

## The Role of National Culture in National Innovative Capacity

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**Abstract.** *Purpose of the study is to examine the relationship between national culture and the capacity of the nation to innovate. The motivation of study was driven by the differences national innovative capacity in the open access knowledge era. The total sample was involved in this study is 77 countries. Hofstede's national culture Index and Global Competitiveness Index were used to measure national innovative capacity variable and national culture variable respectively. The study involved two control variables namely categorization of national income (low, upper low, upper medium and high) and the Human Development Index. Bivariate correlation analysis and multiple regression analysis were applied. The findings indicated that national culture classification namely individualism, long-term orientation, and indulgence were found positively and significantly related to national innovative capacity. Power distance and uncertainty avoidance national culture classification showed a negative and significant relationship with national innovative capacity. Masculinity national culture was found no relationship with national innovative capacity. Human Development Index as a control variable showed a positive and significant association with national innovative capacity. There is no indication association between income categorization and national innovative capacity*

**Keywords:** *National culture, innovative capacity, global competitiveness, power distance, uncertainty avoidance.*

### 1. Introduction

An open market system as a consequence of globalization forces the nations to increase competitiveness level in the International market. National innovation capacity is the key factor that determines the competitiveness of the country on an international level. The capability of the nation regarding innovation will determine survival ability in the global market (Natario, Couto, Tiago, & Braga, 2011). Innovation is a fundamental factor in the economic growth of the nation and it is key to survival for the firms to compete in a globalization era (Westwood, & Low, 2003). Endogenous growth theory explains that internal factors, i.e., human capital, innovation, and knowledge are an essential factor that determines national's economic growth. Knowledge investment and innovation can increase the national standard of living through productivity improvement (Harrison, & Huntington, 2000).

National prosperity can be achieved by increasing national innovative capacity (Williams & McGuire, 2010). Innovation capability is not only fundamental to the business organization, but it is also a critical factor that determines successful national economic development (Hung, 2004; Stern, Porter, & Furman, 2000)

Country's capacity for innovation is generally linked to knowledge, research and development funding, and economic power. However, by increasing the budget on research development is not automatically will increase national innovative capacity (Andrijauskienė, & Dumčiuvienė, 2017). National Innovative capacity is also believed influenced by essential factors that are rooted form the local value of the country and it refers to national culture. National culture determines individual value and attitudes of society that distinguish one country from another including national innovative capacity.

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National culture, social institutions, industrial characteristic, and innovative behavior are elements that are interrelated each other (Hayton, George, & Zahra, 2002).

Jones and Herbert (2000) argue that national culture influences individual innovative capacity. Understanding the relationship between national culture and national innovative capacity may help to explain the phenomenon of differences in national innovation performance across countries (Uhlener, & Thurik, 2007). The study related national culture's influence on national innovative capacity has been widely conducted, however, inconclusive results make the study is still relevant to do (Andrijauskienė, & Dumčiuvienė, 2017).

Furthermore, compared to management sciences and organizational psychology, cultural study and its association with national innovative capacity are relatively lack of attention (Anderson, De Dreu, & Nijstad, 2004) and therefore, it needs further research. The theoretical foundation supports the premise that national culture plays an important role that determines individual creativity and innovativeness. However, it is still cannot be understood easily (Westwood, & Low, 2003). Therefore, further empirical research is relevant to be conducted to test the validity of the existing theory. Purpose of this study is to investigate the association of dimension of national culture proposed by Hofstede with a capacity of the country to innovate.

## **2. Literature Study / Hypotheses Development**

### *National culture*

National culture can be defined as a distinctive set of norms, beliefs, values, and behaviors within the population of a country (Andrijauskienė, & Dumčiuvienė, 2017). Values and beliefs that are transmitted across generations (House, Hanges, Javidan, Dorfman, & Gupta, 2004) make national culture becomes a long-lasting social identity.

It guides the way of life of the individual in society and becomes codes of conduct for everyday life (Rosset, 2014). The way of the individual in the society interacts is guided by internal social, cultural coherence of society, the norms, and values rooted from national culture. Each nation has distinctive beliefs and value inherited from the predecessor that becomes a character of society and national identity (Moon, & Choi, 2001). The beliefs and value inherent in the society rooted from national culture may influence individual characters in daily life including the one that supports or not support the process of innovation. Williams and McGuire (2010) argues that national culture determines how an individual in society behaves regarding risks, opportunities, and rewards

There is various national culture model introduced in the literature, however, the one developed by Geert Hofstede is among the most popular in terms of the number of citation in a research paper (Moon, & Choi, 2001). Despite the popularity and used widely as the main source of reference, however, Hofstede's national culture model has been criticized as being outdated. The model was developed using survey from IBM employees around the world from the period of time 1970 to 1990. Therefore, validity and stability of the model are questionable in regard measuring national culture at present time (Williams, & McGuire, 2010). Hofstede's national culture model classifies national culture into five dimensions namely power distance, individualism/ collectivism, uncertainty avoidance, long-term/short-term orientation, masculinity/ femininity. Recently, the dimension was added with new categorization called indulgence/restraints

### *National Innovative Capacity*

National innovative capacity defined as country's ability to create and commercialize product or services by utilizing knowledge and technology both at the national and firms level (Stern et al., 2000) and to create innovation continuously (Hu, & Mathews, 2008). Understanding the concept of national innovation capacity involves discourses about

evolutionary process of innovative activity as well as basic infrastructure for the invention. It provides information regarding government institutional structures and national innovation systems that support the sustainability of innovation activity (Hu, & Mathews, 2008). Research and development investment, government policies and infrastructure for new technologies development and the environment for innovation considered as fundamental factors that determine national innovative capacity (Furman, Porter, Stern, 2002; Stern et al., 2000). Social aspect should also be considered as a determinant of national innovative capacity beside basic element of innovation. Belitz, Clemens, Schmidt-Ehmcke, Schneider, & Werwatz (2008) emphasize that national innovation system in the first place need conducive social aspects for innovation to support the achievement of high-level national innovative capacity.

National innovative capacity is believed strongly influenced by the effectiveness of the national innovation system. It requires a solid combination of innovation framework, institutions related innovation, strong national culture for innovation and innovation infrastructure. Stern et al., (2000) argue that the endogenous growth, the industrial clusters, and national innovation systems are three fundamental aspects that determine national innovative capacity. Furthermore, Schwab and Porter (2008) have highlighted general aspects that determine a successful national innovation system. Those aspects are public institutions, resources, policies, the environment (industrial cluster), synergy between industry and research institutions, collective efforts among parties involved in innovation, and technology adoption.

Researchers have used a variety of methods to operationalize a nation's capacity for innovation. Measurement using the amount of money from royalty and license fees, the number of trademarks (Williams, & McGuire, 2010), patent per capita income and adoption rates for technological products are among common indicators to measure national

innovative capacity. World Economic Forum developed twelve pillars of Global Competitiveness Index, including a pillar of Innovation. In that pillar, innovation is operationalized with indicators namely budget spent for research and development (R&D), availability of research institutions that facilitates new technologies development, intense collaboration between education institutions and industry in terms of research and technological developments, the protection of intellectual property and easiness to get financing and venture capital access for technology start-up (World Economic Forum, 2014)

#### *Power Distance and National Innovative Capacity*

Power distance is the degree to which a society adheres to formal authority and status differences among group members (Khan, & Cox, 2017). Society in high-power distance culture has high respect for norms, values, and beliefs. Inequality, dependent on a leader and privileges is others characteristic representing society with high power distance culture. Subordinate acknowledge the superordinate as a legitimate power, and they strictly follow the hierarchical chain of command. Low power distance society finds that the titles, status, and formality command are less important in both social relationship and organizational relationship (Davis, & Ruhe, 2003).

Low power distance society demands equality role and against discrimination. Empowerment employee, matrix organization structure, and flat organizations are the practice of business commonly found in low power distance national culture (Wursten, & Jacobs, 2013). People who live in countries categorized as high-power distance they tend to accept a hierarchical order (Kovačić, 2005). Low power distance society recognizes right, and role based on their hierarchical level. The unequal distribution of power and obedience on elite groups indicate that high power distance culture adopt centralistic value. The business and economic literature suggest that high levels of obedience and centralistic value will have no favor on the economic

development of the country (Williams, & McGuire, 2010). Individuals who live in low power distance tend to have a modern character in a positive way such as likeness toward the challenge, non-procedural, non-bureaucratic. (Williams, & McGuire, 2010). Therefore, characteristic of society with low power distance enables innovators to more easily manage relations across hierarchical borders, challenge formal and informal authority, and build networks that support innovation activities (Khan, & Cox, 2017; Van Everdingen, & Waarts, 2003). A society with low power distance culture fits with the required environment needed by innovators to succeed. On the contrary, a society with high power distance, creative people or innovator may be expected to work only through hierarchical organizational channels.

Therefore, idea and creativity can be done only with support from the top (Williams, & McGuire, 2010). Low power distance society with a character such as freedom of expression, thinking outside the box, feeling challenging are convenience environment for innovators to express their creativity. Jones and Davis (2000) suggest that low power distance society is better for innovation because it allows more freedom to individuals to do anything they believe valuable for themselves and society. Therefore, the hypothesis is proposed as follows:

*Hypothesis 1: Country with lower power distance national culture will have a higher national innovative capacity*

#### *Individualism/Collectivism and National Innovative Capacity*

Individualism national culture refers to a society where the selfishness character is the dominant value for life. Individual accomplishment, self-responsibility, independent of organizations or groups are common character representing individualism society (Davis, & Ruhe, 2003). Ability and individual achievement are the main indicators to reward people in individualistic society. Collectivist national culture has characteristics that an individual is part of the group and therefore the decision is always on collective

consideration rather than individual decision. Collectivist society has norms, values, and beliefs such as group membership identity, group decision making, solidarity and loyalty to the groups (Davis, & Ruhe, 2003). People live in collectivism national culture considers the group is the primary reference for individual identity. Collectivist society has characteristics such as emotional dependence on the group, a sense of belonging to a group and a strong belief in group decisions (Davis, & Ruhe, 2003). Group-based performance is commonly used in collectivism society rather than individual performance method. On the other hand, individualism society prefers using individual-based performance as a method to measure the performance of the individual (Kovačić, 2005).

The studies indicated that the country with individualism national culture has a tendency to be a competitive nation (Mihaela, Claudia, & Lucian, 2011). Value and reward that is based on individual achievement encourage innovators and researchers to do more activities related to innovation and R&D. Individual live in high individualism society has the freedom to do an experiment, putting a high value on individual achievement and having a high probability of success. Creativity is identic with individual expression, and therefore individualist society supports innovation activities. Westwood and Low (2003) suggest that there is the alignment between creativity and innovation with the autonomy of the individual, individual independence, and freedom. A society with individualistic cultures is more enthusiastic to adopt technologically innovative products.

Individualists are more likely to champion new ideas in the face of resistance. Higher innovation activities may be more present in individualistic societies due to the reward and performance measurement is based on individual achievement. Meanwhile, in a collective culture, creativity and critical thinking have to confirm the group first, and it will slow down the innovation speed. Therefore, the hypothesis is proposed as follows:

*Hypothesis 2: Country with higher individualism national culture will have a higher national innovative capacity*

*Masculinity/Femininity and National Innovative Capacity*

Masculinity is the culture of the society that has a commonly associated with a male character such as assertiveness, performance orientation, success orientation, and competitive. Masculine culture society considers the opportunity for high earning, recognition regarding job achievement, promotion and a challenging work environment. In masculine cultures, performance and achievement are the most important thing (Wursten, & Jacobs, 2014). Masculinity national culture mostly emphasizes on values of wealth, material success, ambition, and achievement. Femininity refers to cultural values that are representing common woman's character such as making a priority of quality of life, maintaining warm personal relationships, service, care for the weak and solidarity.

Feminine culture makes a priority on social needs, and it leads to sacrificing on working productivity (Adler, 2002). The country with a feminine national culture, its society considers rewards such as time-off, improved benefits, or symbolic rewards are meaningful. They prefer on social relationships, caring people, making a priority on quality of life, finding small and slow as beautiful, solidarity, modesty, benevolence and preserving the environment. A society with masculine cultures has characteristic more orientation on individual achievement and exhibit less gender egalitarianism. On the other hand, feminine cultures are more orientation on the social relationship and exhibit greater gender egalitarianism (Khan, & Cox, 2017). Masculinity society emphases on the assumption that men character is achievement orientation (Hofstede, 2005). Mueller and Thomas (2000) found that male's gender has significant indication more innovative and creative orientation compared to female's gender. A society with higher individualism and masculinity have more freedom to do

something new (experiments), orientation on individual achievement and potential to succeed. Freedom to do experiments and more orientation on achievement is a principal character for the inventor. The country with masculine national culture facilitates the inventor with convenience environment so that they can express their creativity to achieve something such as a new invention. Therefore, we can propose a hypothesis as follow:

*Hypothesis 3: Country with higher masculinity national culture will have a higher national innovative capacity*

*Uncertainty Avoidance and National Innovative Capacity*

Uncertainty avoidance national culture is a categorization of country's cultural value where individual lives in that country have a tendency to avoid ambiguous circumstances and prefer to certainty and predictability circumstance (Davis and Ruhe, 2003). People that have strong uncertainty avoidance culture, they tend to follow formality structure of living, systematic and rarely think outside the box. Additionally, individual live in strong uncertainty avoidance culture prefer to avoid risks if they face the unstructured situation. Meanwhile, low uncertainty avoidance society, the people live in that society is welcome in an uncertain circumstance. Weak uncertainty avoidance society is commonly called as risk taker society (Kovačić, 2005).

Hofstede, & Hofstede (2005) revealed that managers who have high uncertainty national culture background showed a tendency to risk avoidance and risk reduction compared to managers with low uncertainty avoidance cultural background. The study found that individual lives in low uncertainty avoidance are commonly open to new ideas and beliefs. The more a culture avoids uncertainty, the less they are open to influences from outside and the less they are willing to leave their comfort zone. A strong uncertainty avoidance society is relatively closed from outside influence. Society falls into category strong uncertainty avoidance tends to develop a stagnant relationship with others. On the other hand, a

society with low uncertainty avoidance, relations with others are much more dynamics. People who live in a country with a low score on uncertainty avoidance are more accepting of risk and ambiguity (Khan, & Cox, 2017). Willingness to take risks and to accept opinions other than their own is a fundamental character that encourages individual to do innovation and entrepreneurship. Low uncertainty culture would increase the likelihood of innovation implementation among innovators and less likely to violate societal norms due to the belief of openness value. The study found that among individual in low uncertainty avoidance society indicated higher adoption rate on new technological product compared to a person who lives in a high avoidance national culture.

Mueller and Thomas (2001) argue that the country with low uncertainty avoidance cultures is having a potential chance to be more innovative. Higher uncertainty avoidance culture is associated with reduced experimentation which is limiting potency of innovation. Individual, business organization and public sector organization that is in high uncertainty avoidance national culture tend to have less courage to accept risky projects (Jang, Ko, & Kim, 2016). Therefore, the hypothesis can be proposed as follows:

*Hypothesis 4: Country with higher uncertainty avoidance national culture will have a lower national innovative capacity*

#### *Long-term/Short-term Orientation and National Innovative Capacity*

Long-term/short-term orientation national culture is culture categorization based on the horizon of thinking among individual regarding the future. Individual live in Long-term orientation society has a personal characteristic such as future rewards orientation, diligence, persistence, thriftiness, perseverance. Long-term orientation cultures have a tendency to anticipate potential benefits over the long-term period. Therefore, long-term orientation society has a principle of avoiding conflict with others just only to achieve short-term benefits (Ryu, & Moon,

2009). Long-term orientation culture cultures need to take care of conflict since they anticipate long-term relationships with their partners. Conflicts would deteriorate the current relationship, and the consequence of that is losing potential benefits in the future (Ryu, & Moon, 2009).

Short-term orientation culture is a categorization of culture where individual lives in that society more focus on past and present. Short-term orientation society emphasizes tradition, stability, face-saving, reciprocity, and gift-giving. Shorter-term societies tend to have values indicative of a more present- and past-oriented perspective, and reciprocation, concerns for traditions and fulfilling social obligations (Hofstede, & Hofstede, 2005). A society with the short-term orientation of national culture tends to have a short horizon of thinking. They are relatively static and have a tendency to respond to the environmental changes using a reactive approach. Short-term national culture is rarely to prepare the potency and threat that will happen in the future. They are more focus on the current situation and adjust to current situation if they feel on threatening position.

Purpose of innovation is to accommodate the change that will happen in the future. The country with long-term orientation cultures has a probability to achieve greater economic success. It is because its societies have orientation preparing something that will be a trend in the future (Jang et al., 2016). In societies exhibiting a longer-term perspective, values such as perseverance, hard work, shame, and savings may predominate should be associated with higher levels of innovation (Khan, & Cox, 2017). Van Everdingen and Waarts (2003) investigated the effects of national culture on the adoption of innovations using the Hofstede dimensions. They found that higher degrees of Long-term orientation were related to the increased adoption of innovations.

*Hypothesis 5: Country with higher long-term orientation national culture will have a higher national innovative capacity*

### *Indulgence/Restraint and National Innovative Capacity*

Indulgence national cultural value refers to the perception that the individual is not only responsible for his/her own life but also can make an impact on other individuals (Hofstede, & Hofstede 2005). Meanwhile, restraint national cultural refers to the perception of helplessness. People who live in a society with restraint national culture believe that what happens in one's life is beyond his/her own control (Hofstede, & Hofstede 2005). It implies that society with indulgence national culture is active and self-confidence. On the other hand, a society with restraints national culture tend to have inferior behavior and lack of self-confidence to make a change and contribution to society.

Indulgent societies are characterized by a desire to gratify basic and natural human drives related to enjoying life and having fun. Restrained societies suppress the gratification of needs using strict social norms (Khan, & Cox, 2017). People in indulgent societies tend to be more optimistic; people in restrained societies tend to be more pessimistic and cynical (Khan, & Cox, 2017). It can be concluded that indulgence national culture is strongly associated with individual characteristics such as extrovert, self-assurance and optimistic. Meanwhile, restraints national culture is associated with the society where individual on that tends to have a character such as introvert, diffidence and pessimistic.

Clinicians study on individuals who have handicap disability revealed that individuals belong to indulgence culture feel that they have the self-confidence to control their future life and can participate in giving a contribution to social activities (Hofstede, 2011). Meanwhile, individuals who have a background of cultural restraint tend to be inferior, helplessness and being a follower instead of a leader. A study by Syed and Malik (2014) found that cultures with low Uncertainty Avoidance and high Indulgence tend to adopt new technology more readily than cultures with high Uncertainty

Avoidance and low Indulgence or restraints. Indulgent societies may encourage innovation as a way to continually satisfy drives related to having fun and enjoying life (Khan, & Cox, 2017). Therefore, the hypothesis can be proposed as follows:

*Hypothesis 6: Country with higher indulgence national culture will have a higher national innovative capacity*

## **3. Methodology**

### *Variables Definition*

The study investigates the relationship between national culture and national innovative capacity. In this study, national culture was treated as independent variables. Meanwhile, national innovative capacity was a proxy for dependent variables. Additionally, variable National Income Group and variable Human Development Index were added as control variables. Geert Hofstede's national culture model was adopted in this study, which is referring to uncertainty avoidance, individualism/collectivism, long-term/short-term orientation, masculinity/ femininity, power distance, and indulgence/restraint. Variable national culture in this study was broken down into six sub-variables referring to Geert Hofstede's national culture model. National innovative capacity in this study relates to the ability of the nation to develop technological innovation. National Income Group was classified into four categories namely lower Income, Lower Middle Income, Upper Middle Income, and High Income. Human Development Index refers to a composite statistic of life expectancy, education, and per capita income indicators

### *Measurement and the Data*

The variable national culture was measured using Geert Hofstede's national culture Index. The data of Geert Hofstede's national culture index is an open publication, and it was obtained from the official website of Geert Hofstede. The index indicates the range of scale from a minimum value (0) to maximum value (100). For the purpose of national competitive capacity measurement, Pillar

Innovation of Global Competitiveness Index released by the World Economic Forum was adopted in this study. The index is stated in interval scale 1 (worst) – 7 (Best) and the data was obtained from the official publication of the Global Competitiveness Index by World Economic Forum. National Income Group was adopted from income group categorization by World Bank Organization. For the purpose of measurement, each category group of income was given measurement value (Lower Income =1, Lower Middle Income=2, Upper Middle Income =3, High Income =4). The data were obtained from the open publication of the World Bank Organization. Human Development Index was measured using Index released by the United Nations Development Programme (UNDP)

#### *Sample and Analysis*

Purposive sampling technique was applied in this study. The study involved 77 countries as a sample of the research. The countries that were selected as a sample in this study is based on the consideration of the completeness of the data. It refers to the availability of the data on both sides, Hofstede national culture data and Innovation Index of World Economic Forum. Hofstede's national culture index survey involved fewer countries than the global competitiveness index survey by the World Economic Forum. Therefore, matching the data on both side (national culture index and National Innovation Index) was required. The Descriptive statistics analysis, bivariate correlation analysis, and multiple linear regression analysis were applied in this study. The descriptive statistical analysis was intended to understand basic information related to raw data. Bivariate correlation analysis was addressed to justify whether proposed hypotheses are supported or rejected. Furthermore, application of bivariate correlation analysis was driven by the consideration that the nature of the research is exploratory study. It means that the main objective of the study is to reveal the association relationship (not causal relationship) between variable dependent and variable independent. Multiple Regression

Analysis was applied to understand whether national culture is a function of national competitiveness and also to justify the role of control variables.

## **4. Findings and Discussion**

### *Descriptive Statistics*

Hofstede's national culture Index was stated in interval scale in the range 0 (minimum) to 100 (Maximum). Index national culture > 50 indicates that the country falls within category high power distance, Individual, Masculine, high uncertainty avoidance, long-term orientation, and Indulgence. Meanwhile, Index national culture < 50 means that the country is in category low power distance, collective, feminine, low uncertainty avoidance, short-term orientation, and restraint. Descriptive statistic information as stated in Table 1 shows that the sample have characteristic as high-power distance (Mean = 61.17), Collective (Mean =42.84), Feminine (Mean = 48.29), high uncertainty avoidance (Mean = 65.21), Short-term orientation (Mean = 44.84) and Restraint (Mean = 47.86).

The country with lowest power distance is Venezuela (11 of 100), and Australia and the United States are the countries with highest Power Distance (100 of 100). Venezuela and United States are also countries with the most collective culture (12 of 100) and most individualist culture with an Index value (91 of 100) respectively. Meanwhile, Sweden has a predicate as the most feminine country (5 of 100), and Slovakia is the most masculine country (100 of 100). Regarding uncertainty avoidance in national culture, Singapore is the lowest (8 of 100), and Greece is the highest (100 of 100). Ghana is the country with the most short-term orientation of national culture (4 of 100), and South Korea is a country with the most long-term orientation of national culture (100 of 100). Pakistan is the country with most restraint national culture (0 of 100) and Venezuela is the country with the most indulgence national culture (100 of 100).



Table 1.  
*Descriptive Statistics of National Culture and Innovative Capacity*

	N	Minimum	Maximum	Mean	Std. Deviation
Power Distance (PODI)	77	11	100	61.17	20.45
Individualism (INDIV)	77	12	91	42.84	22.90
Masculinity (MAS)	77	5	100	48.29	19.70
Uncertainty Avoidance (UNAV)	77	8	100	65.21	21.63
Long-term Orientation (LONG)	77	4	100	44.84	23.98
Indulgence (INDUL)	77	0	100	47.86	22.92
Innovation Capacity (INCAP)	77	3.07	6.12	4.49	0.72

Innovation Index by World Economic Forum is Twelfth pillar of Global Competitiveness Index. Innovation Index is stated in interval scale 1 (worst) to 7 (best). The information in Table 1 shows that the sample on average is in the moderate position regarding innovation capacity index (Mean = 4.49 of 7.00). Egypt is the country with least innovation capacity

(3.07 of 7.00), and Switzerland is the country with the highest innovation capacity (6.12 of 7.00).

#### *Correlation Analysis*

Correlation among the Hofstede model of national culture and National Innovative Capacity is depicted in Table 2.

Table 2.  
*Correlation Matrix*

	PODI	INDIV	MAS	UNAV	LONG	INDUL	INCAP
<b>PODI</b>	1						
<b>INDIV</b>	-0.691**	1					
<b>MAS</b>	0.160	0.046	1				
<b>UNAV</b>	0.197*	-0.153	0.040	1			
<b>LONG</b>	-0.072	0.190*	0.057	0.078	1		
<b>INDUL</b>	-0.263*	0.128	0.013	-0.152	-0.460**	1	
<b>INCAP</b>	-0.588**	0.654**	-0.026	-0.350**	0.404**	0.195*	1

\* $p < 0.05$  (1-tailed), \*\* $p < 0.01$  (1-tailed)

Negative correlation magnitude indicates a contrary characteristic of national culture (High Power Distance/Low Power Distance, Individualism/collectivism, Masculine/Feminine, High Uncertainty Avoidance/Low Uncertainty Avoidance, long-term orientation/short-term orientation, indulgence/restraint). Default information of national culture in Table 2 refers to high power distance, individualism, masculine, high uncertainty avoidance, long-term orientation, and indulgence. Meanwhile, Positive correlation between innovative

capacity means high innovation and negative correlation means less innovative.

Information in Table 2 shows that the country with high power distance national culture has tendency being collective ( $r=0.691$ ,  $p < 0.01$ ), Uncertainty avoidance ( $r=0.197$ ,  $p < 0.05$ ), restraint ( $r=0.263$ ,  $p < 0.05$ ) and less innovative ( $r=0.588$ ,  $p < 0.01$ ). The country with Individualism national culture tends to have low power distance ( $r=0.691$ ,  $p < 0.01$ ), long-term orientation national culture ( $r=0.190$ ,  $p < 0.05$ ) and Innovative ( $r=0.654$ ,  $p < 0.654$ ). The country with high uncertainty avoidance national culture is

having tendency high power distance ( $r=0.1.97$ ,  $p<0.05$ ) and less innovative ( $r=0.350$ ,  $p<0.01$ ). The country with long-term orientation national culture is more restraint ( $r=0.460$ ,  $p<0.01$ ), Individualism ( $r=0.190$ ,  $p<0.05$ ) and more innovative ( $r=0.404$ ,  $p<0.01$ ). The country with indulgence national culture is having low power distance national culture ( $r=0.263$ ,  $p<0.05$ ), short-orientation national culture ( $r=0.460$ ,  $p<0.01$ ) and more innovative ( $r=0.195$ ,  $p<0.05$ )

*Multiple Regression Analysis*

The study applied multiple regression analysis to understand whether national culture is a function of national innovative capacity or not. Furthermore, it was intended to detect the role of control variables national income category and human development index in determining national innovative capacity. Summary of multiple regression results with national innovative capacity as a function of national culture is presented in Table 3. Model 1 indicates Multiple regression results without variables control and model 2 is Multiple regression results with variables control.

Table 3.  
*Multiple Regression Summary – Standardized Coefficient*

Variable	Model 1	Model 2
Power Distance	-0.159	-0.102
Individualism	0.381*	0.278
Masculinity	-0.039	-0.033
Uncertainty Avoidance	-0.253*	-0.266*
Long-term Orientation	0.474*	0.356*
Indulgence	0.285*	0.240**
National Income		-0.230
Human Development Index		0.487*
F	24.719*	22.220*
R Square	0.679	0.723
Adjusted R Square	0.652	0.691

\* $p<0.01$  (1-tailed), \*\* $p<0.05$ (1-tailed)

Based on information depicted in Table 3, it indicates that national culture is a function of national innovative capacity in model 1 ( $F = 24.719$ ,  $p<0.01$ ) and Model 2 ( $F=22.220$ ,  $p<0.01$ ). It means that by understanding the national culture of the particular country, we can predict the national innovative capacity of that country. The adjusted R square suggests that the model explains 65.2% of the variance of national innovative capacity in model 1 and 69.1% in model 2. In Model 1 (without control variables), Individualism, long-term orientation and indulgence have positive correlation with national innovative capacity ( $r=0.381$ ,  $r=0.474$ ,  $r=0.285$ ,  $p<0.01$ ). Meanwhile, Uncertainty avoidance is negatively correlated with national innovative capacity ( $r=-0.253$ ,  $p<0.01$ ). In model 2, long-

term orientation and indulgence have positive correlation with national innovative capacity ( $r=0.356$ ,  $p<0.01$  and  $r=0.240$ ,  $p<0.05$ ). Meanwhile, uncertainty avoidance has a negative correlation with national innovative capacity ( $r=-0.266$ ,  $p<0.01$ ). Individualism in model 2 shows insignificant correlation with national innovative capacity. Information in Model 2 indicates that the human development index is playing a significant role in determining the capability of the nation to innovate ( $r=0.487$ ,  $r<0.01$ ). However, national income category shows no indication to influence nation regarding capacity to innovate.

*Hypothesis Testing*

The study proposed that national culture has a correlation with national innovative capacity. The hypothesis was broken down into six hypotheses following classification of national culture by Geert Hofstede. The study

is exploratory research, and therefore the hypothesis was examined with Pearson Bivariate Correlation. By adopting information from the correlation matrix in Table 2, the summary of hypothesis testing is presented in Table 4 bellows:

Table 4.

*Summary of Hypothesis Testing*

Hypothesis Statement	Pearson Correlation	Conclusion
H1. Power distance national culture is negatively and significantly associated with national innovative capacity	-0.588**	Significant
H2. Individualism national culture is positively and significantly associated with national innovative capacity	0.654**	Significant
H3. Masculinity national culture is positively and significantly associated with national innovative capacity	-0.026	Not Significant
H4. Uncertainty avoidance national culture is negatively and significantly associated with national innovative capacity	-0.350**	Significant
H5. Long-term Orientation national culture is positively and significantly associated with national innovative capacity	0.404**	Significant
H6. Indulgence national culture is positively and significantly associated with national innovative capacity	0.195*	Significant

\* $p < 0.05$  (1-tailed), \*\* $p < 0.01$  (1-tailed)

Based on the information presented in Table 4, all proposed hypotheses are supported (Significant) except for hypothesis 3 (not significant). Low power distance national culture and Individualism national culture have a strong correlation with national innovative capacity ( $r > 0.5$ ,  $r < 0.7$ ). Low Uncertainty Avoidance national culture and long-term orientation national culture has a moderate correlation with national innovative capacity ( $r > 0.3$ ,  $r < 0.5$ ). Indulgence national culture has a weak correlation with national innovative capacity ( $r > 0.1$ ,  $r < 0.3$ ). By understanding the magnitude of correlation among category national culture toward innovative capacity on the hypothesis testing, we can conclude that power distance national culture and individualism national culture are the best predictor to understand the capacity of the country to innovate.

## 5. Conclusions

In general, the study concludes that national culture has an association with national innovative capacity. Using Geert Hofstede national culture model, power distance, individualism, uncertainty avoidance, long-term orientation, and indulgence are having a correlation with the capacity of the nation to innovate. However, masculinity national culture shows no association with national innovative capacity. Power Distance and Individualism national culture are two categories of national culture that has a strong association with national innovative capacity. The rest category of national culture indicates moderate correlation (Uncertainty avoidance and long-term orientation) and weak association (Indulgence) with national innovative capacity. The results imply that the way society behaves and think rooted from the value of national culture will determine the national innovative capacity. The results are an explanation about the cosmic question about differentiation of innovation

performance among countries even though the technology and infrastructure to do innovation are the same. It implies that innovation performance is not only determined by the sufficiency of basic infrastructures for innovation (Technology and financial) but also influenced by national identity rooted in society in that country.

This study is also confirming that national innovative capacity is not influenced by the categorization of national income. Categorization income into lower income, lower middle income, upper middle income, and high income have no correlation with national innovative capacity. It implies that high-income country will not guarantee that it will lead to success regarding the ability to innovate. On the other hand, the low-income country is not identical with less innovative capacity. The low-income country still has the opportunity to have high innovative capacity if that country has a strong national culture that supports innovation activity. Meanwhile, the Human Development Index is strongly associated with national innovative capacity. It implies that factors that determine Human Development Index namely lifespan, education and Gross Domestic Product are playing a significant role in determining national innovative capacity.

Suggestion for future research of national culture and national innovative capacity is the application of another model of national culture and national innovative capacity measurement. GLOBE model of national culture is another alternative that can be tested to confirm consistency result of the role of national culture on national innovative capacity. Regarding national innovative capacity measurement, future research may better adopt specific national innovative capacity indicator such as the Global Innovation Index. Furthermore, the application of more sophisticated statistical analysis tool such as SEM (Structural Equation Modelling) is highly recommended. By using SEM analysis, we can understand more comprehensive the relationship among categorization of national culture. Lastly, the

increasing number of sample is suggested to get a more convincing representation of the population.

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