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National Culture Dimensions as Predictors of Innovation, Creativity, and Entrepreneurship

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Abstract

The purposes of this study were twofold. The first was to encourage other investigators to examine more closely three indices related to economic growth, specifically innovation, entrepreneurship, and creativity. The second was to encourage further investigation of Hofstede's national culture as explanatory variables. This investigation addressed this research gap by examining the relationships among indices of nations' creativity, entrepreneurship, and innovation, and their relationships with Hofstede's (2015) national culture dimensions. No previous research was identified which examined countries' creativity, entrepreneurship, and innovation in the same study. The relationships among four measures associated with economic development—the Global Innovation Index (GII), the Global Entrepreneurship Index (GEI), the Global Creativity Index (GCI), and Bloomberg 50 most innovative countries (B50) were studied. Two rarely investigated indices (B50 and GCI) were included in this research. Results indicated that all four indices were highly correlated. The factor structure of Hofstede's six cultural dimensions was reduced to three major factors: *heteronomy-autonomy*, *gratification*, and *competition-altruism*. Using multiple regression analysis, heteronomy-autonomy and gratification predicted GII. Gratification predicted the remaining three criteria. This study addressed this research gap of criterion development by examining the relationships among these variables, their relationships with national culture, and their predictability from different national culture dimensions. Practical implications of these findings for decision-makers and policymakers who want to increase their country's economic growth through the support of creativity, innovation, and entrepreneurship were discussed.

Keywords: business creation, global creativity index, global entrepreneurship index, societal values, inventiveness

Introduction

Rapid population growth and the resulting accelerated competition for resources have caused many nations to focus on finding innovative policies to foster economic growth within their borders (Handoyo, 2018). Innovation is a major contributor to sustainable economic growth and advancement (Hajar et al., 2020). Competition around the world is contingent on innovation and a nation's ability to create innovative products, services, processes, and strategies (Czyrniak & Smygur, 2017) Consequently, country leaders and policymakers must better understand factors

which contribute to and influence their nations' global competitiveness and economic growth (Da Silva & Teixeira, 2016; Moonen, 2017).

Creativity, innovation, and entrepreneurship all influence a country's economic growth—and though the constructs are interrelated, they are important conceptual differences. For example, a nation's creativity and its ability to identify unique solutions to current and future problems contribute directly on the nation's innovation process. The creative solutions must meet a need and provide a return on investment. Both creativity and innovation contribute to entrepreneurial growth within a nation through the expansion of existing businesses and business start-ups. Entrepreneurial activities are important contributions to economic growth (Noseleit, 2013) and business creation is a crucial component of a country's economic engine. Without enterprise development, without entrepreneurs, without new job creation and growth in productivity—innovation would not occur (Acs et al., 2018). Entrepreneurship is more important today than in the past (Galvao et al., 2017) and remains a key factor in economic development (Jovanovic et al., 2018) through job creation (Acs et al., 2018).

Understanding the relationships among a country's entrepreneurial activities, its innovation, and its creativity is essential to influence their economic growth, as well as the conditions which inhibit and encourage these constructs. Cross-country variations, particularly in the growth of innovation and entrepreneurial activity, have not been fully explained with economic and institutional factors (Frederking, 2004; Krueger et al., 2013). Consequently, research has turned to national culture as a major influence on economic growth, particularly its relationship to innovation, entrepreneurship, and creativity (Dubina & Carayannis, 2016). National culture influences citizen values and perceptions of creativity and innovation, the conditions leading to the development of these constructs, and the decisions from national leaders and policy makers regarding those variables affecting economic growth. Leaders and policy makers must understand the *measures* of economic growth and the variables over which they have the most influence as well as those which will provide immediate results. For example, to increase a country's creativity, leaders should know which actions should be taken first in elementary, secondary, or higher education. For entrepreneurship, policy makers should know to focus on governance, which encourages business creation (Cox & Khan, 2017). Finally, they should know where to place their emphasis regarding policies and infrastructures of entrepreneurial start-ups and the policies which encourage innovation in the larger corporations within their country (Da Silva & Teixeira, 2016; Handy, 2018).

The literature review conducted for this study investigating the relationship between a country's national culture and its creativity, entrepreneurship, and innovation identified four gaps (Jourdan & Smith, 2019). First**,** despite the high inter-correlations of some of its dimensions, Hofstede et al.'s (2010) six-dimensional model requires further investigation (Beugelsdijk & Welzel, 2018). Second, the three criteria (creativity, entrepreneurship, and innovation) have not yet been examined within the same study. Third, there is a dearth of research comparing two or more independent measures of economic growth-related variables. In this research, two measures of innovation were investigated to determine if one was more strongly related to Hofstede's cultural dimensions. Finally, there is limited research examining the validity of different dimensions to predict creativity, entrepreneurship, and innovation. These four gaps were the foundation to identify the purpose of this study; they include the following:

- To explore the inter-relationships among a country's creativity, entrepreneurship, and innovation.
- To determine if Hofstede's six cultural dimensions can be explained by a reduced set of factors.
- To determine if cultural dimensions are differentially related to national creativity, entrepreneurship, and innovation.
- To compare the relationships of two independent measures of the same construct (innovation) to determine if the measurements are equally valid.

Literature Review

The literature review begins with a discussion of the importance of innovation, entrepreneurship, and creativity in the economic growth of a country. A discussion of national culture and its relationships to a country's creativity, entrepreneurship, and innovation is followed by hypotheses posited based on the available literature and an explanation of the study's conceptual framework. The methodology, findings, theoretical and practical implications, and future research avenues follow this review.

Previous research on innovation and entrepreneurship related to national culture used only one or two criteria. For example, Shane (1992; 1993) performed some of the earliest studies on culture-innovation relationships when he examined the number of patents and trademarks. Similarly, Jang et al. (2016) used national rates of patents per capita. More recent research investigated composite measures of innovation, entrepreneurship, and creativity (Acs et al., 2015; Coy, 2015; Dutta et al., 2014; Florida et al., 2016). This study extends the examination of composite, multidimensional measures of entrepreneurship, innovation, and creativity because they are more expansive and comprehensive.

Multidimensional Measures of Entrepreneurship, Innovation, and Creativity

The most frequently studied cross-national indices of innovation and entrepreneurship have been (a) the GII (Dutta et al., 2014), (b) the Global Entrepreneurship Monitor (GEM; Bosma & Kelley, 2019), and (c) GEI (Aces et al., 2015). Investigations of national creativity have lagged entrepreneurship and the most promising measure is (d) the GCI (Florida et al., 2011; Florida et al., 2015).

A measure of national innovation in over 120 countries, GII's key objectives are to help nations evaluate their performance in innovation and to provide them with the necessary information to address their strengths and weaknesses for the purpose of creating policies. These policies support the development of innovation in those countries served, which accounts for over 96% of the global gross domestic product (GDP) and over 90% of the world's population. Meanwhile, GII acknowledges their initiatives have a substantial influence on economic advancement. Selected for this study because it has studied over 120 economies, GII also provides in-depth measurements of national innovation and is a multidimensional composite measure widely used in research on cross-country innovation.

Next, the GEM survey has studied 73 economies encompassing 72.4% of the world's population and 90% of the world's GDP. It studies individual attributes, social values, entrepreneurial

activities in social, cultural, political, and economic contexts. Governments use the results to better understand and apply interventions to build entrepreneurial skills and enhance entrepreneurial ecosystems (Singer et al., 2014). However, GEM was not selected for this research investigation because of its smaller sample size (less than 100 countries) compared to other databases, such as the GEI (Acs et al., 2015; Acs et al., 2018).

The Global Entrepreneurship and Development Institute (GEDI) studies the relationship between entrepreneurship and economic development and publishes the GEI, which assesses the dynamics and quality of entrepreneurship for entrepreneurship ecosystems in over 100 countries from data on entrepreneurial attitudes, abilities, and aspirations (Acs et al., 2015; Acs et al., 2018). This report describes national entrepreneurship as an entrepreneurial interaction between attitudes, abilities, and aspirations of individuals, thus driving support for startups.

Few investigations and measures of intercountry creativity exist (Fang et al., 2016; Hollanders & van Cruysen, 2009; Rinne et al., 2013) even though creativity is important for economic growth (Florida, 2007). The literature uncovered limited articles examining GCI (Esen & Sirkintioglu-Yildirim, 2018; Hollanders & van Cruysen, 2009; Rinne et al., 2013; Rojenko & Dahs, 2017). The GCI uses three measures of economic development to investigate economic growth and sustainable prosperity and includes over 130 countries (Florida et al., 2015; 2016). It was selected for this study because, even though it offers great potential for investigating and expanding the knowledge of national creativity and its relationship to innovation and entrepreneurship, it is largely absent in published research.

Finally, the Bloomberg Innovation Index (B50) measures innovation in 50 countries (Coy, 2015). Even though it has been published for over a decade, the literature review revealed only two peer-reviewed articles that mentioned B50, neither examining it empirically. Vasconcellos et al. (2018) visually compared the rankings of the top 25 countries in both the 2017 B50 and the 2017 GII against the top 25 countries on their measure of innovative capacity for economic strength of countries and their populations. They concluded that each measure has its advantages and disadvantages, and each could arrive at different conclusions based on the criterion used. Meanwhile, Wolniak and Grebski (2018) examined B50's subindices and concluded that it was a measure of economic growth. It was included in this study because it is a multidimensional index and absent in the published investigations. It offers promise as an alternative to GII for measuring cross-country innovation. Investigation of this innovation index will improve understanding of national innovation rather than using GII alone.

National Culture, Innovation, Entrepreneurship, and Creativity

Hofstede's (2015) 6-dimension (6D) model of national culture has received widespread attention from investigators working in cultural studies. The six cultural dimensions identified by the model are (a) individualism-collectivism (IND), (b) power distance (PD), (c) uncertainty avoidance (UA), (d) masculinity-femininity (MAS), (e) long term-short term orientation (LTO), and (f) indulgence-restraint (INDUL). A description of each dimension follows.

Individualism-Collectivism (IND)

The most investigated of Hofstede's dimensions is IND, where a high score reflects the perception that individuals primarily look after themselves and close family members, while a low score indicates an expectation for people to take care of the larger group and to remain loyal to that group. Prior research has confirmed that individualism is associated with national creativity, entrepreneurship, and innovation; for example, Rinne et al. (2013) found individualism is positively related to creativity. Multiple studies reported that individual creativity was positively related to the IND dimension (Goncalo & Staw, 2006; Kharkhurin & Samadpour-Motalleebi, 2008; Leung & Wang, 2015; Ng, 2003; Zha et al., 2006).

Using different operational definitions of innovation, several studies confirmed the association of individualism and innovation (Cox & Khan, 2017; Czerniak & Smygur, 2017; Handoyo, 2018; Jang et al., 2016; Rinne et al., 2012; Shane, 1992; 1993; Strychalska-Rudzewicz, 2015; Taylor & Wilson, 2012). In some of the earliest studies of the culture-innovation link, Shane (1992; 1993) found a positive relationship between individualism and innovation as measured by number of patents issued. Similarly, Rinne et al. (2012) uncovered a positive correlation between innovation and individualism. Taras et al.'s (2010) meta-analysis determined that of Hofstede's six dimensions, individualism had the highest positive correlations with innovation. These findings suggest that an innovative country values individualism, which support the inclusion of autonomy, independence, and freedom. Leung and Wang (2015) posited that individual in high individualist (low collectivist) cultures often score higher on creativity tests, indicating they encourage novelty. Conversely, some high collectivist countries are innovative because they encourage usefulness.

Multiple investigations concluded a positive correlation between entrepreneurship and Hofstede's measure of individualism (Celikkol et al., 2019; Crespo, 2017; Jovanovic et al., 2018; McGrath et al., 1992; Mueller & Thomas, 2001; Rarick & Han, 2015). Notably, Celikkol et al. (2019) confirmed that individualism supports the rate of entrepreneurship.

Uncertainty Avoidance (UA)

Describing a country's comfort level or tolerance of ambiguity and uncertainty, nations with high UA scores attempt to reduce the uncertainty in their culture with laws, guidelines, and rules; and they believe there is one truth by which everyone should live and follow. On the other hand, countries with low UA scores have fewer rules and regulations, feel comfortable with uncertain and ambiguous situations, and freely accept different ideas and opinions. Research on the relationship between UA and creativity, entrepreneurship, and innovation has been mixed with few investigations into the relationship between UA and creativity. No studies were identified that could indicate a positive association, and only two studies found a negative relationship (Shane, 1995; Williams & McGuire, 2010). Rinne et al.'s (2012) study found no significant relationship. For the most part, UA negatively correlated with innovation (Cinjarevic & Veselinovic, 2017; Damic et al., 2019; Halkos & Tzeremes, 2013; Handoyo, 2018; Kaasa & Vadi, 2010; Shane, 1993; Strychalska-Rudzewicz, 2015; Sun, 2009; van Everdingen & Waarts, 2003). Shane (1995) found that low UA was associated with the promotion of innovative activities. Others found contradictory outcomes in that it was unrelated to innovation (Rinne et al., 2012; Shane, 1992). Taras et al.'s (2010) meta-analysis determined that UA had a strong negative relationship with innovation. Another meta-analysis concluded that moderate UA maximizes the association between creativity

and innovation (Sarooghi et al., 2015). Findings relating entrepreneurship and UA have been mixed, but trending toward a negative relationship (Crespo, 2017; Jovanovic et al., 2018; Kreiser et al., 2010; McGrath, 1992; Mueller & Thomas, 2001). Celikkol et al. (2019) and Rarick & Han (2015) reported contradictory findings of no relationship.

Power Distance (PD)

High PD is the degree to which citizens are willing to accept unequal distribution of power in their society. Those with less power and influence accept the existence of this inequality and expect it to continue. Citizens from nations with low PD try to influence and distribute power, often questioning formal authority. The relationships between PD and creativity, innovation, and entrepreneurship are differential with national culture. Of the few relevant studies, no relationships between PD and creativity were reported (Fang et al., 2016; Ng, 2003; Rinne et al., 2013; Williams & McGuire, 2010). One study was the exception. Leung and Wang (2015) found individuals' creativity scores were negatively related to PD. A meta-analysis using individual level data indicated that PD had a strong negative relationship with openness to experience, a characteristic associated with creativity (Taras et al., 2010).

Creativity is part of the innovation process for both businesses and individuals (Rinne et al. 2013). Much of the research on innovation has concluded that innovation has an inverse relationship with PD (Cinjarevic & Veselinovic, 2017; Czerniak & Smygur, 2017, Halkos & Tzeremes, 2013; Handoyo, 2018; Jang et al., 2016; Kaasa & Vadi, 2010; Rinne et al. 2012; Shane, 1992; 1993; Strychalska-Rudzewicz, 2015; Sun, 2009; van Everdingen & Waarts, 2003). Shane (1992) reported that PD was negatively correlated with the number of inventions per capita, which some define as creativity and others define as innovation.

Investigations of a link between entrepreneurship and PD have also been mixed, with more evidence tending toward a negative association. Several studies found a negative correlation (Hayton & Cacciotti, 2013; Hayton et al., 2002; Jovanovic et al., 2018; Kreiser Marino et al., 2010; Rarick & Hahn, 2015). Celikkol et al. (2019) found that of four measures of entrepreneurship, entrepreneurial aspirations were not significantly correlated with masculinity while significant negative associations were found for the remaining three. McGrath et al., (1992) and Crespo (2017) found a positive relationship between PD and entrepreneurship.

Masculinity (MAS)

A country high in MAS values achievement, competition, assertiveness, and material rewards for being successful. Countries high in femininity (low MAS) encourage cooperation, quality of life, and modesty, prefer consensus over competition, and care for the weaker members of the society. There have been fewer investigations on MAS, LTO, and INDUL compared to the previous three dimensions (Xie & Paik, 2018). Two studies investigated a MAS-creativity link, and neither found a significant relationship (Rinne et al., 2013; Xu et al., 2016). Both studies used patent data as a measure of creativity, and GCI as a national measure of creativity, though no relationship with MAS was found. Only one study was identified which found a statistical relationship between entrepreneurship and masculinity: Celikkol et al. (2019) found that MAS was negatively related to entrepreneurship rates as measured by GEI. Other studies found no relationship between the two (Hayton & Cacciotti, 2013; Javanovic et al., 2018; Rarick & Han, 2015). Investigations of

MAS with innovation provided results like those with entrepreneurship, with no relationship reported between MAS and innovation (Cinjarevic & Veselinovic, 2017; Cox & Khan, 2017; Handoyo, 2018; Prim et al., 2017; Rinne et al., 2012).

Long Term Orientation (LTO)

This cultural dimension recognizes the challenge of a country to maintain tradition and the culture's need to adapt to current and future challenges. Meanwhile, short-term orientation (low LTO) societies are more likely to hold on to tradition, sometimes at the expense of societal change. High LTO societies take a more pragmatic perspective and see the need for adaptation and practical problem solving. Fang et al. (2016) found a positive relationship between LTO, and creativity as measured by the number of patents per 1,000 people Celikkol et al. (2019) examined the relationship between GEI and Hofstede's six dimensions and came to a similar conclusion.

Indulgence (INDUL)

The final dimension, INDUL, describes the values of whether the focus of a culture is on gratification, whether freely experienced, suppressed, or delayed. A society high in INDUL (low in restraint) provides citizens the freedom to satisfy basic needs and desires, whereas a nation high in restraint (low in INDUL) uses strict norms to control its citizens' need for gratification (Hofstede, 2016). No studies were located which examined the relationship between creativity and the INDUL dimension. A consistent finding was that entrepreneurship is positively related to INDUL (Broberg et al., 2019; Celikkol et al., 2019; Jovanovic et al., 2018). Findings related to innovation are mixed. Three studies reported no relationship between INDUL and innovation (Cox & Khan, 2017; Czerniak & Smygur, 2017; Prim et al., 2017), though others reported a positive relationship (Andrijauskiene & Dumciuviene, 2018; Handoyo, 2018).

Hypotheses

Creativity, entrepreneurship, and innovation are interrelated. Creativity, often seen as ideation, is the identification of new ideas. Entrepreneurship can be viewed as the practical application of creative ideas where the intent is to implement a useful product, service, or solution. Innovation is primarily seen as the implementation of the creative idea, which may or may not be useful initially since innovation involves prototyping and testing.

Creativity requires individuals or groups to take risks, tolerate ambiguity and uncertainty, and be in a situation with low structure, including structures encouraging separation of the more powerful from the less powerful. Finally, creativity requires indulgence from its people to take the opportunity to indulge oneself when following unproven and untested ideas.

- **Hypothesis 1:** GII, B50, GEI, and GCI are significantly intercorrelated.

Culture plays an important role in societies' creativity. Society must encourage its citizens to take risks, to be comfortable with ambiguity, and to believe that they have some control over what happens to them.

- **Hypothesis 2:** GCI, a measure of a nation's creativity, is significantly related to IND and UA.

For entrepreneurship to flourish, people in a culture must believe they have control over what happens. Characteristics of citizens with high individualism include autonomy, self-initiative, and independence. A society which encourages these measures must also encourage action through low power distance, or more equal distribution of power. To have an entrepreneurial spirit, one that values entrepreneurship, people must be comfortable with the unknown and the uncertain. Further, societies must encourage aspiring entrepreneurs to follow their dreams, to indulge in fantasies, and to seek gratification of their need to be entrepreneurial.

- **Hypothesis 3:** GEI is related to IND, PD, and UA.

For countries to be innovative, they must encourage its citizens to take self-initiative to experience some degree of autonomy since innovation involves the implementation of something new and different. The culture must be high on individualism. To encourage people to act, they must feel they are in control of their fate. Countries with high PD do not provide this because of accepted inequalities in society. Innovation is a long-term endeavor which requires planning and restraint in the implementation and marketing of a new product or service.

- **Hypothesis 4:** Innovation, as measured by GII and B50, is significantly related to IND, PD, and LTO.

Previous research exists that has questioned the factor structure of Hofstede's six dimensions. Consequently, Beugelsdijk & Welzel (2018) recommended a three-factor model based on their findings.

- **Hypothesis 5:** A factor analysis of Hofstede's six dimensions will confirm three factors.

Creativity is a contributing influence on entrepreneurship and innovation. Each requires different behaviors, with creativity describing ideation, and entrepreneurship and innovation relate more to application and implementation. Different factors will be predictive of different criteria. Specifically, because it is posited that creativity and entrepreneurship contribute to national innovation, innovation will be related to more factors than either creativity or entrepreneurship.

- **Hypothesis 6:** The resulting three factors will differentially predict each of the indices, specifically, innovation will be related to more factors.

This study's framework posits that a nation's innovation, entrepreneurship, and creativity are related to and can be predicted by a country's culture, specifically Hofstede's (2015) 6-D model composed of individualism, power distance, masculinity, uncertainty avoidance, long-term orientation, and indulgence (Fang et al., 2016; Jovanovic et al., 2018; Sarooghi et al., 2015). The main premise of this study is that creativity (the identification of unique ideas) contributes to entrepreneurship and leads to the creation or operation of a business to implement this idea. Consequently, entrepreneurship (the creation of innovative products and services) contributes to the overall innovation of a country through the application and implementation of policies in corporations and governments.

A summary of the findings indicates that (a) all four indices (creativity, entrepreneurship, and two measures of innovation) were highly related, (b) Hofstede's six dimensions are reducible to three

dimensions, (c) these three new factors were differentially related to the four criteria, and (d) both measures of innovation were significantly intercorrelated but related to different dimensions. Each of these findings are discussed in more detail below.

Research Design

A cross-sectional research design was selected, using secondary data with ordinary least squares (OLS), multiple regression analysis, Pearson correlation, and exploratory factor analysis -all appropriate for interval scale data and all frequently used in past research on national culture.

Variables

The dependent variables were four cross-country indices of innovation, creativity, and entrepreneurship. The indices utilized were the 2014 GII (Dutta et al., 2014) with $n = 119$, the 2015 GCI (Florida et al., 2015) with $n = 107$, the GEI (Acs et al., 2015) with $n = 126$, and the 2015 B50 Score (Coy, 2015) with $n = 50$.

The independent variables were Hofstede's six cultural dimensions of power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence. There are 111 countries in this database, with 66 countries having complete data on the six dimensions (Hofstede, 2016).

Data Analysis

Pearson correlation examined the bivariate relationships. Exploratory factor analysis (EFA) examined the factor structure of Hofstede's dimensions as a data reduction technique often used in prior national culture research (Beugelsdijk & Welzel, 2018; Hofstede, 1980). The EFA determines the justification of factors retained and supported explanations of factors and solution (Pallant, 2013; Tabachnick & Fidel, 2007). The objectives of EFA are to decrease the number of variables, investigate interrelationships of variables, assess a scale's construct validity, simplify analysis and interpretation, manage multi-collinearity, and develop and provide contrary evidence of proposed theories and constructs (Thompson, 2004). It was used to determine if Hofstede's model could by simplified since some researchers have questioned the number of dimensions it currently uses (Beugelsdijk & Welzel, 2018; Smith et al., 1996). Because this dataset has been widely investigated, neither a Kaiser-Meyer-Olkin (KMO) test for sampling accuracy nor a Bartlett's test of sphericity were done.

Varimax rotation was selected to identify orthogonal and independent factors such that there is no correlation among them, to maximize factor loadings variance, and to minimize the number of variables with high loadings across factors (Pallant, 2013; Tabachnick & Fidell, 2007). It is an efficacious means of achieving simple structure and facilitates replication (Costello & Osborne, 2005; Fabrigar et al., 1999). Other rotations can be more challenging to interpret (Field, 2009; Matsunaga, 2010). Variables with factor loading of .50 or higher were used as a selection criterion for including variables as a composite variable in each factor. The higher the factor loading, the more interpretable the factor (Comrey & Lee, 1992; Kline, 1994). Factor loadings of .50 are acceptable (Leech et al., 2014; Matsunaga, 2010; Wipulanusat et al., 2017). This approach facilitates identification and naming of factors, can be used to reduce the number of independent variables (dimensions) which are highly intercorrelated and which can create statistical problems

with multi collinearity in multiple regression analysis (MRA). Past research demonstrates that at least two of Hofstede's dimensions have Pearson correlation absolute values greater than .60. Reducing the number of variables in MRA increases the stability of regression weights, allowing for more independent variables such as interactions and other variables, as the researcher chooses. While there is no generally accepted ratio of observations to independent variables, a frequently used rule of thumb is 10:1 ratio of 10 observations for each independent variable. The sample sizes in a significant number of previous studies examining national culture and innovation and entrepreneurship were small because of limited or missing data, sample sizes sometimes between 25 and 60, so fewer dimensions will lead to more stable models.

The reliabilities of composite variable(s) composed of variables with factor loadings of .50 or more for each factor were measured using Cronbach's alpha (Cronbach, 1951), the most widely used statistic of scale reliability (Warrens, 2016). It had previously been used to measure the reliability of factors from a factor analysis of Hofstede's cultural dimensions (Beugelsdijk & Welzel, 2018).

MRA has been frequently used in earlier investigations related to national culture and innovation, entrepreneurship, and creativity. This technique was used because of the varying sample sizes for each of the criteria. Backward stepwise multiple regression analyses were utilized to examine the relationships of each index with composite variables resulting from the factor analysis of Hofstede's six dimensions of national culture. Backward selection multiple regression technique allows all variables to be in the model from the first step, and the variables enter or are removed depending on their significance level and contribution to multiple *R*. This technique is a combination of forward selection and stepwise regression, and other multiple regression techniques were used in the selection of variables. Backward stepwise regression is expected to out-perform forward selection because the former is less susceptible to independent variable collinearity (Darlington & Hayes, 2017).

Findings

Hypothesis 1 was confirmed that all four indices were significantly related. The correlations between the four indices were significant ($p < .0001$) for both pairwise and listwise deletion of missing data (See Table 1). Using pairwise deletion, the Pearson correlations ranged from .70 (.706) to .89 (.895). The GII was correlated with the other three indices, and all correlations were greater than .80, with GEI showing the highest correlation at .89. Using listwise deletion, correlations ranged from .68 between B50 and GEI to .81. The GII was significantly correlated ($p < .0001$) with the other three indices, with the lowest correlation at .802. The highest correlation was .81 between GII and GCI. GII correlated with the other three indices, including B50 and a measure of innovation, were consistently at .80 or above for both pairwise and listwise deletion. Pearson correlations between GCI and GEI were consistently high (.70 and above) whether listwise or pairwise deletion was utilized. In summary, all global indices were highly inter-correlated and significant at $p < .0001$ for analyses using listwise and pairwise deletion of missing data.

Hypothesis 2 was also confirmed: GCI is related to IND and UA. GCI was also related to LTO and INDUL. There were similarities and differences in the correlations between the four indices and the six dimensions, and the use of listwise or pairwise deletion influenced the results. Similarities included that IND, PD, and INDUL were significantly related ($p < .05$) to all four

indices, and MAS was unrelated to the four indices ($p > .05$) regardless of the deletion process used. Differences in associations occurred for UA and LTO. UA was significantly related to three of the four indices ($p < .05$) but not to B50 for listwise deletion ($p > .05$). UA was only significantly related to GII ($p < .05$) for pairwise. LTO was significantly related ($p < .05$) to three of four indices but was unrelated to B50.

Table 1. Pearson Correlations Between Global Indices

Global Index	GII	B50	GEI	GCI
GII	1.00	1.00		
B50	.81 (.80)	.70 (.68)	1.00	
GEI	.89 (.81)	.71 (.70)	.82 (.76)	1.00
GCI	.84 (.80)			

Note. All bivariate correlations for both pair wise and list wise deletion were significant $p < .0001$. Correlations for list wise deletion are in parentheses for $n = 44$. Pairwise deletion sample sizes for GII = 143, for B50 = 49, for GEI = 119, for GCI = 118.

Hypothesis 3, that GEI was related to IND, UA, and INDUL, was partially supported. IND and INDUL were correlated with GEI, but with no significant correlation with UA. For Hypothesis 4 -that innovation, as measured by GII and B50, was correlated with IND, PD, UA, and INDUL- was partially supported. GII and all four cultural dimensions were significantly correlated , and for B50, IND and INDUL were correlated.

Hypothesis 5 was confirmed by EFA with varimax rotation resulting in three factors like those of Beugelsdijk and Welzel (2018). They named their first factor collectivism-individualism, in which PD, IND, and UA had factor loadings of .47 (UC) and over .80 for PD and IND. In this present study, three factors were identified, and the same three factors loaded on Factor 1 with the lowest absolute value factor loading over .50 for uncertainty avoidance. The factor loading for IND was negative, and the loadings for UC and PD were positive, and IND's negative loading indicates high collectivism, whereas UA's positive loading for indicated discomfort with uncertainty, ambiguity, and desire for rules and structure to reduce uncertainty. PD's positive loading was interpreted as acceptance of inequality and differences in power within society. Therefore, a high score on this factor indicated the need for autonomy and a low score indicated lower preference for autonomy. In this study, Factor 1 was named *heteronomy-autonomy*, where heteronomy refers to control or regulation from others, or a form of control from the outside. For their second factor, absolute values of the two highest factor loadings, both higher than .80, were found for LTO (positive factor loading) and INDUL (negative factor loading). This factor was titled *duty-joy*. Comparable results were found in this study. Since LTO factor loading was positive, it connotes a time orientation toward the future. INDUL's negative loading indicates a direction toward the restraint, delayed gratification, and a future orientation. For the current study, this factor was called *gratification,* which is like indulgence or to restraint, which connotes impulse control. Beugelsdijk and Welzel's third factor, *distrust-trust*, contained only one variable, MAS, which the current study also found. For Hofstede's MAS dimension, a high score demonstrates a preference for competition, extrinsic rewards for success, and achievement; while a lower score demonstrates more of a focus on people, including cooperation, consensus approach, and caring for weaker members of society. The study named this factor *competition-altruism*.

PD and UA had a positive loading and IND and Indulgence (INDUL) loaded negatively on Factor 1. Based on these results, three composite variables were created. On each factor, variables with

factor loadings of .50 or greater were summed. Factor 1 was the sum of scores for IND, PD, and UA and explained 31.096% of total variance. Factor 2 included two dimensions -LTO and indulgence- and explained 27.027% of the variance. Only one variable, masculinity, was included for the third factor, which explained 17.46% of total variance.

Table 2. Factor Analysis With Varimax Rotation of Six Cultural Dimensions

Independent Variable	Factor 1	Factor 2	Factor 3
IND	-.859	.085	.179
PD	.843	-.249	.116
UA	.570	.083	.087
LTO	-.114	-.906	.114
INDUL	-.278	.853	.101
¤ MAS	.044	-.021	.986
% of Total Variance Explained	31.096%	27.072%	17.46%

Reliabilities of newly formed factors were calculated using Cronbach's alpha. One caveat is that the combined use of negative and positive loadings can affect the value of Cronbach's alpha since it ranges from 0 to 1. In this study, IND was converted to a positive score. The reliability of three variables in factor 1 was .63, and the reliability of the variables with the two highest loadings (> .80) was .77. With the LTO dimension reversed scored, Cronbach's alpha was .75. Hypothesis 6 was supported. The resulting three factors will differentially predict each of the indices; specifically, innovation will be related to more factors than either creativity or entrepreneurship. The three cultural dimensions with the highest loadings on Factor 1 were combined to create a composite Factor 1 independent variable. The two factors which had the highest loadings on Factor 2 were combined to create Factor 2 independent variable. And the single variable which loaded highly on Factor 3 (MAS) was used as a Factor 3 independent variable. Backward selection multiple regression analyses were then completed using each of the four indices as the dependent variable. Using GII as the dependent variable, Factors 1 and 2 remained in the model and had a multiple correlation (*R*) of .66 ($F = 18.48$, $df = 2,49$). For B50, only one composite variable (Factor 2) remained in the model with an *R* of .53 ($F = 16.99$, $df = 1,43$). For GCI, only Factor 2 remained in the model with an *R* of .40 ($F = 10.96$, $df = 1,57$). Likewise, only Factor 2 remained in the model for GEI with an *R* of .44 ($F = 13.19$, $df = 1,54$). All were significant at $p \leq .002$.

Table 3. Multiple Regression Multiple *R*s for Each Index

Index (DV)	Independent Variable	Multiple *R**	*n*
GII	Factors 1 and 2	.66	52
B50	Factor 2	.53	45
GEI	Factor 2	.44	56
GCI	Factor 2	.40	59

Note. Factor 1 = individualism, power distance, and uncertainty avoidance.
Factor 2 = long-term orientation and indulgence. *All F-ratios significant at $p \leq .002$.

Conclusions and Implications

Theoretical Implications

This study addressed the dimensionality of Hofstede's 6-D model of national culture and the potential differential impact of these dimensions on creativity, innovation, and entrepreneurship. Beugelsdijk and Welzel (2018) redefined Hofstede's six-dimension model to three dimensions: (a) collectivism-individualism dimension, like Hofstede's individualism dimension; (b) duty-joy

dimension; and (c) distrust-trust dimension. The current research also identified three additional dimensions: (d) heteronomy-autonomy; (e) gratification; and (f) competition-altruism. Therefore, both Beugelsdijk and Welzel's (2018) research and the present research suggest that the factor structure of national culture be re-examined, and alternative models should be considered beyond the 6-D model.

As the foundation of Hofstede's cultural dimension are being reconsidered, researchers are also asking if it will alter the interpretation and impact of national culture on economic growth; specifically, how these dimensions are related to a country's creativity, innovation, and entrepreneurship. Researchers must determine how these three complex variables relate to economic growth through specific types of entrepreneurships such as supporting need-based or opportunity-based initiatives, encouraging female entrepreneurship, and exploring how these options relate to different types of innovation such as incremental and radical innovation.

This investigation contributes a better understanding of the dimensional foundations of national culture. Further, it considers that a revised explanation of Hofstede's model may influence prior research conclusions regarding the relationships of cultural dimensions and entrepreneurship and innovation.

Practical Implications

First, more research on the criteria of national creativity, entrepreneurship, and innovation is needed, including their relationships. An important finding of this study is that all four indices were positively correlated with one another. Since creativity is frequently seen as ideation, this is related to idea/solution identification, and possibly opportunity identification for both entrepreneurial and corporate entities. Innovation is seen as largely implementation and commercialization of the idea, and innovation occurs both in entrepreneurial and corporate environments. Examination of these criteria can result in more integrated and effective understanding of contributors to national creativity, innovation, and entrepreneurship and their impact on economic growth.

Second, when two measures purport to assess the same construct, as GII and B50 do, there should be some justification for selecting one over the other when measuring country innovation. More research is recommended on the criteria and their convergent and divergent validity.

Third, countries and national governments should be concerned as to which criterion to support through education, public policies, incentives, and institutional structures and infrastructures. If national creativity were a priority, then emphasis on student creativity may be placed in elementary and secondary education. If emphasis is placed on entrepreneurship, secondary and higher education might receive more support. If the focus is primarily entrepreneurship and innovation for small businesses and corporations, then different incentives, policies, and institutional structures would come into play. Governments must have data to assist in determining which contributes most to economic development. Also, national governments identify which existing cultural dimensions are strengths and which could be used to encourage economic growth through creativity, innovation, and entrepreneurship. In this study, each of these three were better predicted by certain dimensions than others.

Limitations

There were several limitations to this study. First, secondary data were used for all data sets, for both the dependent variables (GII, GEI, GCI, and B50) and the independent variables (Hofstede's six cultural dimensions). Second, when using multiple independent data sources, sample sizes frequently vary because of missing data. In this study, sample sizes varied from 50 for B50 to 143 for GII. Third, using small samples limits the number of independent variables that can be used because stability of statistical weights is affected in multivariate analyses. Therefore, any analyses comparing all dependent variables simultaneously will result in smaller samples. Fourth, a criticism in using measures of national culture is that researchers are unable to apply the measures to a whole country which raises the importance of country subcultures (Valliere, 2019), for which reliable data are lacking. This criticism applies to this investigation as well with its use of national culture dimensions. Finally, this research does not support the conclusion of causation between national culture and a country's innovation, entrepreneurship, and creativity since the analyses are correlational.

Strengths

There were several strengths of the study. First, it examined indices related to economic growth. Some have rarely been investigated, specifically their relationships with national culture, especially within the same study. There was a dearth of research on two of the indices. The GCI has rarely appeared in research investigations, and B50 has appeared in no published empirical research. Second, this investigation provided a better understanding of their associations. The four indices purported to measure different constructs, sometimes used interchangeably, were highly intercorrelated. However, national culture differentially predicted those criteria. While intercorrelations were high, there were differences in their predictability by different cultural dimensions. There were similarities in the constructs which they measure, and, at the same time, did contribute some unique variance. Third, this study investigated the factor structure of Hofstede's model. Researchers have empirically investigated the efficacy of fewer dimensions and redefined his dimensions (Beugelsdijk & Welzel, 2018; Minkov, 2018; Minkov et al., 2018; Venaik & Brewer, 2010). Beugelskiijk and Welzel's (2018) investigation reduced Hofstede's model to three-dimensional factors, as did this study. However, differences in composition, definition, and identification were noted.

Future Research

There are several promising avenues for future research. First, investigations of criteria and the interrelationships among various criteria, including global indices, are needed. This effort would also include less frequently researched indices such as B50 and GCI, in addition to two well-known entrepreneurial indices, GEI and GEM. Operational definitions vary across studies. Simonton (2012) used the number of patent applications as a measure of creativity, whereas Shane (1992) and Fang et al. (2016) used the same criterion as a measure of innovation. Second, it would be worthwhile to determine if historical measures of national culture dimensions can predict future growth in a country's innovative, entrepreneurial, and creative activities and outcomes. For example, future research could explore predictability of a country's historical measures of national culture on innovation five or ten years into the future. Third, continued research on the structure of national culture dimension is necessary. Fourth, an examination of the reliability and stability

of these indices across time would add to the body of knowledge, as some researchers have already begun to explore (Beugelsdijk et al., 2015; Hofstede, 1980). In doing so, one could examine the predictability of changes in cross-country innovation, entrepreneurship, and creativity using lagged index measures. Fifth, efforts to see how each of these measures is related to culture, Hofstede's dimensions, and other cultural measures such as Inglehart & Welzel (2005) and Schwartz (2004) should continue. Finally, evidence suggests that specific configurations of cultural dimensions promote entrepreneurial activities differently for males and females (Crespo, 2017). Similarly, different configurations have also influenced formal and informal entrepreneurship (Jang et al., 2016; Thai, & Turkina, 2014).

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