Challenges in Facing Industry 4.0 and Society 5.0 in Indonesia and How to Overcome: Social-Economic Perspectives

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Abstract
Nowadays, the society among the world has been experiencing transformation to industrial revolution 4.0 along with transformation to society 5.0 that known as Super Smart Society which its characteristics are liberation; disparity deficiency; improving efficiency; society's necessities fulfillment; privacy matter; modern values formation. Although Indonesia is one of the emerging countries that estimated increasing rapidly in Gross Domestic Product, Indonesian society has not been fully able to transform towards society 5.0. Caused by the high rate of Indonesia's diversity in the aspect of geographic, natural resource, demographic, ethnic, and culture, Indonesia has to confront various, complex, and unique issues. Indonesia also faces the unbalanced development issue as a result of the former government's Java-centric policies. Although in the new government puts development aspect (especially in infrastructure sector) as a priority, due to extraordinary large Indonesia's areas, numerous harder efforts are still required to achieve ideal condition. This paper aims to review Indonesia's current social-economics condition and the challenges that Indonesia's society confronts to be part of society 5.0. The results of this study have described the socio-economic map in Indonesia using cluster analysis based on the educational and the Gross Regional Domestic Product conditions of the provinces in Indonesia. By adopting the concept of Smart Province and Economic Sharing, this study proposes the existence of a specific development approach in each cluster to deal with industry 4.0 and transformation to society 5.0.

Keywords: industry 4.0, society 5.0, social-economic, Indonesia

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Introduction

According to (Price Waterhouse Cooper, 2017) that the emerging markets will continue to be the engine of global economic growth. In 2050, the E7 economies can increase their share of world GDP from about 35% to nearly 50%. China potentially becoming the largest economy in the world, accounts for approximately 20% of world GDP by 2050, with India in second place and Indonesia in fourth place (based on GDP at PPP). G7 group is advanced economies of Canada, France, Germany, Italy, Japan, United Kingdom, and the United States, while E7 is a group of emerging market economies of Brazil, China, India, Indonesia, Mexico, Russia, and Turkey. GDP at PPPs is the gross domestic product at purchasing power parity adjusts for price level differences across countries.

Countries	2016	2050	Countries
China	1	1	China
US	2	2	India
India	3	3	US
Japan	4	4	Indonesia
Germany	5	5	Brazil
Russia	6	6	Russia
Brazil	7	7	Mexico
Indonesia	8	8	Japan
UK	9	9	Germany
France	10	10	UK

Source: PwC (2017)   ■ G7   ■ E7

Figure 1. Top 10 economies in 2050 (GDP at PPPs)
Source: (Price Waterhouse Cooper, 2017)

Based on Figure 1, the G7 ranking all goes down, and between E7, China and Russia remain, India rises one rank, Brazil rises two ranks, Indonesia rises four places, and Mexico rises rapidly. This figure illustrates that Indonesia has an excellent opportunity to be able to contribute to the world economy and also to the welfare of the Indonesian people, as well as being able to take part in the industry 4.0 era.

Even though in 2050, Indonesia's GDP is ranked fourth in the world, according to (Price Waterhouse Cooper, 2017) the condition of Indonesia's GDP per capita is not as high as other countries. Indonesia's GDP per capita is only included in the intermediate criteria, among the nine groupings of GDP per capita in the countries of the world.

Another thing that creates optimism for Indonesia is the increasing number of start-up businesses in Indonesia that are included in the unicorn on the world stage. The Unicorn is Tokopedia and Bukalapak (e-commerce), Go-Jek (on demand), and Traveloka (travel tech). As of March 2019, the cumulative market value of all Unicorns is approximately USD 1.038 billion. Unicorns in Indonesia do not show a

declining growth trend. Around 50 or more new companies are projected to reach USD 1 billion (Ministry of National Development Planning of the Republic of Indonesia, 2019).

However, the projections above create optimism, but there are still many problems that must be solved first so that these opportunities can truly be realized. There are several problems faced, one of which is the high disparity in social and economic aspects. Figure 2 illustrates some of these problems.

Source: Population Census and Indonesia Population Projection 2010-2035

Figure 2. Indonesia diversities on geographic and demographic aspects
Source: (BPS, 2018)

Figure 2 illustrates the problems faced by Indonesia in the social aspect. In this case, in terms of the diversity of population density by province. There are four provincial groups based on population density. This situation is one of the causes of the uneven development between provinces, considering that human resources in quantity are also an essential factor in development.

Another problem in social matters is the low level of education in Indonesia in general. Besides, there is still an uneven level of higher education between regions in Indonesia. Based on data from the welfare statistics 2017, the percentage of population aged 15 years and above based on education is as follows: Primary and Secondary Schools (69.12%), Higher Education namely Diploma 1,2,3, and Strata 1,2,3 (13.88%), the remaining 17% are uneducated

Based on the explanation above, it can be seen that education is still a social problem faced by Indonesia. On the other hand, intellectual capital is a form of the knowledge economy, which is an industry prerequisite 4.0 and society 5.0. Thus, the educational problems faced by Indonesia have the potential to hinder the achievement of industry 4.0 and society 5.0.

The Study Objectives

This study aims to review Indonesia current social-economic condition, and the challenges that Indonesia's economic and society confronts to be part of industry 4.0 and society 5.0, and how to overcome.

Research Questions

1. Is the challenge in the form of social and economic diversity can be overcome by clustering the provinces in Indonesia?
2. What strategies can be implemented by Indonesia to face challenges towards industry 4.0 and society 5.0?

Literature Review

1. Industry 4.0 and society 5.0

According to Amit Supe in (Zaidin, Diah, Yee, & Sorooshian, 2014) and (i-scoop, 2016) Industry 4.0, which is also often called the fourth industrial revolution, is the transformation of the industry by assimilating the Internet of Things (IoT), information integration and other high technology that began in the manufacturing sector. Then it expanded to many sectors outside the industry such as transportation, utilities, oil and gas, mining and metals and other segments, including the resource, health, pharmaceutical, smart city industries.

Shwab, in his publication *"The Fourth Industrial Revolution"* (Schwab, 2016) stated: There is the potential impact of the fourth industrial revolution on the economy, business, governments and countries, society and individual, as follows:
- Economy: Growth, aging, productivity, employment, labor substitution, and skills, impact on developing economies
- Business: Customer expectation, data-enhanced products, collaborative innovation, new operating models, combining the digital, physical, and biological worlds.
- National and Global: Governments, countries, regional, and cities
- Society: Inequality and the middle class, community
- The Individual: Identity, morality, and ethics, human connections, managing public, and private information.

According to (Intelligence on Global Japan, 2017), society 5.0 has become Japan's main vision for the future. It is a super-smart society where technology such as big data, Internet of Things (IoT), artificial intelligence (AI), and robot fuse into every industry and across all social segments.

Super Smart Society characteristics are: liberation; disparity deficiency; improving efficiency; society's necessities fulfillment; privacy matter; modern values formation. Yuichihiro Anzai in (CRDS-Japan Science and Technology Agency, 2016) stated that society 5.0, known as the Super Smart Society, emphasized the importance of improving the quality of human life compared to increasing the power of technology. Also, it is hypothesized that the innovation job ecosystem can always contribute to a people-centered economy that is better at maximizing human value compared to arbitrary task-centered economy. Refers to Japan Business Federation in (Hitachi

Review, 2017) that society 5.0 is a new society that was created by the transformation that was led by scientific and technological innovation. It is characterized by: everyone gets his needs with the right type, quantity, quality, and time with excellent service. Thus everyone has a comfortable life. Communities with differences in age, sex, region, language, and so on, all get support.

2. Smart city and smart province

Smart city/province is a city/province that can manage various resources effectively and efficiently to solve multiple challenges of cities/provinces using innovative, integrated and sustainable solutions to provide infrastructure and provide city/provincial services that can improve the quality of life of their citizens (Supangkat, 2018).

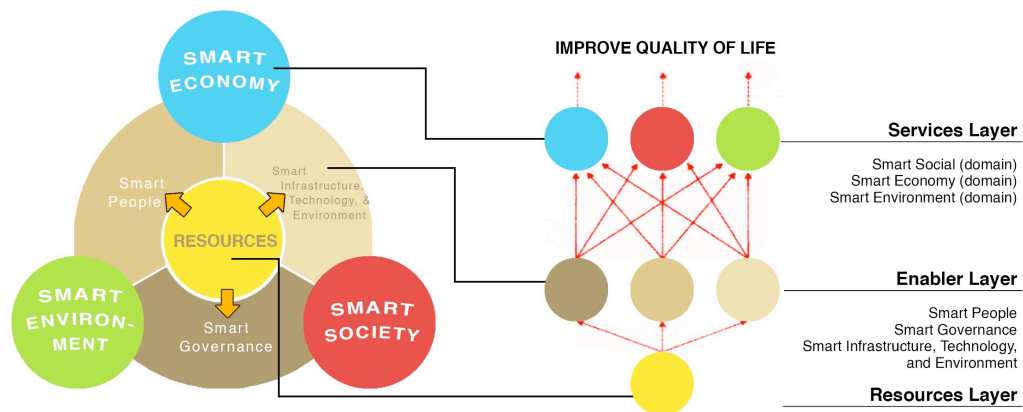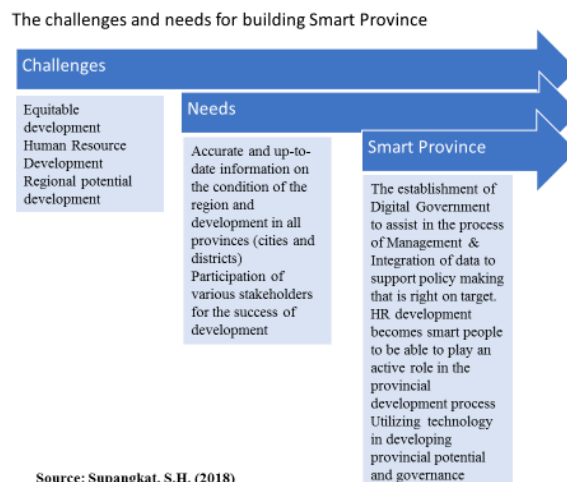Figure 3. Smart City model
Source: (Supangkat, 2018)

The challenges and needs for building Smart Province are as in Figure 4

Figure 4. The challenges and needs for building Smart Province
Source: (Supangkat, 2018)

3. Sharing Economy

Sharing Economy is an economic system that is based on people sharing possessions and services either for free or for payment, usually using the internet to organize this (Cambridge University, 2019). According to (Kopnina, 2015) and (B.Schor & J.Fitzmaurice, 2015), sharing economy discusses the use, accessibility, ownership, facilitation of the internet, and issues of resource management, including social capital. The Ensuk, et al. research (Sung, Kim, & Lee, 2018) included economic benefits, enjoyment, social relationships, networking effects and sustainability variables in a two-way relationship model between customers and providers in the sharing economy model.

Methodology

This study uses a quantitative-qualitative approach by conducting a literature review and analyzing statistical data. The type of data used in this study is secondary data obtained from the 2018 Indonesian Statistical Yearbook by the Indonesian Central Bureau of Statistics (BPS, 2018). The scope of the data consists of Gross Regional Domestic Product (GRDP) and Population in each province in Indonesia, representing economic conditions of the people in each region. Data on tertiary education in each province in Indonesia (number of universities, number of students, number of lecturers), represents community concern in the social aspects (in this case is the aspect of human development) in each region. Data were analyzed using cluster analysis to determine economic and social diversity between regions in Indonesia. The next step is to map the provinces in Indonesia to each cluster. The concept of sharing economy and smart cities/provinces is used as a framework to find solutions to this problem, which is expected to be the right strategy to deliver Indonesian people to the industrial era 4.0 and society 5.0.

Results and Discussion

1. **Cluster Analysis Classification of Indonesia provinces based on Economic factor (GRDP and Population), and Social Factors (number of populations, number of universities, number of students, number of lecturers)**

According to the analyses, sequencing order by a number of students, University, Population, GRDP, and in the last sequence is the number of lecturers. It explains technically how the data is analyzed by the SPSS program.
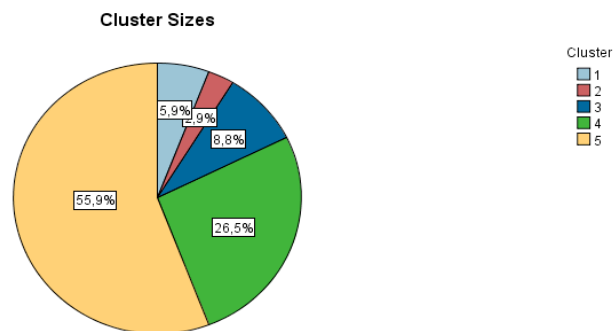
Clusters

Input (Predictor) Importance
■ 1,0 ■ 0,8 □ 0,6 □ 0,4 □ 0,2 □ 0,0

Cluster	5	4	3	1	2
Label					
Description					
Size	55,9% (19)	26,5% (9)	8,8% (3)	5,9% (2)	2,9% (1)
Inputs	Student 62.131,32	Student 174.679,44	Student 759.524,00	Student 404.602,50	Student 4.684.123,00
	University 32,89	University 93,11	University 334,00	University 244,00	University 323,00
	Population 2.590,42	Population 6.417,53	Population 40.529,50	Population 11.476,20	Population 10.374,20
	GRDP 2017 80.623,26	GRDP 2017 261.213,33	GRDP 2017 1.239.717,00	GRDP 2017 388.220,00	GRDP 2017 1.635.856,00
	Lecturers 2.443,42	Lecturers 6.602,44	Lecturers 27.145,67	Lecturers 14.433,00	Lecturers 28.119,00

Figure 5. The sequence of distinguishing variable in cluster analysis

Based on cluster analyses, the results can be revealed in Figure 6, which shows that the optimal number of clusters to group 34 provinces in Indonesia is five clusters. The size of each cluster in percentage is shown in Figure 6, which are from the largest to the smallest, respectively 2.9%, 5.9%, 8.8%, 26.5%, and 55.9%.

Cluster Sizes

Cluster
□ 1
■ 2
■ 3
■ 4
■ 5

5,9% 2,9%
8,8%
55,9%
26,5%

Size of Smallest Cluster	1 (2,9%)
Size of Largest Cluster	19 (55,9%)
Ratio of Sizes: Largest Cluster to Smallest Cluster	19,00

Figure 6. Cluster Sizes

Furthermore, the provincial composition in each cluster is as shown in Table 1.

CLUSTER				
1	**2**	**3**	**4**	**5**
Sumatera Utara	DKI Jakarta	Jawa Barat	Aceh	Jambi
Sulawesi Selatan		Jawa Tengah	Sumatera Barat	Bengkulu
		Jawa Timur	Riau	Kepulauan Bangka-Belitung
			Sumatera Selatan	Kepulauan Riau
			Lampung	Nusa Tenggara Barat
			DI Yogyakarta	Nusa Tenggara Timur
			Banten	Kalimantan Barat
			Bali	Kalimantan Tengah
			Kalimantan Timur	Kalimantan Selatan
				Kalimantan Utara
				Sulawesi Utara
				Sulawesi Tengah
				Sulawesi Tenggara
				Gorontalo
				Sulawesi Barat
				Maluku
				Maluku Utara
				Papua Barat
1 Provinces	2 Province	3 Provinces	9 Provinces	19 Provinces

Table 1. Provinces list in each cluster

The following discriminant analysis is carried out to test the significance of differences between clusters which are the justification for the number and composition of clusters resulting from this cluster analysis.

Tests of Equality of Group Means					
	Wilks' Lambda	F	df1	df2	Sig.
University	,052	133,171	4	29	,000
Student	,006	1256,075	4	29	,000
Lecturers	,075	89,755	4	29	,000
GRDP 2017	,073	92,057	4	29	,000
Population	,054	127,166	4	29	,000

Table 2. Discriminant Analysis

Based on the results of the analysis, there are 5 clusters, in which in one cluster there are similarities in GRDP, number of populations, number of universities, number of students, and number of lecturers.

2. The smart province model and the concept of sharing economy as a framework to find solutions to the social-economic problem, which is expected to be an appropriate strategy to deliver Indonesian society into the industrial era 4.0 and society 5.0
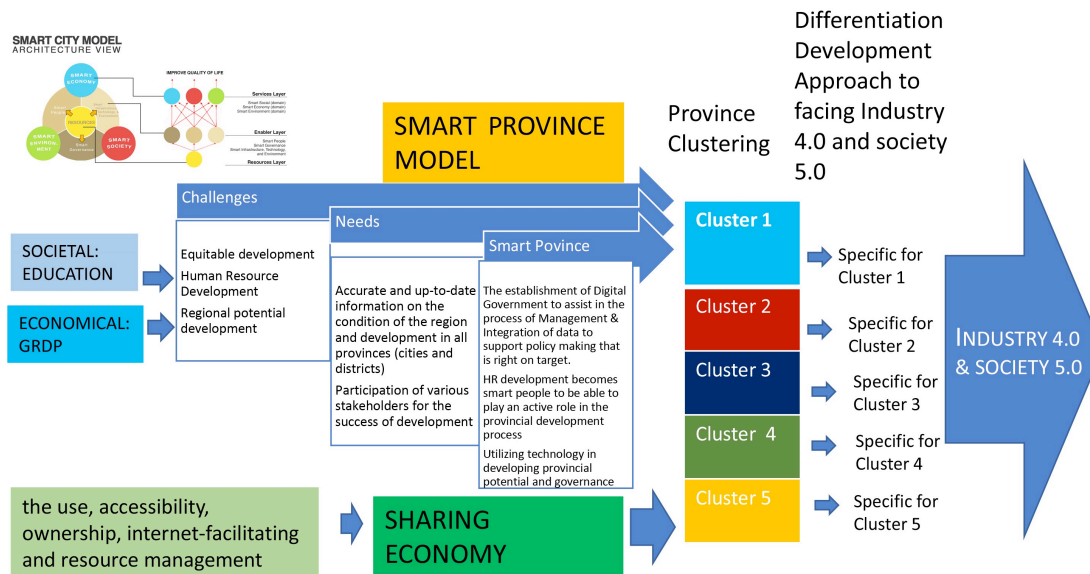

Figure 7. Proposed Model

The results of the analysis show that there are five provincial clusters in Indonesia that have different economic characteristics and one another's society. In general, Indonesia faces industry 4.0 challenges, but with five distinct clusters, it is proposed that the Government and other stakeholders need to make a different approach, even though the model may be the same. The model adopted in this research is the Smart Province Model by Supangkat (2018).

Figure 7 illustrates the Smart Province model which is an extension of smart city with the same basic concept, namely the existence of Services Layer (Smart Economy, Smart Society, Smart Environment), Enabler layer (Smart people, Smart Governance, Smart Infrastructure, Technology, Environment), and Resources Layer. The challenges that exist in developing Smart Province, namely the challenges of Equitable development and Human Resource Development can be overcome by increasing the quantity and quality of education while the challenges of the Regional potential development can be overcome by increasing economic development that increases GRDB. Education and GRDP are the perspectives examined in this study that represent the social and economic aspects of society. What is needed in developing smart provinces includes: Accurate and up-to-date information on the condition of the region and development in all provinces (cities and districts). This study contributes information about the optimal number of provincial clusters, namely 5 clusters, and mapping of each province in clusters that correspond to their respective characteristics. Furthermore, with the mapping of each province, a specific strategy and development policy for smart province can be made according to the nature of the cluster. In this case, five specific strategies and policies can be drawn up, to lead Indonesian people to Industry 4.0 and society 5.0.

Sharing economy will be an acceleration of development. Indonesian people are quite ready to support this. Indonesia society is the top 5 world internet users, 50%

population connected, 49% population use social media, 67% has phones, 45% on mobile screens. The population of Indonesia is 265.4 million peoples (Asosiasi Industri Teknologi Informasi Indonesia, 2018). This data is the basis of why the social capital factor is used as a driving factor to solve the problems faced by Indonesia in entering industry 4.0 and society 5.0.

Conclusion

Indonesia has great potential to develop in the future and can keep up with the industry in the direction of industry 4.0 and society 5.0, as indicated by the potential of Indonesia to become the 4th largest GNP country in the world by 2050. Indonesia still faces challenges in the form of disparity and diversity in terms of demographic, geographic, social, and cultural factors, so that condition to be an obstacle in formulating and implementing development strategies. This research suggests a grouping of provinces in Indonesia into five provincial clusters based on their social and economic characteristics, represented by education and GRDP. By simplifying the diversity of 34 provinces into five provincial groups, it will facilitate the formulation and implementation of development strategies in each province based on the characteristics of their respective clusters. By adopting the concept of Smart Province and Sharing Economy, this research proposes the existence of a specific development approach in each cluster to transform it towards industry 4.0 and society 5.0. Other research is still needed to discuss other factors that affect Indonesia's ability to deal with industry 4.0 and society 5.0.

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