

# The Challenges and Opportunities of the Building Material Industry in Indonesia Related to the Industrial Revolution 4.0

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The coming disruptive technology is a sign that the manufacturing business process or industry sector has to face the industrial revolution 4.0—regardless of one’s liking. The implication and possible changes must be huge; as the matter of fact, it is imperative for the industry to examine the status. PT XYZ is an anonymous cement company in Indonesia, this company is facing a tight competition, considering its supply that is greatly higher than the demand (35%). In the midst of competitiveness, it is essential to have a comprehensive assessment to find out the relevance of the presence of Industry 4.0 disruptive technology in the cement industry: whether it will be a threat or will create opportunities. The study is aimed to discern how the competitiveness level of PT XYZ related to industry 4.0. Expectedly, it will be relevant to their productivity and product value proposition; and ultimately be beneficial in facing the tight competition in either the domestic or global market. The research result showed that the readiness level of the existing condition of PT XYZ is at the level of “experienced”. Based on the analysis, four top priority initiatives needed to seize the opportunities and mitigate the risk. Those four priority initiatives are: (1) ensuring the digital trust and data security are in place, (2) administering people development and developing the digital culture, (3) integrating two web sales systems, (4) and increasing the usage of product data and customer data, while developing the Smart Factory system. The Capex that is required for those initiatives has a short payback period of less than one year. Through the suggestions listed, it is expected that PT XYZ can improve the competitiveness by enhancing the productivity and improving product value proposition.

**Key words:** *Industry 4.0 revolution, Disruptive technology, Digital transformation, Competitiveness, Digital culture.*

## Introduction

The Fourth Industrial Revolution (Industry 4.0) has arrived, and it has reached the commercial sector and caused a major shift in the way humans live and work. Industry 4.0 brings the physical and digital world concomitantly, at a tremendous speed exceeding the prior industrial revolution. This shift is characterised by the presence of disruptive technology such as the power of data, analytics, automation, and mobility in all aspects of the company. Regardless of the fact, it has to be faced by all industry sector. The manufacturing business process, especially, would be much affected as it utilises intense machinery for production.

Industry revolution 4.0 was originated from the concept of the smart factory which began in 2011. A smart factory is an environment where machinery and equipment are able to improve the process through automation and self-optimisation. This function is a combination of Information Technology and Operation Technology, which eventually create value. In turn, the concept of smart factory develops widespread to all value chain processes.

The history of Industrial Revolution starts with the so-called Industry 1.0, subsequently to 2.0, 3.0, and now 4.0. In 1784, Industry 1.0 or The First Industrial Revolution began. It is characterised by used water and steam power to mechanise production. In 1870, Industry 2.0, or the second industrial revolution, came and was characterised by the use of electric power to create mass production. Then in 1969 it was the beginning of Industry 3.0, or the third industrial revolution. In this era, industry used electronics, programmable logic controller (PLC) and information technology (IT) to automate production. Finally, today the Industry 4.0, or the fourth industrial revolution, has arrived with is a fusion of technology that connected all physical, biological and digital spheres by virtual and cyber processes.

McKinsey defines Industry 4.0 as the digitisation of the manufacturing sector, with embedded sensors in virtually all product components and manufacturing equipment, ubiquitous cyber physical systems, and analysis of all relevant data. The Industry 4.0 is characterised by “data and connectivity”, “analytics and intelligence”, “human-machine interaction”, and “digital-to-physical conversion”. In general, these disruptive technologies will bring some benefit of connectivity, transparency, predictability and self-optimising.

Considering the implication of disruptive technology, it is crucial to analyse and asses the status of Indonesia Manufacturing Industry. In this case, the study focuses on building material industry. The aim of this study was to examine whether Industry 4.0 will be a threat to the existing industries or otherwise become business opportunities. Additionally, this study investigated the challenges that might be faced. Among the building material industry, the cement industry has the most considerable required capital, involved heavy machinery with modern technology and full of automation.



In the meantime, related to the business competition, the cement industry is in a very challenging situation due to the tight competition over an oversupplied condition. The research took the case of PT XYZ, an anonymous company. This corporation is one of the big cement industries in Indonesia.<sup>1</sup> Like other cement companies in Indonesia, they also suffer a tight competition condition where the national supply is considerably greater than the demand (35%). So, the competitiveness becomes a key factor to win the market.

The arrival of Industry 4.0 was earlier known in several developed countries such as Europe, America, and Japan. The comprehensive study about Industry 4.0 implementation by conducting the survey to several countries and companies has been done in 2015 by McKinsey and in 2016 by PWC. Both studies stated that Industry 4.0 technology can improve the productivity and increase the revenue. This fact is aligned with the objective of PT XYZ on how to improve their competitiveness to win the tight competition.

Considering the abovementioned problem, this research is to discover the relevancy of the presence of Industry 4.0 disruptive technology in the cement industry by mapping the existing condition, the challenges, and opportunities related to Industry 4.0 implementation. Then from those points, this research observed the gap between existing status with the Industry 4.0 requirement, and the existing gap compared to one of the local competitors and with one of regional competitor that is believed to be already in an advanced level; through benchmarking analysis.

The analysis will be beneficial in depicting how the competitiveness level of PT XYZ as related to industry 4.0. Therefore, the company may refer the result with their productivity, and product value proposition, in facing the tight competition in the domestic market and also in meeting the global competition challenge, especially from the low-cost players such as China manufacturers. Expectedly, the company can define the required action to mitigate the risk and to grab the existing opportunities.

### ***Business Issue Exploration***

Business situation analysis covers external environment analysis using the approach of PEST analysis with the stress on disruptive technology, Industry Analysis and Porter's Five Forces. Internal environment analysis reviews the most difficult challenge that company facing. The mapping out of readiness status related to industry 4.0 based on the primary data (interview and questionnaire) that was collected. On the gap analysis there will be benchmarking industry 4.0 readiness status between the company, the local competitor and the regional competitor.

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<sup>1</sup> which for some reasons of confidentiality, the company name does not want to be mentioned officially.

The research is of both competitors using secondary data based on the observation, and public documentation and some discussion.

### ***External State Analysis***

Based on PEST Analysis (PEST stands for Political, Economic, Social, Technological):

- A. *Political factor*: 2019 will be a political year (central government and parliament election), political heat expected to rise a bit and economy expected to slow down with “wait and see” tendencies. Fortunately, one of the political party head who is also the Minister of Industry has just launched the program that called “making Indonesia 4.0”, it is about campaigning the Industrial Revolution 4.0 with the objective to improve the competitiveness index of Manufacturing in Indonesia.
- B. *Economic factor*: Although the economy growth still positive and above 5%, due to the oversupplied condition, the competition in cement market still the major challenge.
- C. *Social factor*: The greatest concern of any possible negative externalities on individuals and society at large is about the increasing possibilities of the substitution of the human role by new technological innovations in the form of artificial intelligence, robotics, drones, virtual reality, and the IoT. As a result, certain jobs may be made redundant or obsolete through automation and the digitisation of the production process, the qualification requirements of new jobs will be different where new skills and knowledge will be required (Rabeh Morar, 2017).
- D. *Technological Factor*: Innovation and the disruptive technology that comes along with Industry 4.0 will impact the manufacturing industry quite significantly. According to McKinsey, there are 4 clusters of disruptive technology, these are: *data and connectivity, analytics and intelligence, human machine and interaction and digital-to-physical conversion*. As described in the introduction these disruptive technologies come along with Industry 4.0.

While according to PWC the business aspects that drive Industry 4.0 are: *digitisation and integration of vertical and horizontal value chains, digitisation of product and service offerings, and digital business models and customer access*.

In summary, the benefit of Industry 4.0 in general is about *Transparency, Predictability and Self Optimising processes*. The Industry 4.0 benefits above are general for all industries, of course, each industry will have different relevance and implications depending on the nature of the industry and the business process of the industry. More specifically, the benefit of Industry 4.0 in cement Industry According to Jennifer Scholze:

- 1) **Equipment monitoring: the first step.** These connected machines stream health and status data, which is captured by other machines or by monitoring systems. Should the data fall outside of normal parameters, alerts are triggered, allowing workers to immediately resolve the problem, or in some cases prompting the equipment to self-adjust. Real-time issue resolution or problem identification can save significant time and money.
- 2) **Predictive maintenance.** It enables to continuously monitoring and analysing of data transmitted from the equipment. Using this information, companies can proactively schedule maintenance during times of least impact and avoid unexpected, costly downtime.
- 3) **Predictive quality.** Once a company has implemented remote monitoring and predictive maintenance solutions, it's possible to take the next step toward predicting product quality.
- 4) **Connected logistics.** Collecting, comparing, and integrating data from multiple sources to identify best practices or anomalies is proving to be useful in making smart decisions that improve production yields and fleet management.

Based on Porter's Five Forces Model:

The supply demand situation of cement industry is quite challenging. Currently the existing supply capacity is 35% higher than the demand. The disparity is due to the impact of mass expansion and new player investment that happened starting on 2010. Unfortunately, the actual growth is much lower than the projection, and until 2024 the cement consumption will match the supply with assumption of growth of 8% (ASI, Presentation to Ministry of Industry, 2018).

This oversupplied condition creates pressure on the cement price. This is indicated by the decline in market share for three major players by 3% even though three major players have lowered their prices by 4% in 2016 and 8% in 2017 compared to 2016 prices. And there are many cement producers that exporting their product to improve their plant utilisation to reduce the production cost. The export players have to compete with the global player particularly regional players such as Thailand, Vietnam, India, and China, where their competitiveness index is better than Indonesia (Deloitte, Global Manufacturing Competitiveness Report, 2017).

Porter's Five Forces Model may be summed up as follows:

- 1) **Threat of New Entry:** The new low-cost players are entering domestic market building new plant in some area and to penetrate the market they always sell with lower price.
- 2) **Supplier Power:** Suppliers have more flexibility to sell their product and service as the number of cement industry is increasing. One of the biggest material costs is the fuel cost, and that is coal. With the increased demand on coal export and interruptions to production due to weather, regulation etc., this all makes the supplier power higher.
- 3) **Buyer Power:** As a commodity and with an oversupplied market, the buyer has a power to drive the price down.

- 4) ***Threat of Substitution***: Presently there is no new invention that can substitute cement as building material
- 5) ***Competitive Rivalry***: The rivalry among cement industries is very challenging due to the oversupplied condition. The company must increase the competitiveness in term of product value proposition and cost leadership through improving the productivity and efficiency in the whole company value chain

All external factor analysis shows that the competitiveness of company is very crucial to win the domestic market and the export market.

### ***Internal Present State Analysis***

#### ***Overall Business Condition***

Because of the oversupplied condition, their plant utilisation in 2018 is only around 50 %, which is quite low, and this creates an inefficient performance mainly related to production cost. This situation becomes worst knowing that the coal price also increased significantly from 35% in 2017 and 12% in 2018. So, with low utilisation and variable cost increase would add pressure on the company as they could not increase the product price too high as the market price is already high. To improve plant utilisation and also to reduce production cost, PT XYZ started to find an export market to improve their plant utilisation. Their export in YTD June 2018 is more than 30% of their total sales. With this high percentage of the export, they have to compete with the global player particularly regional player such as Thailand, Vietnam, India, and China. Therefore, the competitiveness for PT XYZ is very crucial both in the domestic market and the export market.

#### ***Industry 4.0 Existing Condition***

Based on the primary data obtained through questionnaires and interviews, it can be concluded regarding the conditions at PT XYZ related to the implementation of digital technology that is closely related to Industry 4.0, although PT XYZ does not mention it was Industry 4.0 technology. The existing condition includes the question about how commitment from management related to digital technology innovation that is aligned with disruptive technology brought by Industry 4.0 revolution, as well as the digital technology applications that have been applied by PT XYZ to support business operations and to increase the service levels to the customer in order to win the market. In terms of management commitment, PT XYZ has a high commitment to the implementation of digital technology, this is implied from the belief that the disruptive technology brought by Industry 4.0 is very important to speed up the decision making and control business operation. Besides that, the company has also compiled a digital transformation roadmap with a time frame of 2013 until 2019 onward, and it has implemented

the digital technologies in the entire value chain to support their business objective where the degree of implementation between one and another is different. This is aligned with their digital transformation platform.

### ***Business Solution***

### ***Readiness Assessment***

The assessment of readiness status is based on the existing primary data research result. The assessment tool is created by The University of Warwick in collaboration with Crimson & Co. and Pinsent Masons. The readiness assessment tool is comprehensive which cover 6 core dimensions i.e. 1) Strategy and organisation, 2) Products and services, 3) Manufacturing and operations, 4) Supply chain, 5) Business model, and 6) Supporting functions. For this study, the legal dimensions were excluded and replaced by supporting functions dimension as the focus is more on the technical readiness, the business strategy support, and people capability. One of the assessment results in manufacturing and operating dimensions as shown in table 1.

**Table 1:** Readiness level at manufacturing and operations dimensions of PT XYZ related to Industry 4.0

<b>Readiness level</b>	<b>Level 1 Beginner</b>	<b>Level 2 Intermediate</b>	<b>Level 3 Experienced</b>	<b>Level 4 Advanced</b>	<b>Exist-ing Status</b>	<b>Remark</b>
Automation	Automation can control few machines.	Automation can control some machines and system infrastructures.	Automation can control most machines and system infrastructures.	Automation can control machines and systems completely.	4	The plant is fully automated
Machine and operation system integration (M2M)	There is no M2M capability on machines and systems.	Up to some extent, machine and systems are interoperable	There is partially integration between machines and systems	There is fully integration between machines and systems	4	There is fully integration between machines and systems
Equipment readiness for Industry 4	To meet Industry 4 model, significant overhaul is required	Some machines and systems can be upgraded	Machines already meet some of the requirements and can be upgraded where required	Machines and systems already meet all future requirements	3	Some machine needs additional sensors especially for maintenance purpose

Self-optimising processes	Self-optimisation processes are not in use	Self-optimising processes are not in use, but there are pilots in more advanced areas of the business	Self-optimising processes are used in selected areas	Self-optimising processes are widely used	1	Optimisation is done manually based on the analysis of automatically collected data
Digital modelling	No digital modelling	Some processes use digital modelling	Most processes use digital modelling	Complete digital modelling used for all relevant processes	1	No digital modelling
Operations data collection	Data is collected manually when required, e.g. sampling for quality control	Required data is collected digitally in certain areas	Comprehensive digital data collection in multiple areas	Comprehensive automated digital data collection across the entire process	2	Required data is collected digitally in certain areas
Operations data usage	Data is only used for quality and regulatory purposes	Some data is used to control processes	Some data is used to control and optimise processes, e.g. predictive maintenance	All data is used not only to optimise processes, but also for decision making	3	Some data is used to control and optimise processes, e.g. predictive maintenance
Maintenance system	There are no sensors on main equipment for maintenance purpose	There are basic sensors on main equipment and connected to the online monitoring	There is a smart sensor and connected to the analytic application but applied for one or two machines	All main machine is equipped with smart sensors and connected to the analytic application	2	There are basic sensors on main equipment and connected to the online monitoring
Cloud solution usage	Cloud solutions not in use	Initial solutions planned for cloud-based software, data storage and data analysis	Pilot solutions implemented in some areas of the business	Multiple solutions implemented across the business	3	Pilot solutions implemented in some areas of the business

IT and data security	IT security solutions are planned	IT security solutions have been partially implemented	Comprehensive IT security solutions have been implemented with plans developed to close any gaps	IT security solutions have been implemented for all relevant areas and are reviewed frequently to ensure compliance	3	Comprehensive IT security solutions have been implemented with plans developed to close any gaps
Average					2.6	

The average level of readiness Industry 4.0 in the Manufacturing and Operation dimension in PT XYZ is 2.6 or in between “intermediate” and “experienced” level. There are many weak points in this manufacturing and operations dimensions. The aspects that have a readiness level below 3 or even below 2 are the ones that need to be addressed for further analysis such as the self-optimising process, digital modelling, operations data collections, maintenance system, and cloud solution usage.

And overall readiness of PT XYZ,

**Table 2:** Overall Readiness level of PT XYZ related to Industry 4.0

Dimensions	Readiness level	Remark
Strategy and organisation	3.1	The weakest point is on the people and capabilities aspect
Products and services	3.0	The readiness level of product and services is already good enough
Manufacturing and Operations	2.6	There are many rooms of improvement in this dimension and no need big investment
Supply chain dimensions	3.3	The readiness of the supply chain dimension is already good enough
Business model dimensions	2.8	The weakest point is on real time automated scheduling
Supporting Functions dimensions	3.3	The readiness of supporting functions is already good enough
<b>Average</b>	3.02	

In general, the level of readiness of PT XYZ that related to Industry 4.0 can be concluded to be quite good approaching experienced level. This is good news considering nationally, the Government of Indonesia has just launched Program making Industry 4.0 in April 2018, while PT XYZ has launched a digital transformation starting in 2013.

### ***Benchmarking Analysis***

To see whether this position is safe enough in terms of competitiveness. The next approach will be able to map the strength and weakness that are useful for further evaluation. To see the readiness level at the national level, the benchmark that was taken was one of the local cement Industry (PT ABC) that was a member of a global cement industry group, while for the regional level, the benchmark that was taken was one of the companies in Thailand (SCCC Thailand) that is believed to have almost advanced readiness levels. From this benchmarking analysis, it can be used to determine the SWOT analysis of PT XYZ related to Industry 4.0 and furthermore it can be continued to determine the next plan which will be based on business risk analysis and prioritisation. As a local competitor, now PT ABC is running the digital transformation that expected to be finished by the beginning of 2019, therefore the estimated readiness level after the project is completed will be mapped out also.

### ***Benchmarking Result***

<b>Dimensions</b>	<b>PT XYZ</b>	<b>PT</b>	<b>SCCC</b>	<b>PT ABC near</b>
Strategy and organisation	3.1	2.6	4	3.1
Products and services	3.0	2.3	3.3	3
Manufacturing and Operations	2.6	2.8	3.9	2.8
Supply chain dimensions	3.3	2.7	3.7	3.7
Business model dimensions	2.8	2.5	4	2.8
Supporting Functions dimensions	3.3	2.8	3.8	3.5
Average	<b>3.02</b>	<b>2.6</b>	<b>3.8</b>	<b>3.2</b>

Through the readiness level elaborated abovementioned, it can be concluded that the overall readiness between three companies are overlapping in each dimension. Nevertheless, PT XYZ tends to be in the middle. Based on the readiness level assessment, where covers all dimension then it can be analysed the strength, the weaknesses, the opportunity and the threat (SWOT) of PT XYZ related to the Industry 4.0

### SWOT Analysis

**Table 3:** SWOT Analysis of PT ABC related to Industry 4.0

<p><u>STRENGTHS</u></p> <p>The average readiness level related to Industry 4.0 is already at the experienced level (level 3). That is indicated that PT XYZ already implemented the Industry 4.0 technology at a high enough level. The strategy and organisation dimensions especially on the strategy implementation degree by having clear digital transformation roadmap.</p> <p>Strong leadership commitment related to the digital transformation that shown by the digitisation roadmap and the progress of implementation.</p> <p>The implementation already on the level of "end to end business" although the degree of implementation is not the same depend on the business priority</p> <p>The supply chain dimensions readiness level is high (higher than level 3, especially on the supply chain visibility aspect where there are many applications related to the supply chain and integrated into one dashboard report.</p> <p>The supporting functions dimensions readiness level is high (higher than 3). That indicated by most HR functions use digital application, most Procurement processes use digital application, and in finance functions, most of the ERP system is integrated with relevant digital applications of other functions.</p> <p>The infrastructure has been prepared with the high specification that ready to adopt the industry 4.0 technology.</p>	<p><u>OPPORTUNITIES</u></p> <p>Additional revenue through increased customer loyalty by providing a better value proposition through digital features of products and services.</p> <p>Improve Plant Overall Equipment Efficiency by 2% to 4% and reduce the maintenance cost by 10% by improving the weakness related to the Manufacturing and Operations dimensions such as Self-optimising process and digital maintenance system refer to SCCC best practice (Fujitsu, 2018)</p> <p>According to the McKinsey survey, Companies expect Industry 4.0 to increase revenues by 23 percent and productivity by 26 percent within 5 years (McKinsey Company, 2015).</p> <p>According to PWC survey, most company believe they will see a return on investment (ROI) within two years (PWC, 2016).</p>
<p><u>WEAKNESSESS</u></p> <p>People capabilities: The employee with some digital skills already in place but the skills in the internal resources are not always able to analyse the latest technology, while the user is very demanding for the operational effectiveness of the work. The challenge is the flexibility of the people in responding to the business changes.</p> <p>Self-optimising processes: Self-optimisation processes are not in use, and optimisation is done manually based on the analysis of automatically collected data.</p> <p>Digital modelling: No digital modelling in plant process.</p> <p>Operations data collection: Required data is collected digitally in certain areas.</p> <p>Maintenance system: There is no a smart sensor and connected to the analytic application. There are only basic sensors on main equipment and connected to the online monitoring.</p> <p>Real-time and automated scheduling: Some machines alert operators of a performance issue which enables them to manually schedule a maintenance task. There is no smart sensors and smart analytic machine on main equipment.</p>	<p><u>THREATS</u></p> <p>Lack of Digital capabilities in the works force.</p> <p>One of the big competitors, PT ABC is doing the digital transformation with the aggressive approach.</p> <p>One of the regional competitors, SCCC Thailand already reached advanced level related to Industry 4.0.</p> <p>The reluctant of the company to make investment related to the innovation technology due to the tight market competition.</p> <p>Confidentiality and data security.</p> <p>Reliable infrastructure (hardware, software, network, platform and application).</p>



From the above analysis, it can be seen some points of strength, the weakness, the opportunity, and the threat. The strength result shows the advantage or the uniqueness of PT XYZ as a strong foundation to the next level. The weakness, the opportunity, and the threat are the results that need to be followed up with a business risk assessment to prioritise the action that needs to be taken (Javanmard et al, 2018).

### ***Business Risk, Challenge and Opportunity Assessment***

The business risk assessment is based on the SWOT analysis result. The assessment describes the likelihood (chance) and the impact on the business. The criteria of risk and opportunity level refer to the one of the Indonesia cement industry risk assessment best practice. *Likelihood (chance)* criteria: Low: <10%, Medium: 10 – 50%, High: 50-90%, Very high: >90%. *Impact on Operating profit* criteria: Low: 1.25 -2.5%, Medium: 2.5 – 5%, High: 5 – 10%, Very high: >10%

### *Opportunity Assessment*

**Table 4:** Opportunity's assessment based on SWOT analysis result of implementing Industry 4.0 technologies

No	Opportunity Description	Likelihood (chance)	Impact on Operating profit	Remark
1	Additional revenue through increased customer loyalty by providing a better value proposition through digital features of products and services	High	High	The likelihood of this opportunity is high (between 50% to 90%), considering that in the tight competition market, the added value proposition will be adding the value to the customer where the customer behaviour is increasingly familiar with digital features both in terms of product and service. While the impact on the operating profit also high. It assumed the revenue can be increased by 2% (based on the PWC and McKinsey survey and expectation from management), then the impact on operating profit become 7.5%.
2	Digital Productivity Improvement: Improve Plant Overall Equipment Efficiency by 2% to 4% and reduce the maintenance cost by 10% by improving the weakness related to the Manufacturing and Operations dimensions such as Self-optimising processes and digital maintenance system refer to SCCC best practice (Fujitsu, 2018).	High	High	The likelihood and the impact on the operating profit of this opportunity is high. This is based on the survey result from McKinsey, PWC and the best practice of SCCC Thailand where they can increase the productivity by 3%.

Both additional revenue opportunity and productivity improvement opportunity related to the Industry 4.0 technologies, the likelihood and the impact on the business is high. For the additional revenue opportunity, the high likelihood is due to the added value proposition that

will impact positive value to the customer where the customer behaviour is increasingly familiar with digital features both in terms of product and service, while for the impact on the business is based on the survey that is concluded by McKinsey and PWC as explained in the table. For the productivity improvement, the high likelihood is based on the survey results from McKinsey, PWC and the best practice of SCCC Thailand where they can increase the productivity by 3%.

### *Threat Assessment*

**Table 5:** Threat's assessment based on SWOT analysis result of implementing Industry 4.0 technologies

No	Threat Description	Likelihood (chance)	Impact on Operating profit	Remark
1	Lack of Digital capabilities in the works force	High	High	Based on the current condition, PT XYZ has issue related to the lack of digital capabilities in the work force. This is potential to be the barrier of the implementation of digital transformation program where has an impact on productivity and revenue
2	Digital Competitor actions: One of the big competitors, PT ABC is doing the digital transformation with the aggressive approach	High	Low	Related to the Industry 4.0 technology implementation, PT ABC as one of the main competitors has the strength on the manufacturing and operation dimension and now they are running the digital transformation program that potential to increase the value proportion of their product and value. This potentially will have an impact on the goal of PT XYZ to have better revenue capture.
3	Regional Competitor advance readiness level: One of the regional competitors, SCCC Thailand already reached advanced level related to Industry 4.0	Very high	Low	SCC Thailand already in advanced level related to the industry 4.0. Their competitiveness level at the regional level is better than PT XYZ. And this condition has a potential impact on the export competition.

4	Reluctance for digital investment: The reluctant of the company to make investment related to the innovation technology due to the tight market competition.	Medium	High	Now companies aware that to improve the competitiveness they must invest on innovative technology. Based on the PWC survey, companies in average willing to invest with the amount of 5% of their revenue per year, and most of them believe that the payback will be within two years (PwC, 2016).
5	Digital trust and data security	Very high	Very High	With the digital ecosystem where the use of data is much bigger and broader, it creates the issue around cybersecurity. More data collection and more data exchange through more touch points, also mean more potential for entry for an attacker.
6	Reliable infrastructure (hardware, software, network, platform and application)	Medium	Medium	Technology providers that capable to provide the infrastructure as required by Industry 4.0 for cement industry already available in the market and reliable proven.

Based on the above threat assessment, the threats that have both high/very high likelihood and high/very high impact on the business due to lack of digital capabilities and digital trust and data security.

### **Prioritisation**

Based on the business risk assessment result, the business needs to prioritise the opportunities and the threats that need a mitigation plan. The priority of opportunity and the threat is based on the category of high and very high (for both the likelihood and the impact on the business.) So, based on above criteria, the mitigation plan priority is as follows:

**Table 6:** Mitigation action/initiatives

No	Opportunity/Threat	Mitigation action / initiatives
1	Digital trust and data security: With the digital ecosystem where the use of data is much bigger and broader, it creates the issue around cybersecurity. More data collection and more data exchange through more touch points, also mean more potential for entry for a hacker	Ensure the digital trust and data security are in place: Create standard operating procedures related to access and use of tools connected to the internet Create architectures so the sensitive data can be protected from hackers such as firewall implementation, data encryption and other techniques. Periodically conduct audits and security tests such as ethical hacking, etc.) Create operational tool/dashboard to monitor and manage all security points.
2	Lack of Digital capabilities in the works force: Based on the current condition, PT XYZ has issue related to the lack of digital capabilities in the work force. This is potential to be the barrier of the implementation of digital transformation program where has an impact on productivity and revenue.	People development and develop Digital culture: Develop strategy to attract people that has knowledge and skill of digital Conduct training the existing resources that can implement the digital transformation program in place Introduce new role in the organisation that related to the digital competence. Develop the digital campaign that the new era of digital workspace is coming where covering end to end process for all users across different channels
3	Additional revenue through increased customer loyalty by providing a better value proposition through digital features of products and services.	Digital features of product and services Integrate the customer data (distributor and transporter) that managed by internal sales team with the customer data (retailer and end customer) that managed by the distributor to be a real-time system Increase the usage of product data and customer data for sales improvement and marketing improvement with more customer interaction as the impact of the integration of two sources of customer data.
4	Digital Productivity Improvement: Improve Plant Overall Equipment Efficiency by 2% to 4% and reduce the maintenance cost by 10% by improving the weakness related to the Manufacturing and Operations dimensions such as Self-optimising process and digital maintenance system refer to SCCC best practice.	Smart factory: Install process Self-optimising system. Plant already have automation system and real time monitoring system, so no big infrastructure required. Please see figure 18 for more detail Install smart sensors and data analytic on all main machine and connected to IoT.

## **Conclusion and Implementation Plan**

### ***Conclusion***

In general, the level of readiness of PT XYZ that relates to Industry 4.0 can be concluded to be quite good approaching experienced level. There are many Industry 4.0 technologies that have been implemented along the company value chain (Sohrabi, 2017).

Based on the benchmarking analysis, compared to the local competitor PT ABC, the readiness status of PT XYZ related to Industry 4.0 is better, but PT ABC is running the digital transformation that expected by the end of 2018 to be completed and expected the readiness level would, as a result be better than the current condition of PT XYZ. Meanwhile, benchmarking with SCCC Thailand, the regional competitor, shown that their readiness level related to the Industry 4.0 is much better than PT ABC. SCCC Thailand readiness level is almost on the advanced level

Based on the SWOT analysis and Business Risk Assessment which considering the result from readiness assessment and benchmarking analysis, there are two main opportunities and two main threat that PTXY is facing related to the Industry 4.0 as follows:

### ***Opportunities***

- Additional revenue through increased customer loyalty by providing a better value proposition through digital features of products and services.
- Productivity Improvement by implementing Self-optimising system and digital maintenance system

### ***Threats***

- Digital trust and data security, with the digital ecosystem where the use of data is much bigger and broader, it creates the issue around cybersecurity. More data collection and more data exchange through more touch points, also mean more potential for entry for a hacker.
- Lack of Digital capabilities in the works force, that potential to be the barrier of the implementation of digital transformation program where has an impact on productivity and revenue.

There are 4 prioritized initiatives that PT XYZ need to do in order to grab the opportunity and to mitigate the threat related to the Industry 4.0:

- 1) Ensure the digital trust and data security are in place.

- 2) People development and develop the Digital culture
- 3) Integrate two web sales system (the one that managed by internal and the one that managed by distributor) and increase the usage of product data and customer data.
- 4) Develop the Smart Factory system

### **Implementation Plan**

**Table 7:** Implementation plan

#	Initiatives	PIC	Time frame 2019				Estimated Cost IDR (Mio)	KPI
			Q1	Q2	Q3	Q4		
1	<p><b>Ensure the digital trust and data security are in place:</b>            Create standard operating procedures related to access and use of tools connected to the internet            Create architectures so the sensitive data can be protected from hackers such as firewall implementation, data encryption and other techniques.            Periodically conduct audits and security tests such as ethical hacking, etc.)            Create operational tool/dashboard to monitor and manage all security points.</p>	IT Manager					750	The digital security system is in place
2	<p><b>People development and develop the Digital culture:</b>            Develop strategy to attract people that has knowledge and skill of digital.            Conduct training the existing resources that can implement the digital transformation program in place.            Introduce new role in the organisation that related to the digital competence.</p>	HR Director					250	Digital skills and digital culture are in place

	Develop the digital campaign that the new era of digital workspace is coming where covering end to end process for all users across different channels.						
3	<b>Integrate two web sales system</b> (the one that managed by internal and the one that managed by distributor) and increase the usage of product data and customer data.	Marketing Director				900	Two web sales systems are integrated. Data analytics for sales, product, and customer are in place
4	<b>Develop the Smart Factory system:</b> Install process Self-optimising system. Plant already have automation system and real time monitoring system, so no big infrastructure required. Install smart sensors and data analytic on all main machine and connected to IoT.	Manufacturing Director				8,175	Self-optimising system and smart sensors with data analytics are in place

Total investment cost is estimated around IDR 10 billion, with the payback period less than one year and positive NPV. <sup>2</sup>

<sup>2</sup> With the assumption of revenue increase by 2% and production cost decrease 3% refer to PWC Global Survey and SCCC Thailand best practice

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