Industry Digital Maturities during Covid-19: Empirical Evidence from Indonesia

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Abstract 'Digital' is becoming a more prevalent concept in current times and companies are competing in undergoing digitization in this Industry 4.0 era. The focus of this research is on measuring digital maturity of industries in Indonesia with the aim to find out which industry leading, and which lagging and to discover the impact of Covid-19 pandemic in Indonesia towards their digital maturity. This exploration is intended for companies to understand industry's strengths that can be built on and which opportunities they may need to integrate to improve their digital maturity in the new normal. Methodology: The combination of Digital Maturity Model by Berghaus and Back and Digital Maturity Segment by Gill and VanBoskirk are used to measure digital maturities for the nine industries in Indonesia. Result: This study offers the information on the digital landscape across sectors before and during the pandemic and how each industry responds to the crisis as a result to its digital maturity. Conclusion: The study suggests that the landscape of digital maturities for all industries changed positively, with different magnitude for each industry, as the response to the Covid-19 pandemic. Further researches are recommended to find out the optimal balance in digital maturity for each industry and to explore the most impactful dimension of digital maturity per industry to its business outcome and sustainability.

Keywords: *: Digital Maturity; Digital Transformation; Industry 4.0; Leading; Lagging; Covid-19 pandemic*

1. Introduction

'Digital' is becoming a more prevalent concept in current times and companies are competing in undergoing digitization in this Industry 4.0 era. One can define that digitization as "a process of transforming information from analogue media to digital form using electronic devices"[1]. To improve their business is the ultimate goal for industry leaders worldwide, in doing digitalization for the company's functions along the value chain. [2]. Based on a study conducted by PwC, the foremost benefits of doing digital transformation are the revenue increment of 2.9% and the cost reduction of 3.6% p.a. on average[3]. Other than those advantages, the potential business model transformation resulted from the innovation of products and services, is another thing that company can benefit from [4].

The question now is to what degree companies are ready to do the digital transformation in order to experience such advantages? This is mainly referred as how digitally mature one company is, or how changes in digital is prepared and conformed by an organization [5]. In a straightforward way, Chanias and Hess have narrated that digital maturity is where the company stands in a digital transformation [6].

How about the digital maturity in Indonesia, and specifically the companies and industry in the country? McKinsey has reported that ICT Infrastructure in Indonesia is weak and digital usage is uneven within and among various business sectors [7]. Looking from the IT spending across all of Indonesia's sectors, Indonesia is lagging behind not only from developed countries but also peer countries, with the largest IT spending comes from Financial Services and Media & Communication sector (around 6% IT spend per GDP, compared to 20% average in peer countries and 35% average in developed countries) while Industrial sector (including agriculture, mining, manufacturing and construction), that contributes approximately 50% of Indonesia's GDP, has the lowest IT spend (around 1% IT spend per GDP compared to 2% average in peer countries and 4% average in developed countries) [8].

Ramantoko investigated the maturity of digital transformation of small medium enterprises (SME) in Indonesia among three traditional communities by conducting a qualitative research methodology and concluded that the maturity index is between 2 and 3 from the maximum level of 4. [9]. Rahayu and Day explored the e-commerce adoption in SME in Indonesia where they concluded that the adoption in developing nations, including Indonesia, lagged far behind the developed ones [10]. Yet, there were limited reviews on the evaluation on digital maturity itself especially for industries in Indonesia.

Digital adoption of companies is influenced by some factors, i.e. individual, organization and external; and external drivers includes customer behavior and market constraint, have been identified as the immediate element for digital transformation [11]. While Schmidt, Drews, and Schirmer highlighted the changing customer behavior as one of major drivers of digitalization, Berghaus and Back analyzed the activities and motivations for companies to conduct a digital transformation and concluded that changing competitive landscape (economic situation) as one of the key drivers, among others such as limiting existing structures, changing regulations and digital industry transformation [12].

In this paper, we want to highlight the external factor, specifically the Covid-19 pandemic, that started in China around December 2019. The coronavirus has progressed to over than 200 countries around the world and transmitted infection to more than 3 million people and caused more than 150,000 pandemic victims by end of April 2020. The pandemic has also changed the way people lives and operates, since countries reinforce all actions to reduce the virus spreading including physical distancing, halting schools, ceasing borders and suggesting people to stay home.

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In Indonesia, the Covid-19 has brought a serious disruption to consumer sentiment and slowly but sure towards the country's economy. McKinsey's survey in April 2020, concluded that there were significant cutbacks in consumers' spending for out-of-home dining, hotel stays, apparel and footwear for more than 60%. Contrarily, the expenditure for groceries, household supplies and at-home entertainment climbed for more than 20% while time spending for social media and online news rocketed to more than 50% [13].

We would see in this research whether the quick adoption to new digital activities and a strong shift to online channels caused by Covid-19 situation in Indonesia as mentioned above will be followed by quick digital adoption from companies, start with including digital transformation to the strategy of the company and ensuring the readiness of internal organization, in order to respond to the changed consumers behavior and to survive in the disrupted economy during and after Covid-19. In other words, we will learn if Covid-19 crisis will bring impacts to the digital maturity of companies in Indonesia.

PROBLEM STATEMENT

The focus of this research is on measuring digital maturity of industries in Indonesia with the aim to find out which industry leading and which lagging, and to measure the changes of digital maturities of Indonesia's industries, before and during the Covid-19 pandemic.

2. Literature Review

2.1 Digital maturity model

Many researchers have tried to answer this question regarding the measurement digital maturity in companies and develop digital maturity models by using different parameters. In their paper, Remane and his colleagues described an explanatory analysis regarding digital transformation from multiple industries to answer their question regarding how can the digital maturity of companies be separated? Their research concluded two outcomes, which are, Digital Maturity scales (Digital Impact and Digital Readiness) and Digital Maturity Clusters (5 clusters) based on the scales [14].

Berghaus and Back have built another digital maturity model that comprises of nine dimensions; Strategy, Organization Product Innovation, Customer Experience, Culture and Expertise, Transformation Management, Process Digitization, Collaboration, and Information Technology [15].

Gill and VanBoskirk also developed a model to measure digital maturity named Digital Maturity Model 4.0 that was built upon four dimensions; organization, insights, technology and culture. They then clustered the results into four segments with its behavior and strategy [16].

To serve our objective, we will adapt the nine dimensions of Berghaus and Back's model since it includes an internal and external view of the company as well as direct focus towards industry characteristics. However, we have adapted the model to conform with the nature of the specific range of industries currently existing in Indonesia by using a simplified quantitative approach in measuring digital maturity score rather than the much more complex model proposed by Berghaus and Back. We will also be incorporating the four segments of the digital maturity level of Gill and VanBosKirk's model: skeptics, adopters, collaborators and differentiator. Comparisons between Berghaus and Back's model, Gill and Vanboskirk's model and our own model are detailed in Tabel 1.

Table 1. Model Comparison (adapted from Chanias & Hess, 2016)

Design Parameter	Berghaus and Back Model	Gill and Vanboskirk Model	Afkar and Syamsi Model
Number and Focus of Dimension	• 9 dimensions, discuss about a holistic internal and external view of the company	• 4 Dimensions, focusing to internal view of the company	• 9 dimensions on internal and external view of the company
Adaptive potential	• Updates regularly of best practice indicators • Concern on industry characteristics • Do not focus to company specifics	• Regular updates based on new ideas and data • Focus on firms • Highly related to digital marketing and e-business	• Concern on industry characteristics • Do not focus to company specifics
Evaluation and Data Collection	• Assisted self-evaluation (online questionnaire) • Best practice indicators (ca. 60) for each dimension • Questions with a 5-point Likert scale	• Self-evaluation • Best practice indicator for each dimension (28 questions) • Questions with 4 points Likert scale	• Self-evaluation (online questionnaire) • Total 18 questions (two for each aspect) • Questions with a 5-points Likert scale
Digital Maturity level determination	• Complex quantitative approach based on combination of various mathematical-statistical score	• Simple quantitative approach based on summarized score • No weighting on indicators	• Simple quantitative approach based on summarized score • No weighting on indicators

	computation procedures • Dynamic weighting of indicators		
Digital maturity assessment	• Company and industry level • Based on 5 levels: Testing, Establishing, Consolidating, Structuring, Optimizing	• Company level • Based on 4 levels: Skeptic, Adopters, Collaborators, Differentiators	• Company level • Based on 4 levels: Skeptic, Adopters, Collaborators, Differentiators
Results visualization	• Numerical score • Maturity level allocation	• Numerical Score • Maturity level allocation	• Numerical Score • Maturity level allocation

Since we will adopt the Gill and VanBoskirk's digital maturity segment, combined with the nine aspects of digital maturity of Berghaus and Back, we updated the maturity score allocation for each maturity level to match with our own model, as shown in the Table 2.

Table 2. Score Range for Each Maturity Segment

Matuity Segment	Gill and VanBoskirk Score Range	Gill and VanBoskirk Distribution of Score (%)	Afkar and Syamsi Score Range
Skeptics	0 - 33	39%	0 - 1.96
Adopters	34 - 52	23%	1.97 - 3.09
Collaborators	53 - 71	23%	3.10 - 4.22
Differentiators	72 - 84	15%	4.23 - 5

2.2. Industry leading and lagging in digital maturity

The study by MIT Center for Digital Business resulted in the creation of the Digital Maturity Matrix that described the immature companies are the ones who are the newcomer to the digital world, either just started utilize it, doubting it or simply unenlightened by what the digital technologies may bring. While the most mature companies are the ones who have applied the latest digital course, complemented by the powerful digital inspiration and culture [17].

With their Digital Maturity Model, Berghaus and Back proposed the lowest maturity stage as the organizations who just started primary digital solution for their current products while the highest maturity level belongs to the companies who embedded breakthrough data analytics solutions into the organizations' decision making process. In their study in Switzerland and Germany organisations, they concluded that the industry leading, i.e. who have the highest mean maturity score is the IT and Telecommunication industry (score 3.22 out of 5) and the industry lagging, i.e. who have the lowest mean maturity score is machine industry and consumer goods industry (score 2.38 and 2.23 respectively out of 5) [18].

Gill and VanBoskirk did the survey to the 227 global marketing decision makers in 2015 and concluded that online retail industry had the highest digital maturity score, categorized in the segment Differentiator and called as the industry leading. On the other hand, public sector has the lowest digital maturity score, categorized in the segment Skeptics and therefore became the lagging industry [19].

Remane and his colleagues recommended some quantified indicators to the definition of companies lagging as the ones who have insignificant IT budget and more talents who have low ICT skills compared to others, while contrastly the companies leading are the ones who have the highest IT budget and more talents who acquire high ICT skills. This resulted to the healthcare and electronics industry are the lagging behind and aerospace becomes the leading industry [20].

In light of our observations, as it is still unclear what the results for Indonesia's situation may be, we propose the consideration of the IT budget as the main indicator for digital maturity to provide the most representative estimation of digital maturity. Quite surprisingly, the IT spending data in Indonesia proves a similar situation that Media and Communication industry has a 6% spend per GDP, the largest spend among all industries [21]. In contrast, manufacturing industries, even though the pressure is high especially for labor-intensive manufacturing, more than 75% of the companies in Indonesia have no aspirations to change digital[22]. This is supported by the fact that this industry, included in the Industrial sector together with mining, natural resources and construction, have the least IT spend compared to the other industries. The main reason for this is because the availability of cheap labor in Indonesia on top of lack of the customer pull for digitization, which becomes the main driver for digitization in financial institutions and retail [23]. Since the mentioned industries above (manufacturing, mining, and natural resources) have the same nature where

they are core sectors, asset-heavy and labor intensive, it is common to group them to become one sector, i.e. Industrial.

For this research's purpose, we will use the industry grouping based on JASICA (Jakarta Stock Exchange Industry Classification), to be examined further:

1. Agriculture (crops, plantation, animal husbandry, fishery, forestry, and others)
2. Mining (coal mining, crude petroleum & natural gas production, metal and mineral mining, land/stone quarrying, and others)
3. Basic Industry & Chemicals (cement, ceramics, glass, porcelain, metal and allied product, chemicals, plastics and packaging, animal feed, wood industries, pulp and paper, and others)
4. Miscellaneous Industry (machinery and heavy equipment, automotive and components, textile, garment, footwear, cable, electronics, and others)
5. Consumer goods Industry (food and beverages, tobacco manufacturers, pharmaceuticals, cosmetics and household, houseware and others)
6. Property, real estate, and building construction
7. Infrastructure, utility and transportation (energy, toll road, airport, harbor and allied products, telecommunication, transportation, non-building construction and others)
8. Finance (bank, financial institution, securities company, insurance, investment fund/mutual fund, and others)
9. Trade, service and investment (wholesale, retail trade, tourism, restaurant and hotel, advertising, printing and media, health care, computer and services, investment company and others)

3. Research Methodology

The purpose of this research is to determine digital maturity score for different industries in Indonesia. In order to do that, we employed an empirical research and drew on a localised survey based on the digital maturity model 4.0 [22] and survey for the digital maturity [21]. The questionnaire consisted of two parts. The first part is intended to acquire understanding on how well the companies experience the digital transformation, based on nine (9) dimensions: customer experience, strategy, culture, technology, organization, product innovation, collaboration, transformation management and process digitization, by asking the respondents with a five-step Likert-scale, ranging from "1 – not at all" to "5 – completely". In this part, respondents were examined to respond to the same 18 queries for two different situations, "before Covid-19 pandemic" and "during Covid-19 pandemic". The second part of the questionnaire is about demographic questions, such as type of industry, firm size, age and education.

3.1 Sampling method

For the study, a total of nine industry are surveyed based on JASICA classification that consists of 674 companies as the number of populations. Since we want to obtain some "quick" information and get a "feel" for the phenomenon of the digital maturities in both situation, i.e. before and during Covid-19, then we will use a convenience sampling [21], with the target sample size of 15-20% from the populations.

The respondents were targeted to be in a senior management position, e.g. C-level, Head of IT or Head of Business Development, to ensure that they can assess the digital maturity of their companies.

3.2 Operationalisation Variable

In this study, we will use Berghaus and Back's framework in measuring the digital maturity, that consists of nine variables and two indicators for each variable as shown in Table 3 [20]. In their study, Berghaus and Back have suggested 7 indicators for each variable, which we chose two of them for simplification purpose.

Table 3. Digital Maturity Variables with Corresponding Indicators

No	Variable of Digital Maturity	Indicator
1.	Strategy	a. "Digital Business" is critically important in our overall strategy. b. We understand digital transformation as the continuous strategic development of our company.
2.	Transformation Management	a. The goals of digital transformation are measurably defined and known within the company. b. The top management level (executive management / board of directors / supervisory board /etc.) recognises the importance of digital business and provides appropriate resources.
3.	Organisation	a. Digital projects are planned and implemented across departments and functions. b. We have enough resources in our day-to-day operations to simultaneously advance digital innovation.
4.	Culture and Expertise	a. Building digital expertise is a central component in employee development. b. Our employees are familiar with our own digital products and use them themselves.
5.	Cooperation	a. The use of digital collaboration platforms (e.g. SharePoint, Jive) improves the exchange of information and collaboration between departments in our company. b. We have defined internal experts for digital matters, who are available as points of contact for employees or external parties.
6.	Process Digitisation	a. We have consistently integrated digital channels (including mobile and social media) into communication and service processes. b. We base decisions on findings from data analysis (e.g. to improve communication).
7.	Information Technology	a. Our internal IT department can ensure the deployment of digital technologies relevant to our company. b. We proactively and comprehensibly explain to customers how their data is used by us.

8.	Product Innovation	a. We have supplemented our products and services with digital innovations. b. We actively involve customers in the development of new digital innovations.
9.	Customer Experience	a. We personalise our digital customer communications (e.g. in terms of content and frequency) according to user behaviour and available CRM data. b. We bring together customer and interaction data across multiple channels.

3.3 Data Analysis

We calculated the digital maturity score of each industry in two steps. First, we measured the digital maturity score of each company (i.e. the respondent). Second, we calculated the average score of all the respondents in each industry to get the industry's digital maturity score.

There are four maturity stages that we want to analyze as the result of this survey: Skeptics, Adopters, Collaborators and Differentiators. Since we used a five-point Likert-scale for 18 questions, then the maximum mean maturity score a company can achieve is 5 and the minimum score is 1. Based on this, we can conclude the stages of digital maturity with a pre-defined score range as described in the Table 2.

To determine whether the industry is lagging or leading, we would map the mean maturity score of each industry according to the maturity segments defined in the Table 2. After the map is defined, we could assume that the industries that fall into the Differentiators segment or has the highest mean maturity score are the leading industries, and that the ones in the Skeptics or Adopters or has the lowest mean maturity score (whichever lower) are the lagging industries. The comparison of the result to the previous studies would be discussed in Section 5 of this paper.

Another analysis would be conducted to see the acceleration of digital maturity for each industry as the impact of Covid-19. This is done by subtracting the mean maturity score before the Covid-19 situation from its value during the pandemic per industry. If the result of the subtraction of an industry is positive, then we could say that the Covid-19 pandemic accelerates the digital maturity of that industry. By comparing the difference, we could analyse the acceleration level of each industry and determine which has the fastest and slowest acceleration.

The same analysis would be done to each variable of digital maturity per industry to see what changes in their score, and therefore whether the variable experiences an improvement in the situation during Covid-19.

4. Results

We received 101 response with 98 valid response that made up to 14.5% response rate. As shown in the Table 4, majority of respondents worked in Finance industry (29%), followed by Trade, Service and Investment (20%) and Infrastructure, Utility and Transportation industry (20%).

Table 4. Profile of Industries and Respondents

Industry Type	Frequency	%
Infrastructure, Utility and Transportation	20	20%
Consumer Goods Industry	7	7%
Finance	28	29%
Property, Real Estate and Building Construction	4	4%
Mining	9	9%
Trade, Service and Investment	20	20%
Basic Industry & Chemicals	5	5%
Miscellaneous Industry	2	2%
Agriculture	3	3%
Total	98	100%
Respondent's Tenure	**Frequency**	**%**
Less than 2 years	27	28%
2-5 years	23	23%
5-10 years	21	21%
More than 10 years	27	28%
Total	98	100%
Firm's Establishment	**Frequency**	**%**
1-10 years	12	12%
11-20 years	19	19%
21-50 years	31	32%
More than 50 years	36	37%
Total	98	100%
Firm's Headcount	**Frequency**	**%**
More than 1000 people	56	57%
100 - 500 people	16	16%
500 - 1000 people	11	11%
Less than 100 people	15	15%
Total	98	100%

Of all the respondents, 28% of them have been working for the firm for more than 10 years and 27% of them have been with the company for less than 2 years. Most of the respondents' firm have been established for more than 50 years (37%) and only 12% that have been established for 1-2 years. Most of the firms employs more than 1000 people (57%).

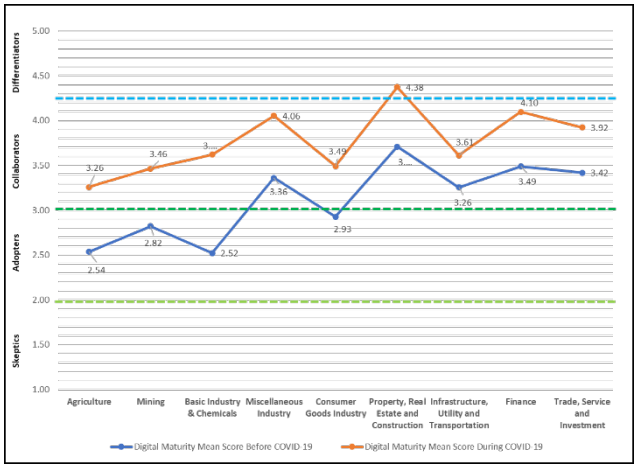

Figure 1. Digital Maturity Industries in Indonesia Before vs During Covid-19

The result (Figure 1) shows that all industries in Indonesia fall in the category of Adopters (Agriculture, Mining, Basic Industry and Chemicals, and Consumer Goods Industry) and Collaborators (Miscellaneous Industry, Property, Real Estate and Construction, Infrastructure, Utility and Transportation, Finance and Trade, Service and Investment) for conditions before the Covid-19 pandemic, with Property, Real Estate and Construction Industry has the highest mean maturity score (3.71) and Basic Industry and Chemicals Industry has the lowest mean maturity score (2.52). During the pandemic, the mean maturity score of all industries surveyed increased with Property, Real Estate and Construction Industry has the highest mean maturity score (4.38) and Agriculture Industry has the lowest mean maturity score (3.26), with all of industries moved to the higher segment, except the Miscellaneous Industry that stayed in the Collaborators level.

In addition to the increment of mean maturity scores of all industries in the pandemic situation compared to the one before pandemic, the Basic Industry and Chemicals industry has the highest jump of scores (2.52 before Covid-19 to 3.62 during Covid-19), and Infrastructure, Utility and Transportation Industry has the lowest jump of scores (3.26 before Covid-19 to 3.61 during Covid-19.

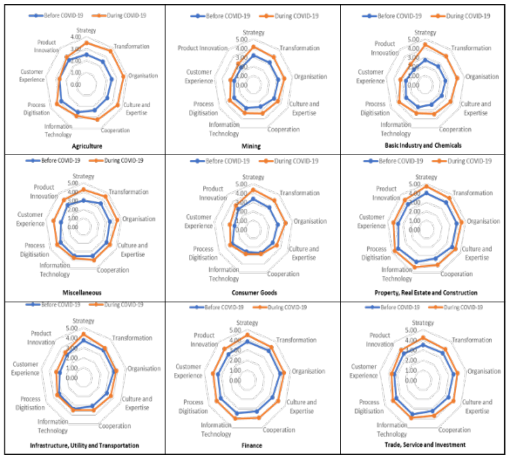

Figure 2. Score of each Digital Maturity Dimension per Industry Before vs During Covid-19

When we further investigate the mean score of each digital maturity dimension per industry and map them for both situations (before and during Covid-19), the result was shown in Figure 2. All dimensions had an increment of score in the situation during Covid-19, except Customer Experience dimension in the Agriculture industry that has the same score in both situations, before and during the pandemic.

5. Discussions

This study aims to find out digital maturity of industries in Indonesia and discover which leading and lagging industry. We had two set of results based on two situations, that are before and during the Covid-19 pandemic. The first result, before the pandemic, it is concluded that Property, Real Estate and Construction is the leading industry and Basic Industry and Chemicals is the lagging industry. If we compare to the survey result in Switzerland and Germany organizations [19]. where the leading industry is IT and Telecommunication Industry with mean maturity score of 3.22, Indonesia's leading industry has a higher score of 3.71.

The same occurred with the lagging industry, which Switzerland and Germany's organizations scored 2.38 and 2.23 for machine industry and consumer goods industry respectively, Indonesia's lagging industry has a higher score of 2.52. For the situation during Covid-19, the mean maturity score of Indonesia's leading and lagging industries (4.38 and 3.26 respectively) are much higher than Switzerland and Germany. This result was quite surprising especially with the fact that Switzerland and Germany are more prosperous and advanced countries than Indonesia. The reason most likely due to the survey conducted in Switzerland and Germany was four years earlier (2016) where the digital level in both countries were not as mature as the current state.

As shown in figure 3, the leading industry in Indonesia is Property, Real Estate and Construction while IT and Telecommunication was the leading industry in Switzerland and Germany. There could be some potential reasons to explain this, one of them may be due to higher spending in construction industry for the last few years in Indonesia, since the industry became one of the priorities of the Indonesian Government. Other possible reason, a technical one, is due to the Telecommunication industry that grouped together with Infrastructure and Utilities industry in which the two latter ones are known as not digitally mature as the Telecommunication industry. Plus, there were less respondents in the Property, Real Estate and Construction Industry compared to the Infrastructure, Utility and Transportation Industry, that could result to a skewed data.

		Digital Maturity Score		
		Before COVID-19	During COVID-19	Score Difference
1	Property, Real Estate and Construction	3.71	4.38	0.67
2	Finance	3.49	4.10	0.61
3	Miscellaneous Industry	3.36	4.06	0.69
4	Trade, Service and Investment	3.42	3.92	0.51
5	Basic Industry & Chemicals	2.52	3.62	1.10
6	Infrastructure, Utility and Transportation	3.26	3.61	0.36
7	Consumer Goods Industry	2.93	3.49	0.56
8	Mining	2.82	3.46	0.64
9	Agriculture	2.54	3.26	0.72

Legend: Skeptics, Adopters, Collaborators, Differentiators

Figure 3. Industry Digital Maturities in Indonesia (sorted by the highest to lowest score during Covid-19)

In terms of the lagging industry, Basic Industry and Chemicals became the lagging industry in the situation pre Covid-19 while Agriculture has the lowest mean maturity score in the situation during pandemic. This is aligned with the explanations mentioned in the Literature Review section of this study, that Industrial sector (consists of mining, manufacturing, and natural resources) has the lowest IT spend among other industries in Indonesia. If compared with the result from Switzerland and Germany, the result was not entirely aligned since the Consumer Goods Industry in Indonesia was not placed in the lowest mean maturity score but instead positioned in the rank 6 (out of 9) for situation before Covid-19 and rank 7 in the situation during Covid-19. The most possible reason for Consumer Goods Industry not being in the lowest rank is because the industry has been exposed to digital since couple years ago with its shopping and delivery application that became much favorable and significantly utilized by consumers during the Covid-19 pandemic.

When we compare the overall digital maturity industry in the situation before and during the pandemic Covid-19, the results show that the acceleration happened in all industries in Indonesia with most industries even moved to the next level of its digital maturity. Before the Covid-19 pandemic, there were four industries positioned as Adopters and five industries as Collaborators. During the pandemic, with the time span less than 6 months, the situation changed and there were 8 Collaborators and one Differentiator. This finding validates that the Covid-19 pandemic would bring an impact and result to the higher digital maturity score for industries in Indonesia. This also proved that the external factor such as the pandemic may cause a faster change to the digital state of industries compared to the situation without an external factor.

However, the speed to adapt may not be the same for all industries as also shown in Table 5. The highest jump of mean maturity score occurred in the Basic Industry and Chemicals and Agriculture, at 1.1 and 0.72 score jumped respectively. This means that the industry may have the fastest acceleration in its digital maturity due to the Covid-19 situation. Contrastingly, industry that has the lowest jump of mean maturity score was Infrastructure, Utility and Transportation with only 0.36 score jumped. This may indicate that the industry has the slowest acceleration in its digital maturity due to Covid-19 situation compared to the other industries in Indonesia.

The pace differences could be caused by many factors, such as the industry characteristics and its consumer's nature, the influence of digital to the industry and its previous state of digital maturity. In this case, Basic Industry and Chemicals and Agriculture Industry had the lowest mean maturity scores in the situation before Covid-19, that could mean the digital influence was previously low. The Covid-19 pandemic has changed the consumer sentiment and behaviour which people mostly stay at home and industries were pushed to make new ways in order to bring their product closer to the consumer. On top of that, the consumer demand was lower compared to the situation before Covid-19 and in order to survive, the industries need to do some efficiencies. These reasons may well be applied to the Basic Industry and Chemicals and Agriculture Industry since manufacturing is their nature of industry, and by doing more process digitally, they could bring their products closer to the customer and at the same time reducing their cost.

The Infrastructure, Utility and Transportation has the slowest pace of adapting to Covid-19 situation. One of the reasons was due to its digital maturity mean score that already high in the situation pre Covid-19, i.e. 3.26 of 5. The other possible reason is because unlike the utility sector, the infrastructure projects and transportation sector were completely disrupted and halted due to the restrictions people movement.

When we look into the nine dimensions, the result has shown that all dimensions have score increments for situation during Covid-19, meaning that there were improvements made by companies across all industries in all digital maturity dimensions, except the Customer Experience dimension in the Agriculture industry that scored the same for both situation. This could be understandable considering that Agriculture industry is one of the lagging industries in Indonesia and its industry nature that is not customer focused just yet.

Overall, the result of digital maturity in Indonesia during Covid-19 is encouraging. Despite the health and economic crisis that the pandemic has impacted to Indonesia and almost all countries in the world, it has pushed Indonesia's industries to be more agile, innovative, efficient and therefore more digital. The Covid-19 is a blessing in disguise situation that all industries need to take advantage of to equip themselves in order to maintain the sustainability of their business. This could be done by learning from more digitally mature countries and adopting

their best practice. This study has thought that all industries in Indonesia, without exception, are changing and adapting to the consumer behaviour shift caused by the pandemic. It has caused a shift in each industry's business models and how they operate, and together has made a digital shift in Indonesia's business.

Going forward, a further study can explore the nine dimensions of the digital maturity to find out which dimension has the highest and lowest impact to each industry's digital maturity score so that one industry can learn from more digitally mature industries on how specifically they can improve their digital maturity. Another exploration to find out the optimal digital maturity score for each industry may be required so that industries can find the balance on its digital transformation to suit its industry nature.

6. Conclusion

The objective of this study is to measure the digital maturity of industries in Indonesia and to find out which industry leading and lagging, and to explore the impact of the Covid-19 pandemic to the digital maturity. The result was Property, Real Estate and Construction industry came as the leading industry for both conditions, before and during the pandemic, while Basic Industry and Chemicals industry was the lagging industry in the situation before the pandemic and Agriculture industry became the lagging industry during the pandemic. The study also shows that the digital maturity mean score for all industries in Indonesia have increased during the pandemic.

In delivering this study, we faced some challenges in reaching target number of respondents. Initially we wanted to use the stratified sampling as the sampling technique however with the limitations of target respondents' correct information such as email address and time constraint, we changed the sampling technique to be the convenience sampling. We also found that the survey in English had a lower response rate since it was difficult to understand. Therefore, we provided two surveys, in English and Bahasa, for the respondents to choose and this has increased the response rate significantly.

Through our digital maturity framework, we contributed to the understanding of digital maturity of industries in Indonesia for the benefits of the industry managers to learn and improve their firm and industry in their digital transformation. Further researches have been suggested to find out the optimal balance in digital maturity for each industry and to detail down and explore the most impactful dimension of digital maturity per industry to its business outcome and sustainability.

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