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INDUSTRY 4.0 AND THE NEED FOR PROPER GOVERNANCE

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Abstract: This paper attempts to fill the gap of that literature by fosussing more on the issu of what is the most industry 4.0 challenge for governing a nation state?. In so doing, the paper will begin with outlining briefly the origin and componets of Industry 4.0, as well as its challenge for the governance. After that, the discussion will be directed to criticise the current Good Governance concept, then proceeded to propose the so called a Proper Governance concept which is belief more suitable to meet the challenge of industry 4.0.

Keyword : Industry 4.0, Proper Governance, Need

INTRODUCTION

Soon upon the Germany introduced Industry 4.0 at the Hannover Fair event in 2011, extensive efforts were undertaken by scholars, in general, and the European manufacturing researchers, in particular, to embrace it. Their interest in this project or concept is due to the fact that under Industry 4.0, production process will become more efficient and less costly (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1389). Numerous of literature then were produced as resulted from their work on the subject which is mostly focusing on the technological aspect, including the adoption and the implementation of that new emerging technology in the society and its promotion (Manda and Dhaou, 2019: 245). However a more important complexity aspects beyond the technology, such governance and its institutional setting seems to have received a little attention from scholars.

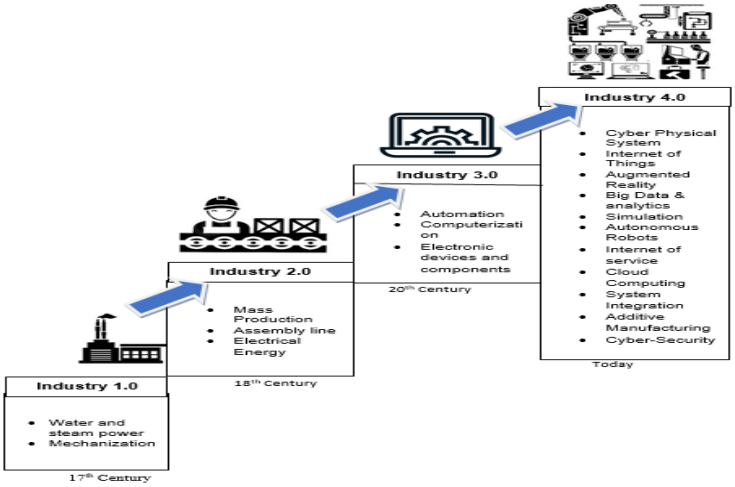
Although there have been some literatures directed to unfold the pivotal role of governance in response to the challenge of Industry 4.0, they seem to have been emphasised more on a micro level perspectif, such as the task must be taken by government to make sure the manufacturing will be well prepared for the next generation of industry revolution. Even narrower to a micro level point of view by just outlining the way in which a manufacturing ought to be governed in order to meet the challenge of Industry 4.0. The same holds true, I would say, for the governance in a wider context, such the way in which a democratic governance oughts to be practiced as an istrument to achieve the wealth of the nation. Therefore, to make sure the day-to-day governance in country will be well prepared for responding the challenge of Industry 4.0, it is legitimate enough to "reweigh" the relevance of current well known *Good Governance* concept with a view to reach the so called a *Proper Governance.*

"Reweighing" the relevance of the present good governance concept is remain crucial for academics discourse as it has been stated by Manda and Backhouse (2017) that the advent of the 4th industrial revolution also known as Industry 4.0 has brought with it significant social and economic challenges which require that governments respond appropriately. This industrial revolution is characterized by a fusion of technologies that is "blurring the lines between the physical, digital, and biological spheres" (Schwab, 2016:1). It is set to disrupt society, business, and government through its innovations (Manda and Dhaou, 2019: 244).
Various governments are taking advantage of this digital-driven industrial revolution to improve their social and economic inclusion through a transformation towards a smart society(Manda and Dhaou, 2019: 244). The failure of the developing country governments, including Indonesia, to embrace the digital-driven 4th industrial revolution may result in being left behind

DISCUSSION

Industri 4.0: The Origin, Definition And Components.

The term "Industry 4.0" was initially coined by the German government which describes and encapsulates a set of technological changes in manufacturing and sets out priorities of a coherent policy framework with the purpose of maintaining the global competitiveness of German industry. Industry 4.0 has brought many professions to change (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1379). Before Industry 4.0, there were three prior industrial revolutions that have led to changes of paradigm in the domain of manufacturing: mechanization through water and steam power, mass production in assembly lines and automation using information technology (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1379). The schematic diagram of overview for the industrial revolutions is illustrated in Figure 1.



Source: (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1389).

The question then, what exactly is the definition of industry 4.0. It is intriguing, meanwhile Industry 4.0 has overwhelmed the academics discourse, there has no a singgle definition been agreed by scholars. Different researchers have different perceptions on the true meaning of Industry 4.0. Kagermann , Wahlster & Johannes (2013), for instance, say that Industry 4.0 utilizing the power of communications technology and innovative inventions to boost the development of the manufacturing industry. Schumacher, Erol & Sihn, (2016) argue, Industry 4.0 is surrounded by a huge network of advanced technologies across the value-chain. Service, Automation, Artificial Intelligence Robotics, Internet of Things and Additive Manufacturing are bringing in a brand new era of manufacturing processes. The boundaries between the real world and virtual reality is getting blurrier and causing a phenomenon known as Cyber-Physical Production Systems (CPPS). Meanwhile, Schwab (2016) points out Industry 4.0 is differentiated by a few characteristics of new technologies, for example: physical, digital, and biological worlds. The improvement in technologies is bringing significant effects on industries, economies and governments' development plans. Schwab pointed out that Industry 4.0 is one of the most important concept in the development of global industry and the world economy.

By referring to the above diverse definition, in general it may be argued that Industry 4.0 refers to the means of automation and data exchange in manufacturing technologies including Cyber-Physical Systems, Internet of Things, big data and analytics, augmented reality, additive manufacturing, simulation, horizontal and vertical system integration, autonomous robots as well as cloud computing (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1379). It is now quite clear that, eventhough the academics is also having difficulty to distinguish industry 4.0 components, there are at least four main components which have commonly been mentioned by scholaras, namely: *Cyber-Physical System (CPS); Internet of Things (IoT); Internet of Services (IoS); and Big Data and Analytics* (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1383).

Industry 4.0 can be played as a Cyber-Physical System study where the advances and speed of development in communication and calculation form the Cyber-Physical System and Industry 4.0. A cyber-physical system (CPS) is a system of collaborating IT elements, designed to control physical (mechanical, electronic) objects. Communication takes place via a data infrastructure such as the Internet (Schoenthaler, F., Augenstein, D., and Karle, T., 2015: 1). Due to Cyber-Physical System to be more common in society and occurs during interaction with humans, it must be ensured that CPS behave stably and has a certain bearing when utilized with artificial intelligence (AI) (Mosterman & Zender, 2015).

CPS is also the foundation to create the Internet of Things (IoT) which can be combined to become the Internet of Services (IoS). Hence, businesses will find it easier to establish

global networks which joins the warehousing systems, machinery and production facilities of CPS in the future (He, 2016). Big data is the utilization of digital technology to conduct analysis (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1383).

Industri 4.0 Challenge For Government

As mentioned earlier, amongst the important complexity aspects of Industry 4.0 beyond the technology is its challenge for governance. Manda and Dhaou (2019: 246) argue strongly that the successful adoption of the 4th industrial revolution will rely on the ability of governments, business and citizens to commit in supporting the transformation of society into a modern and smart society driven by advanced technology, skills, innovation and responsive policy. Due to this challenge, it is undoubted that an innovative policy and legislative reforms are important for supporting digital transformation. They allow governments to put in place measures and resources in response to the challenges and opportunities brought by the digital ear (Lips, O'Neil & Eppel, 2011; Fan, Zheng & Yen, 2014; Scholl & Scholl, 2014)

In response to the above challenges, it was not surprising that some of the governments' plans had been taken by both developed and developing countries (Tay, S.I., Lee, T.C., Hamid, N.A., Ahmad, A.N., 2018: 1384-1385). Just to mention a fiew example, amongst others are: in 2011, USA President Barack Obama started a series of national-level actions, discussions and recommendations, titled 'Advanced Manufacturing Partnership (AMP)'. In 2012, an action plan known as 'High-Tech Strategy 2020' was passed by the German government. In 2013, the French government launched 'La Nouvelle France Industrielle'. This program prioritized 34 sector-based ways in France's industrial policy. In 2013, a long term action plan for the manufacturing industry in the United Kingdom (UK) called the 'Future of Manufacturing' was implemented. This program refocused and rebalanced the policies to support the resilience of UK manufacturing until 2050. In 2014, a plan launched by the South Koreans which had emphasized four ways and tasks for improvement of Korean manufacturing. In 2015, China's government launched two actions simultaneously i.e. the 'Internet Plus' and 'Made in China 2025' strategies. In 2016, the Singapore government launched its RIE 2020 Plan (Research, Innovation and Enterprise) with a budget of $19 billion. In Malaysia, the government aggressively took action by undertaking various efforts in helping industry players to embrace Industry 4.0 through the implementation of automation and smart manufacturing.

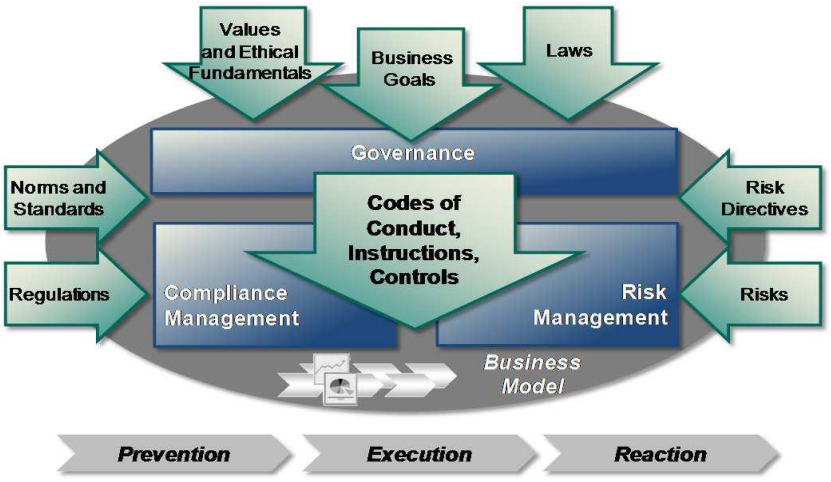
The pivotal role of government in response the wave of Industry 4.0 has, in fact, been highlighted by Schoenthaler, F., Augenstein, D., and Karle, T. (2015). They argue that *Governance, Risk and Compliance issues* (in short: GRC) are at the top of the management's

agenda; and the same holds true for virtual enterprises as in Industry 4.0. Furthermore, it is depicted by Schoenthaler, at.ll. (2015:6) that:

1. *Governance* is running a business on the basis of clearly understood and formulated business objectives and instructions. Important conditions are legal compliance and completeness. Governance thus extends across all business units and levels.
2. *Risk management* is the sum of all measures for dealing with known and unknown internal and external enterprise risks. These include the establishment of early warning systems to identify risks, as well as measures to eliminate potential risks, and for the treatment of incurred risks.
3. *Compliance* denotes conforming to a rule, correspondence or conformity with a specification, policy, standard or law with (ethical and moral) principles and procedures, including standards (e.g. ISO) and clearly defined conventions. Compliance fulfillment can be both forced (e.g. by law) and voluntary (e.g. adherence to standards).

It is now quite clear that the main task of governance, according to Schoenthaler, at.ll. (2015), amongst others are to formulate appropriate instructions, to communicate and to monitor their compliance. Even more, the directives should be complete, efficient and effective, therefore consistent in itself. It is also necessary to implement mechanisms that monitor and control the execution of the directives. In addition, reactive mechanisms are to be provided for, ensuring that the enterprise immediately takes proper measures, in the case of imminent or an actual violation of regulations, to limit damage to the periphery as well as the enterprise itself. In short, the typical structure of a GRC approach, and how it works, can be dipicted in the Figure 2 bellow.

Influencing Factors and GRC Mechanisms



Source: Schoenthaler, F., Augenstein, D., and Karle, T., (2015: 6).

From Good To Proper Governance

Although the above discussion has unfolded the pivotal role of governance in response to the challege of Industry 4.0, it has emphasised more on the task must be taken by government to make sure the manufacturing will be well prepared. Even narrower to a micro level point of view, namely, outlining the way in which a manufacturing ought to be governed in order to meet the challenge of Industry 4.0. The same holds true for the governance in a wider context, such the way in a democratic governance oughts to be practiced as an instrumnt for achieving the wealth of the nation. Therefore, the subsequent discussion will be directed to criticise the current *Good Governance* concept, then proceeded to propose the so called a *Proper Governance* concept which is belief more suitable to meet the challenge of industry 4.0.

Governance is a complex concept, and therefore, the definitions used are also relatively varied, depend on the perspectives, and the disciplines used. However, in general, Chhotray and Stoker (2009: 3) defines governance as *the rules of collective decision-making in settings where there are a plurality of actors or organisations and where no formal control system can dictate the terms of the relationship between these actors and organisations.* This indicates that there are at least three main elements of governance, namely, rules, collectivity and decision making. These three elements of governance must deal with the demands of reality, which in turn, not only requires adaptation, but also revitalization in order to work in line with the context and time.

In the context of nation-state, for intance, the efforts to adapt and revitalize the concepts and the practice of governance undoubtedly need to be carried out to deal with the complexity of social problems, increasing demands of interest groups, and widening impact of internationalization (Benz & Papadopoulos, 2006). While in the economic context, businesses need to adjust and actualize their governance concepts and implementation with a view to accommodate the emerging new demands from consumers, regulatory complexity, corporate social responsibility, and global markets (Mallin, 2003), including the challenges bring with the wave of Industry 4.0.

Among the complexities of the development of the governance concept, one of which has recently been used as a reference among developing countries is the well known concept of good governance. Actually, this concept refers the development studies school, which in fact was introduced by the World Bank in 1992. Substantially, the concept of good governance emphasizes the importance of upholding the principles of accountability, transparency and clarity of legal framework in decision making, and policy implementation (Chhotray & Stoker, 2009). It is believed that these three principles can guarantee the

realization of effective development. Elsewhere, in a review of the *New Emerging Way of Thinking about Government*, Pierre and Peters (2000) pointed out that the essence of good governance concept lies on two major issues, namely: the government changing role in society and its changing capacity to pursue collective interest under severe external and internal constraints.

The brief theoretical review above indicates that the locus of good governance includes two main aspects, that are the state and society. The first aspect is consist of two arenas, namely, Bureaucracy and Political Institutions. Whereas, the second aspect includes two arenas which are called Civil Society and Economic Society. Hyden and Court (2002), then have summarized the principle of good governance into six main issues, namely: a) Participation: the degree of involvement and ownership of affecting stakeholders; b) Decency: the degree to which the formation and stewardship of rules are undertaken without humiliation or harm of the people; c) Fairness: the degree to which rules apply equally to everyone in society regardless of their status; d) Accountability: the degree to which public officials, elected as well as appointed, are responsible for their actions and responsive to public demands; e) Transparency: the degree to which decisions made by public officials are clear and open to scrutiny by citizens or their representatives; and f) Efficiency: the degree to which rules facilitate speedy and timely decision making.

Despite the presence of good governance concept has inspired a number of developing countries in Asia, South Africa and Latin America, there are continuing efforts to criticise the weaknesses of good governance cocept. as it tends to apply parameters the so called "one fits all". Grindle (2004), for instance, points out that the fundamental weakness of good governance concept in response to the challenge of democratic and development reforms in the developing countries, is due to it brings with parameters that tend to be *one fits for all*. As a result, at the implementation level, good governance parameters are relatively inoperative because of their vulnerability in explaining and sitting, amongst other things: a) what is essential and what is not; b) what should come first and what should follow; c) what can be achieved in short term and what can only be achieved over the longer term; and d) what is feasible and what is not.

The same nuace of criticism is put forward by Nanda (20016:269). He strongly argues that to succeed in conducting such reform is not enough to only put good governance into place, but also needs democratic support, ownership, commitment, and has to take into account the country's cultural and historycal context. In his article entitled *Good Governance Concept Revisited*, Ved P. Nanda (2006), not only has criticized ambiguity at the conception level, but has also dissected in more detail the derivation of the concept of good governance by the World Bank, IMF, and U.S. AID. In brief, Nanda puts forward

his point of view as follow: in the 1980s and 1990s, donor countries and other international agencies, especially the World Bank, IMF, and U.S. AID, formulated conditionality for recipient countries to obtain loans. Commitment to implement good governance, then, has been made as one of the conditions in providing assistance to recipient countries. With this scheme, donors not only demand recipient countries to seriously carry out economic reforms, but also have to show clearly the practice of good governance.

Elsewere, Mkandawir (2007) explicitly stated that the current good governance approach is very different from the original concept as contributed by African academics. The essence of good governance concept pursued by African academics strongly opposes structural adjustment, while the concept developed by the World Bank is just the opposite. For more details, Mkandawire (2007: 681) puts forward his criticism as follow:

The approach to good governance and economic policy that finally became dominant differed radically from that of the African contributors who were strongly opposed to adjustment policies because not only were they deflationary and thus not developmental, but also because they were externally imposed, weakened the state, and undermined many of the post-colonial 'social contracts' .

For the African contributors, good governance related to the larger issues of state-society relations and not just to the technocratic transparency-accountability mode that it eventually assumed in the international financial institutions. The actual use of the concept of good governance sidestepped the central concerns of the Africans and rendered the notion purely administrative. And all too often, it looked like a fallback position for failed policies

Due to a series of the above weaknesses, it is reasonable if some scholars have provoked what they call *a new generation of thinking*, which emphasizes the importance of understanding the context in which policy reforms, institutions and processes take place. It is further argued that the design and implementation of governance undoubtedly must not neglect time, space, historical experience, and capacity of such individual country (Grindle, 2011). By relying on that of a new generation of thinking framework, Hidayat (2016) has proposed an alternative concept called *Proper Governance.*

According to Hidayat (2016: 163), the concept of good governance has experienced a lot of refraction both at the concept and policy implementation levels. These deviations occur, especially when the concept of good governance is adopted by international agencies, such as Wold Bank, IMF and USAID to be used as conditionality in channeling aid to recipient countries (developing countries), especially related to the demand to do a structural adjustment. In this case, the concept of good governance is directed more towards

guarding international development agendas, and tends to use parameters that fit for all country. Furthermore, Hidayat (2016) argues, among the conceptual biases in question is that the arena of good governance has been more emphasized in state, while the arena of society does not receive balanced attention. This happens because it is believed by international agencies, especially the World Bank, that the poor performance of the state (government) in providing public services is the main factor that causes failure of most developing countries in utilizing foreign assistance for economic development.

The series of arument delineated above is quite clear indicating the urgency of *re-weighing* the relevance of current well known good governance concept and its practice (Hidayat, 2016: 164). Among the revitalization steps must be taken is to criticize the relevance of the terminology of good governance itself. The word *good* which is attached to the concept of *governance* actually does not give much importance, or even tends to present an impression of ambiguity. The root of the problem is not in good or bad governance, but whether the concept of governance is properly applied. Essentially, it may be argued that the success in managing state and society is determined by the ability to adapt the concept of governance in accordance with the social, cultural, economic and political characteristics owned by such individual country. Based on these theoretical considerations, Hidayat (2016: 164) initiated the proper governance concept that refers to an appropriate, and comfortable governance, in accordance with the characteristics of the state and society owned by each nation-state community.

In berief, the construction of the proper governance concept proposed by Hidayat expressly defines governance as an effort to build state and society relations that can guarantee the realization of three main objectives, namely: 1) governance of healthy economic development in meaning, a development management that allows the integration of efforts to create high economic growth, structural change, and the use of resources responsibly and sustainably in a very tight condition of global competition; 2) democratic life and the respect for the rights of every citizen. The urgency to include democratic aspect here, because it is believed to be able to act as the most effective drug in overcoming the reality of poor governance practices as a result of abuse of authority by those who is in power; and 3) social inclusiveness, in a sense, guarantees every citizen to get a decent life and participate in every national affair (Mkandawir, 2007: 680). Therefore, Hidayat (2016) states that the concept of proper governance must be based on four main principles, namely: Developmental, Democratic, Socially Inclusive, and Cultural and Historical Context (Local Content). Briefly, the derivation of

the Arena, Dimensions, Principles and Parameters of the proper governance concept can be seen in Table 1

Table. 1
Arena, Dimensions and Principles of Proper Governance

Arena	Dimensions	Principles
State	Bureaucracy	▪ **Developmental:** Economic growth, even distribution of wealth, and responsible use of resources. ▪ **Democratic:** Guarantees the right of citizens to participate in decision-making and in overseeing the administration of the government, law enforcement, accountability and public transparency. ▪ **Social Inclusion:** The right of every citizen to get the same rights in accessing economic and political resources; the same legal treatment, without distinguishing status; and the establishment of trust, both among the community, state administrators, and between the community and state administrators. ▪ **Local Content:** Social, culture, economic and political characteristics which may enable the establishment of ownership and commitment in the implementation of governance.
	Political office	
Society	Civil Society	
	Economic Society	

Souce: Hidayat (2016: 162).

It is important here to highlight the fourth principle of proper governance mentioned above, as it may be argeued that local content acts as a frame of the other principles. It is said so because, the three other principles of proper governance will only work effectively if it does not neglect the local social, cultural, economic and political characteristics. With this kind of treatment, it is believed that there will be a sense of ownership and commitment among the community (civil society and the economic community) towards the implementation of development governance and governance at each level. Above all, the urgency of accommodating these local characteristics also aims to eliminate the skepticism of the parameters of good governance that have been applied so far.

When a comparison is made, the similarities and differences between the concepts of good governance and proper governance can be seen in Table 2. In terms of "Arena", for

example, both the concepts of good governance and proper governance put equal pressure on the state arena and society. These two arenas are of equal importance because: in the dimension of democracy, the main function of the state is as an organizer of government, and society is the owner of sovereignty. Meanwhile, in the economic dimension, the state carries out supply functions, and society carries the demand function.

Table 2.
The comparison between the concept of Good Governance and Proper Governance

	Arena	Dimension/ Aspects	Principles and Parameter
The Concept of Good Governance	• **State**	• Bureaucracy	• Public Administration Efficiency • Rule of law • Government effectiveness • Voice • Accountability • Transparency • Control of corruption • Regulatory quality • Ownership • Capacity building • Sustainability, • Selectivity • Partnership • Flexibility Source: Nanda (2006: 274); U.S. AID (2005b); Radelet, Siddiqi, and Dizolele (2005).
	• **Society**	• Civil Society	
The Concept of Proper Governance	• **State**	• Bureaucracy • Political Office	• **Developmental:** Economic growth, even distribution of wealth, and responsible use of resources. • **Democratic:** Guarantees the right of citizens to participate in decision-making and in overseeing the administration of the government, law enforcement, accountability and public transparency. • **Social Inclusion:** The right of every citizen to get the same rights in accessing economic and political resources; the same legal treatment, without
	• **Society**	• Civil Society • Economic Society	

	Arena	Dimension/ Aspects	Principles and Parameter
			distinguishing status; and the establishment of trust, both among the community, state administrators, and between the community and state administrators. • **Local Content:** Social, culture, economic and political characteristics which may enable the establishment of ownership and commitment in the implementation of governance.

The difference between the concept of good and proper governance then begins to be seen in the formulation of dimensions/ aspects of governance. The first concept tends to focus only on the *bureaucratic dimension* in the state arena, and *the civil society dimension* in the society arena. While the proper governance concept, laying two dimensions of the state namely *bureaucracy and political office*, as well as two dimensions of society, namely *civil society and the economic society*.

The next fundamental difference can be seen in the formulation of governance parameters. More specifically, the concept of good governance offers a number of parameters which are derived from the bureaucratic and civil society business, including: Public Administration Efficiency, Rule of law, Government effectiveness, Voice, Accountability, Transparency, Control of corruption, Regulatory quality, Ownership, Capacity building , Sustainability, Selectivity, Partnership, and Flexibility. While the concept of proper governance, downgrading a number of parameter based on four principles proposed, namely: Developmental, Democratic, Socially Inclusive, Cultural and Historical Context.

Finally, what about revitalization at the level of policy implementation? Strictly speaking, the concept of proper governance is in line with Grindle's conception (2004 and 2011), which states that to enable governance to work at the level of reality, then the parameters used must not be one size fits for all, also specifically reduce: a) what's the essential and what's not; b) what should come first and what should follow; c) what can be achieved in short term and what can only be achieved over the longer term; and d) what is feasible and what is not.

CONCLUSION

The 4th industrial revolution also known as Industry 4.0 has brought with it significant social and economic challenges which require that governments respond properly. This industrial revolution is characterized by a fusion of technologies that is “blurring the lines

between the physical, digital, and biological spheres". It is set to disrupt society, business, and government through its innovations. Eventhough the academics is having difficulty to distinguish industry 4.0 components, there are at least four main components which have commonly been mentioned by scholaras, namely: *Cyber-Physical System (CPS); Internet of Things (IoT); Internet of Services (IoS); and Big Data and Analytics.*

The successful adoption of the 4th industrial revolution will rely on the ability of governments, business and citizens to commit in supporting the transformation of society into a modern and smart society driven by advanced technology, skills, innovation and responsive policy. Therefore, *Governance, Risk and Compliance issues* have became at the top of the management's agenda.

Although there have been some literatures directed to unfold the pivotal role of governance in response to the challenge of Industry 4.0, they seem to have been emphasised more on, such as the task must be taken by government to make sure the manufacturing will be well prepared for the next generation of industry revolution. Even narrower to a micro level point of view by just outlining the way in which a manufacturing ought to be governed in order to meet the challenge of Industry 4.0. This paper argues that the same holds true for the governance in a wider context. Particularly, in the case of which a democratic governance oughts to be practiced as an instrument to achieve the wealth of the nation. Therefore, to make sure the day-to-day governance in country will be well prepared for responding the challenge of Industry 4.0, it is crucial to "reweigh" the relevance of current well known *Good Governance* concept with a view to reach the so called a *Proper Governance.*

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