the organization based on Industry 5.0.

The next step is problem identification. In this step we learn that there is no Industry 5.0 readiness assessment research yet, so there is no data which industry is the readiest among others to face Industry 5.0. In this research we want to solve these two problems.

The next step is to study the literature study about what is industry 4.0, what factors that drives the industry 4.0, and then what is industry 5.0 and the factors that drives it. We also learn what is the difference between them to make sure what the critical drivers that differ it. The last one is to study what Industry 5.0 Maturity Model is like from another research.

The next step is to collect data and analyze it. The data will be collected using interview methods with experts in Industry 5.0 and automation. The questionnaire will be spread to several companies to make sure whether companies already understand what is Industry 5.0 and the factors that drive it.

The last step is to make conclusions and recommendations from this research. After conducting this research, we will know which industry sector has the best readiness to face Industry 5.0 and what should other companies do.

Research Positioning

Table 3.1 Research Positioning

Author, Year	Maturity Model	Method and objectives
(Sari et al., 2020)	Corporate Sustainability Maturity Model	Develop three stage maturity model and to assess Indonesian corporation based on the CSMM using data mining
(Okongwu et al., 2013)	Supply Chain Maturity Model	Develop maturity model and assess the company using manual Sustainability Report analysis from 50 company
(Brookes et al., 2014)	Project Management Maturity Model	Develop maturity model and assess the company using questionnaire from 92 company and interview from 33 company
(Katuu, 2016)	Enterprise Content Maturity Model	Develop maturity model and assess the company using FGD technique with 6 company and 1 association
Current Research	Industry 5.0 Maturity Model	Explore three stage development of maturity model and using questionnaire and interview method to 15 company using

Author, Year	Maturity Model	Method and objectives
		maturity level calculation and radar chart.

The main difference between another research is the maturity model that is being used. In this research we used Industry 5.0 Maturity Model that has been elaborated into three stage development. For the data collection we combine Katuu and Brookes method by using interview and questionnaire. Then we analyze it by using Maturity Level Calculation and visualization via radar chart and maturity report to determine the readiness of a company based on some maturity model.

Assessment Method & Participant

In this study, the Industry 5.0 implementation readiness measurement will be done by conducting online survey (questionnaire). The survey consists of five sets of question. One set question about the identity and company's characteristics, three sets question about the three pillars of Industry 5.0 which are:

1) Human-centered design
2) Resiliency
3) Sustainability

And the last set of question about the challenges faced by the industries to transform during their effort in implementing Industry 4.0 or prepare for the implementation of Industry 5.0. There will be 18 questions in the survey that need around 10 minutes to be finished.

Based on (Kementrian Perindustrian Republik Indonesia, 2018), there are five priority sectors of the *Making Indonesia 4.0* program which are:

1) Food and beverages
2) Textile & Apparel
3) Automotive
4) Chemicals
5) Electronics

So, this study will require respondents from each industry at least a representative to join the online survey especially from the industries that already implement and awarded in INDI 4.0 as Industry 4.0's lighthouse in Indonesia. The data collected from the survey will be calculated with Maturity Model Equation and Kruskal-Wallis Test will be used to make comparisons between each maturity category by means of ranking.

Maturity Model Calculation

The maturity matrix has defined that there are four levels of maturity used in this study. Level 0 described a complete lack support to the concept of Industry 5.0 and level 3 described the readiest attributes required to achieve the concept of Industry 5.0. The measurement of companies' maturity follows a three-step procedure that easy to use and can be done with a software supported tool.

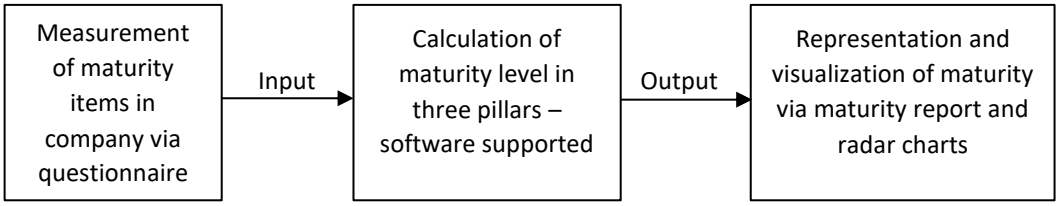

Figure 3.2 Procedure to assess Industry 5.0 maturity

Maturity evaluation will be using a Likert-scale reaching from 1 – "Level 0" to 4 – "Level 3". The responses data from the questionnaire will be inputted to the software tool and calculated with formula in Equation 1 as follows.

$$M_D = \frac{\sum_{i=1}^{n} M_{DIi} \times g_{DIi}}{\sum_{i=1}^{n} g_{DIi}}$$

M: Maturity
D: Dimension
I: Item
g: Weighted Factor
n: Number of Maturity Item

(1)

The maturity level (M_D) of each dimension is the results from the weighted average calculation of all maturity items (M_{DIi}) in each dimension. Then the average importance rating from all respondent resulting the weighting factor (g_{DIi}).

RESULT AND DISCUSSION

Measurement Items based on Maturity Model

The authors completed an analysis process with three separate steps. An early phase to establish a thorough knowledge of Industry 5.0, then a core phase to develop and construct the model's structure as well as a practically helpful tool, and an implementation phase to test the resultant tool in actual use are all necessary. The authors suggested 11 maturity elements as a model that are categorized into three pillar dimensions in order to simplify various evaluations of Industry 5.0 maturity. Table 4.1 gives an overview of the dimensions and some concrete examples to help with comprehension.

The company's maturity through its maturity items is evaluated using a standardized questionnaire with one closed-ended question for each item. On a Likert scale with 1 being "not implemented" and 4 being "completely implemented," each question requires a response. For instance, the question in Table 4.1 for the item "Main driver and innovative factor for Industry 5.0" in the dimension "Human-centered Design" reads as follows.

How would you assess the maturity of your company's main driver and innovative factor for Industry 5.0?

1) No collaboration between employees and new technology.
2) The company is trying to make collaboration between employees and new technology
3) The employees can collaborate with the new technology or robots.
4) Collaboration between employees and new technology is already running well.

The software program will then use the questionnaire responses as data input to compute and illustrate the maturity level.

Table 4.1 Maturity Items for Maturity Assessment

Measurement Categories		Level 0		Level 1		Level 2		Level 3	
Human-centered Design	**Main driver and innovative factor for I5.0**	MDIF0	No collaboration between employees and new technology.	MDIF1	The company is trying to make collaboration between employees and new technology	MDIF2	The employees can collaborate with the new technology or robots	MDIF3	Collaboration between employees and new technology is already running well
	Focus on employees	FOE0	No improvement in technology and study the needs of employees.	FOE1	The company has started to improve to maximize technology and study the needs of employees	FOE2	The company has developed technology enhancements to understand the needs of employees	FOE3	The company have been able to recognize what technology can do for the people and focus on how technology can adjust to the requirements of the worker instead of the other way
	Holistic Adaptation of the processes and system to employees	HAPS0	No study about relation between employees and	HAPS1	Trying to study the skill gap between each employee to	HAPS2	Have been able determine the skills gap between employees and new technology,	HAPS3	Provide training for every skill requirement to build good collaboration between

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Table 4.1 Maturity Items for Maturity Assessment

Measurement Categories		Level 0		Level 1		Level 2		Level 3	
			new technology.		build a good adaptation between employees and new technology		so the company able to make forecast the skills needs		employees and new technologies in the future
	Basic requirement for achieving maturity levels for digitalization and AI	BR0	No supporting technology.	BR1	The company has started build some supporting technology, such as big data, network coverage and specialist skills for use new technology in the future	BR2	The company has developed build some supporting technology, such as big data, network coverage and specialist skills for use new technology in the future	BR3	The company already have the supporting technology, such as big data, network coverage and specialist skills for use new technology in the future
Resiliency	**Stabilization Policy**	SP0	No policy.	SP1	Policy is taken randomly and reacts to market conditions.	SP2	The stabilization policy has been well formulated and structured but is still focused on reacting to market conditions. There	SP3	The stabilization policy has been well integrated into overall economic policy and has been carried out in a proactive

Table 4.1 Maturity Items for Maturity Assessment

Measurement Categories	Level 0		Level 1		Level 2		Level 3	
						is no clear long-term strategy.		and effective manner. There is a continuous evaluation and improvement mechanism to increase the effectiveness of the stabilization policy.
	Creation of Competitiveness	CC0	The company is not aware of the Industry 5.0.	CC1	The company start to aware of the definition and concept of Industry 5.0.	CC2	The company has developed a strategy to leverage Industry 5.0 for competitiveness, but it is not yet fully integrated into its operations.	CC3	The company has fully integrated Industry 5.0 into its strategy and operations, and it regularly measures and manages its performance in this area.
	Use of Modern Technologies and Approaches	UMTA0	No modern technologies or approaches are used in	UMTA1	The company start to study modern technologies or approaches to	UMTA2	A few modern technologies and approaches are used, and their integration into the	UMTA3	Most modern technologies and approaches are used in the manufacturing process,

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Table 4.1 Maturity Items for Maturity Assessment

Measurement Categories		Level 0		Level 1		Level 2		Level 3	
			manufacturing processes.		be used in manufacturing processes.		manufacturing process is improving. However, they are still used in isolation from each other.		and their integration is highly cohesive and optimized. However, there is still room for improvement and refinement.
Sustainability	**Implementation of environmental solution**	IES0	Organization have no awareness of environmental and society issue.	IES1	Organization only give donation as a philanthropy	IES2	Organization makes activity based on their stakeholder demand (CSR) Several programs are done to solve the sustainable issue to society	IES3	Organization integrates all of their activities and culture to achieve business goals and sustainability goals
	Business model with sustainable aspects	BMS0	No sustainability goals.	BMS1	Company has bad image to society Employee does not know about the company	BMS2	Organization feels it has tried to give best benefit to employee, but the employee does not feel any benefit from conducting sustainability	BMS3	Organization has a good image in society Organization has made a work life balance working style and the employees are loyal

Table 4.1 Maturity Items for Maturity Assessment

Measurement Categories	Level 0	Level 1	Level 2	Level 3
			sustainability goals	Some of employee know the company sustainability goals	All of the employee knows the company sustainability goals and make it as a culture
Involvement in strategy planning	ISP0	No regulations are meet	ISP1	Fulfillment of regulations is done by reactive There are no top management commitment to achieve sustainability goals	ISP2	All of regulations are identified and fulfilled Company has PIC to make a relation with government to update the regulations The organization has the commitment to achieve sustainability goals, but there is no review to the achievement	ISP3	The organization is an active member of association to develop regulation The organization goals has been synchronized with government goals about sustainability The organization report its achievement of their sustainability goals

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Table 4.1 Maturity Items for Maturity Assessment

Measurement Categories	Level 0		Level 1		Level 2		Level 3	
								to all stakeholder annually
Monitoring of sustainability indicators	MSI0	No perspective of sustainability indicators.	MSI1	Organization only has economic perspectives indicators to review their achievement Organization is not conducting regular review to their indicators	MSI2	Organization has two perspectives indicators: economic and social/environment Organization is already defined and can be calculated, but still not synchronized to their sustainable goals	MSI3	All of the indicators are meet triple bottom line perspectives Indicator review is done regularly, and corrective action report is made when the achievement is below targeted to make sure they still align to company goals

Weighted Factor of Maturity Items

According to the literature, not all factors appear to be equally important for the growth of a business toward maturity in the context of Industry 5.0. In the dimension "Human-centered Design" for instance, the item "Main driver and innovative factor for Industry 5.0" can contribute differently to Industry 5.0 maturity than the item "Focus on employees." The survey of a weighted factor of maturity items was therefore incorporated into the development process to ascertain the item's maturity contribution on the one hand and to confirm the maturity item's practical relevance on the other.

20 respondents take the survey from the questionnaires sent through email to practitioners at several companies. On a Likert scale, the practical value of each maturity factor was graded from "not important" (rating = 1) to "very important" (rating = 4). For instance, the importance of the item "Main driver and innovative factor for Industry 5.0" was given a score of 3.4 out of 4, whilst the importance of the item "Focus on employees" was given a score of 3.2. The aggregate average of the 20 assessments for the 11 elements is 3.1 out of 4, which is consistent with the model's content being significant.

Table 4.2 Weighted Factor of Maturity Items

Survey for Importance Rating		**Weighted Factor (g)**
Human-centered Design	Main driver and innovative factor for I5.0	3.4
	Focus on employees	3.2
	Holistic Adaptation of the processes and system to employees	2.8
	Basic requirement for achieving maturity levels for digitalization and AI	3.6
Resiliency	Stabilization Policy	3.1
	Creation of Competitiveness	2.7
	Use of Modern Technologies and Approaches	3.5
Sustainability	Implementation of environmental solution	3.3
	Business model with sustainable aspects	3.1
	Involvement in strategy planning	2.8
	Monitoring of sustainability indicators	3.1

Maturity Level Calculation

Results from a case study with an Indonesian manufacturing company are shown below. The authors picked a company that is already involved in Industry 4.0 and has the necessary fundamental knowledge and comprehension of its core ideas of Industry 5.0 in order to assure the correctness of the results.

A questionnaire was sent to the organization through email so that they may reflect on their internal situation at their own pace. The software program was then

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used to enter the response and generate the maturity report and determine the maturity levels.

The evaluation and computation of each of the model's eleven dimensions are described in depth in order to improve comprehension of the model's structural elements. The eleven included maturity components, with maturities (M_{DIi}) ranging from 1 to 4 (see Table 4.3), were self-assessed by the firm.

Table 4.3 Example of Company's Response for Their Maturity Level per Item

Maturity Item		**Company 1's Maturity Level per Item (M_{DIi})**	**Weighted Factor (g_{DIi})**
Human-centered Design (M_{1Ii})	Main driver and innovative factor for Industry 5.0	3	3.4
	Focus on employees	3	3.2
	Holistic Adaptation of the processes and system to employees	3	2.8
	Basic requirement for achieving maturity levels for digitalization and AI	4	3.55
Resiliency (M_{2Ii})	Stabilization Policy	2	3.05
	Creation of Competitiveness	2	2.7
	Use of Modern Technologies and Approaches	2	3.5
Sustainability (M_{3Ii})	Implementation of environmental solution	4	3.25
	Business model with sustainable aspects	3	3.05
	Involvement in strategy planning	3	2.8
	Monitoring of sustainability indicators	3	3.1

(M_{1I1}) (Main driver and innovative factor for Industry 5.0) = 3; (g_{1I1}) = 3.4
(M_{1I2}) (Focus on employees) = 3; (g_{1I2}) = 3.2
(M_{1I3}) (Holistic Adaptation of the processes & system to employees) = 3; (g_{1I3}) = 2.8
(M_{1I4}) (Basic requirement for achieving maturity levels for digitalization and AI) = 4; (g_{1I4}) = 3.55
(M_{2I1}) (Stabilization Policy) = 2; (g_{2I1}) = 3.05
(M_{2I2}) (Creation of Competitiveness) = 2; (g_{2I2}) = 2.7
(M_{2I3}) (Use of Modern Technologies and Approaches) = 2; (g_{2I3}) = 3.5
(M_{3I1}) (Implementation of environmental solution) = 4; (g_{3I1}) = 3.25
(M_{3I2}) (Business model with sustainable aspects) = 3; (g_{3I2}) = 3.05
(M_{3I3}) (Involvement in strategy planning) = 3; (g_{3I5}) = 2.8
(M_{3I4}) (Monitoring of sustainability indicators) = 3; (g_{3I4}) = 3.1

$$M_{1\,(Human-centered\ Design)} = \frac{(M_{1I1} \times g_{1I1}) + (M_{1I2} \times g_{1I2}) + (M_{1I3} \times g_{1I3}) + (M_{1I4} \times g_{1I4})}{g_{1I1} + g_{1I2} + g_{1I3} + g_{1I4}}$$
$$= \frac{3 * 3.4 + 3 * 3.2 + 3 * 2.8}{3.4 + 3.2 + 2.8} = \frac{10.2 + 9.6 + 8.4}{9.4} = \mathbf{3.3}$$
$$M_{2\,(Resiliency)} = \frac{(M_{2I1} \times g_{2I1}) + (M_{2I2} \times g_{2I2}) + (M_{2I3} \times g_{2I3})}{g_{2I1} + g_{2I2} + g_{2I3}}$$
$$= \frac{2 * 3.05 + 2 * 2.7 + 2 * 3.5}{3.05 + 2.7 + 3.5} = \frac{6.1 + 5.4 + 7}{9.25} = \mathbf{2.0}$$
$$M_{3\,(Sustainability)} = \frac{(M_{3I1} \times g_{3I1}) + (M_{3I2} \times g_{3I2}) + (M_{3I3} \times g_{3I3}) + (M_{3I4} \times g_{3I4})}{g_{3I1} + g_{3I2} + g_{3I3} + g_{3I4}}$$
$$= \frac{4 * 3.25 + 3 * 3.05 + 3 * 2.8 + 3 * 3.1}{3.25 + 3.05 + 2.8 + 3.1} = \mathbf{3.3}$$

Using the Equation 1, the maturity of the dimension "Human-centered Design" M_1 is now calculated resulting in a maturity-level of 3,3 out of 4; "Resiliency" M_2 resulting in a maturity-level of 2,0 out of 4: and "Sustainability" M_3 resulting in a maturity-level of 3,3 out of 4. The results of determining each respondent's maturity level for each maturity level measuring dimension are as follows.

Table 4.4 Calculated Maturity Level

Respondent	Sector	Human-centered Design	Resiliency	Sustain-ability	Maturity Level (Avg)
Company 1	Automotive	3.3	2.0	3.3	2.8
Company 2	Automotive	3.7	2.7	3.7	3.4
Company 3	Automotive	4.0	4.0	3.7	3.9
Company 4	Automotive	3.2	3.3	3.2	3.2
Company 5	Automotive	3.5	4.0	4.0	3.8
Company 6	Automotive	3.0	2.3	3.0	2.8
Company 7	Automotive	3.0	2.3	3.0	2.8
Company 8	Automotive	3.0	2.3	3.2	2.9
Company 9	Chemicals	2.2	2.3	3.0	2.5
Company 10	Chemicals	2.0	3.0	3.3	2.7
Company 11	Chemicals	2.0	2.3	3.0	2.4
Company 12	Chemicals	2.0	2.3	3.0	2.4
Company 13	Electronics	2.7	2.7	3.0	2.8
Company 14	Electronics	2.5	2.6	3.0	2.7
Company 15	Electronics	2.5	2.3	3.0	2.6
Company 16	Electronics	2.3	2.0	1.7	2.0
Company 17	Electronics	1.7	1.7	1.3	1.6
Company 18	Food & Beverage	2.0	2.0	2.3	2.1
Company 19	Food & Beverage	2.9	3.2	3.3	3.1

Table 4.4 Calculated Maturity Level

Respondent	Sector	Human-centered Design	Resiliency	Sustain-ability	Maturity Level (Avg)
Company 20	Food & Beverage	2.7	3.0	3.5	3.1
Company 21	Food & Beverage	3.3	3.0	2.8	3.0
Company 22	Food & Beverage	1.0	1.7	2.2	1.6
Company 23	Food & Beverage	3.5	2.7	3.0	3.1
Company 24	Food & Beverage	2.5	2.7	3.3	2.8
Company 25	Food & Beverage	3.5	3.3	3.7	3.5
Company 26	Food & Beverage	2.5	3.0	2.7	2.7
Company 27	Food & Beverage	2.0	2.3	3.0	2.4
Company 28	Textile & Apparel	1.5	2.3	2.2	2.0
Company 29	Textile & Apparel	2.0	2.0	3.0	2.3

Data Analysis

After processing the data using the maturity model calculation, the next process is to analyze how far the three pillars of Industry 5.0 have been applied in each sector. The following are the results of the analysis, the maturity matrix has defined that there are four levels of maturity. Level 1 describe the industry sector is not ready for implement Industry 5.0. Level 2 describe the industry sector is on initial readiness for implement Industry 5.0. Level 3 describe the industry sector is on medium readiness for implement Industry 5.0. Level 4 describe the industry sector is on ripe readiness for implement Industry 5.0.

Human centered design

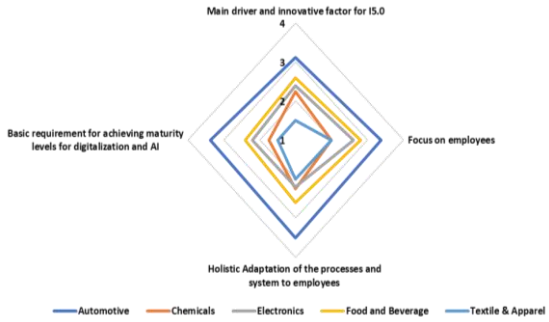

Figure 4.1 The human centered design level

Based on the online surveys are processed using the maturity model calculation, the automotive sector is at level 3 for the human centered design matrix. The chemical sector is at level 2 for each item, but at level 1 for basic requirement. The electronic sector is at level 2, the food & beverage is at level 2 as well. The textile & apparel is at level 2, but still at level 1 for main driver and basic requirement for achieving maturity levels for digitalization and AI.

Resiliency

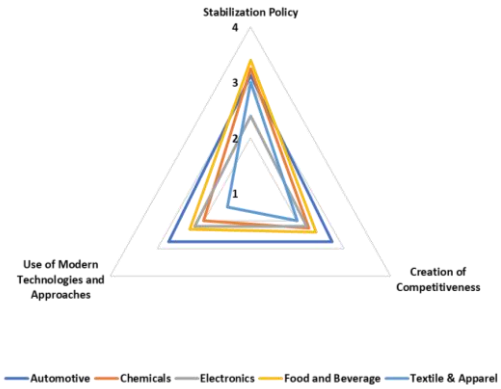

Figure 4.2 The resiliency level

Based on the online surveys are processed using the maturity model calculation, the automotive sector is at level 3, but still at level 2 for creation of competitiveness and use of modern technologies and approaches. The chemical sector is at level 3, but still at level 2 for creation of competitiveness and use of modern technologies and approaches. The electronic sector is at level 2. The food & beverage sector is at level 3, but still at level 2 for creation of competitiveness and use of modern technologies and approaches. The textile & apparel sector is at level 3, but still at level 2 for creation of competitiveness and level 1 use of modern technologies and approaches.

Sustainability

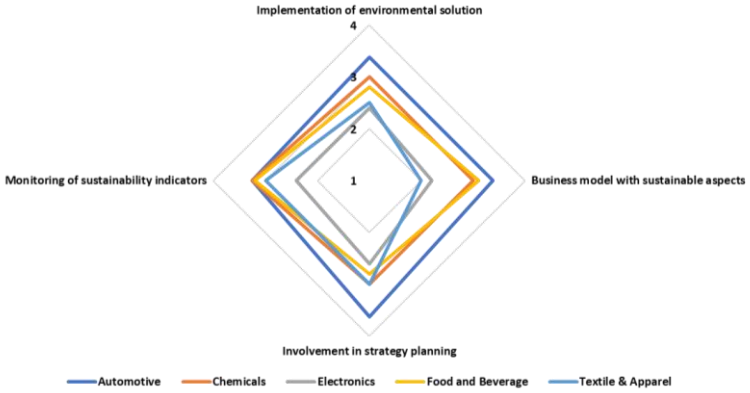

Figure 4.3 The sustainability level

Based on the online surveys are processed using the maturity model calculation, the automotive sector is at level 3 and the chemical sector is at level 3 as well. The electronic sector is at level 2 and the food & beverage sector is at level 3, but still at level 2 for implementation of environmental solution and involvement in strategy planning. The textile & apparel sector is at level 3, but still at level 2 for implementation of environmental solution and business model with sustainable aspects.

From that three pillars analysis to ensure which business sector is most ready for implementation of Industry 5.0, the data analysis has been obtained is processed

again using the maturity model calculation. The following are the results of the analysis.

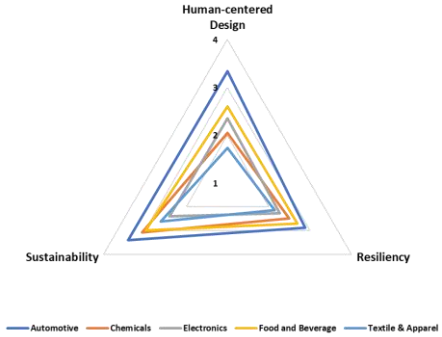

Figure 4.4 The 3 pillars of Industry 5.0 level

Based on the graph above, the automotive sector is at level 3. The chemical sector is at level 3 but still at level 2 for human centered design and resiliency. The electronic sector is at level 2. The food & beverage sector is at level 3 but still at level 2 for human centered design and resiliency. The textile & apparel sector is at level 2 but still at level 1 for human centered design and resiliency.

The business sector is most ready for implementation of Industry 5.0 still can't determine using that analysis because each sector has its own advantages and disadvantages. So, for determine the business sector is most ready for implementation of Industry 5.0 it's done by using kruskal wallis test. The following are the results of the kruskal wallis test.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Score	29	2.7241	.56420	1.60	3.90
Industry	29	2.7931	1.37267	1.00	5.00

Kruskal-Wallis Test

Ranks

	Industry	N	Mean Rank
Score	Automotives	8	20.38
	Chemicals	4	7.75
	Electronics	5	7.90
	Food and Beverages	10	14.45
	Total	27	

Test Statistics[a,b]

	Score
Chi-square	10.734
df	3
Asymp. Sig.	.013

a. Kruskal Wallis Test

b. Grouping Variable: Industry

Figure 4.5 The result of kruskal wallis test

Based on the result from Kruskal Wallis test, there are two results. First one is descriptive analysis, from 29 samples the minimum level of maturity level is 1.6 and maximum level is 3.9 with the standard deviation at 0.56.

The automotive sector get the best mean rank score. Meanwhile the food and beverages sector get the lowest mean rank score. The significant level is 0.013

which is lower than 0.05 that it means there are differences between each sector. So we can conclude that the automotive sector is the most ready for industry 5.0.

CONCLUSION

The research work presented here aimed for the development of a maturity model and a related tool for assessing the Industry 5.0 maturity of industry sector in Indonesia. The mmaturity model can assist with the difficult task of reflecting on the current capabilities regarding Industry 5.0 and the subsequent decision on respective strategies and action plans to be ready for the implementation of Industry 5.0. Based on the research result, the business sector which most ready for the implementation of Industry 5.0 is automotive sector. But it's on level 3 (medium readiness) and still needs development to get to level 4 (ripe readiness).

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