The National Culture as a Determinant of Governance Efficiency:
An Empirical Study on Country Level

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Abstract

The present study examines the impact of the national culture on the country-level governance efficiency index. The dimensions of culture as an independent variable is measured using three different cultural frameworks: Hofstede, Globe and Trompenaar. Based on a secondary data collection, the governance efficiency is the dependent variable adopted in the analysis. As the current study is examining whether the national culture has an impact on the governance efficiency index, it is an attempt to understand the determinants of governance. An empirical study was conducted on data involving 177 different countries with different level of incomes. The analysis adopted is the linear regression to test the relationship between the independent and dependent variables and the machine learning models to classify data based on models which have been developed, the other purpose is to find out the best model for predicting the future outcomes. The paper at the end concluded with a discussion of some of the theoretical and practical implications from the results of the empirical study of governance in a number of different countries. It brings a valuable insight into a previously undocumented area of research stressing on the importance of national culture as an important factor and determinant for a better country-level governance.

Keywords: *Governance Efficiency, National Culture, Institutional Theory, Hofstede, The Globe, Trompenaar.*

Introduction

The focus in the issues related to corporate governance has been risen dramatically and this could be related to the spread of the some of the corporate scandals across the corporate world (Chang, 2015). These scandals have put an emphasis on the importance of good corporate governance. The corporate governance mechanisms can be categorized into two types: the internal and external mechanisms. The internal mechanisms mainly focus on board of directors, ownership structures and control, management incentives mechanisms; whereas, the external mechanisms include issues related to the external market and laws and regulations (e.g. legal system). In these terms, corporate governance research has mostly concentrated on internal governance mechanisms (i.e. board of directors, controlling owners.... etc.). Significantly a lot of the work ignores the external corporate governance practices play in stopping managers from engaging in activities detrimental to the welfare of shareholders, and the overall firm (Aguilera et al., 2015).

The objective of the study is to find out if the national culture dimensions can have a contribution to the governance efficiency score. It is an attempt to shed the light on the determinant of governance effi-

ciency in a country-level analysis. The rationale behind this study is that the efficiency of governance at the country level has an influence on the governance at the firm level (Gryphon et al., 2017). This study proposes a novel approach to examine a basic yet crucial question: how does the governance efficiency index of a country associate with its cultural values?

Prior research on international corporate governance is subject into some limitations and they are: (a) the researches focuses on CG practices that are based on the Anglo-Saxon countries, with the limitation of focusing on certain CG dimensions such as transparency, disclosure, equity-based pay and board independence (Griffin et al., 2017); (b) The literature concerning the relationship between culture and corporate governance has primarily focused on the adoption and implementation of corporate governance practices; however, little research has investigated the impact of cultural differences on governance efficiency overall score, culture is rarely used as a determinate of corporate governance practices in empirical studies (Daniel et al., 2011), mostly the impact of culture has been investigated on various other economic outcomes; (c) the majority of researches that investigates the relationship between culture and corporate governance practices have based they study on only two dimensions of Hofstede cultural model two or three cultural dimensions- uncertainty avoidance, individualism and power distance (e.g. Griffin et al., 2017; Rafiee & Sarabdeen, 2012; Rampling, 2009). However, the Hofstede model has been criticized for oversimplifying culture in a linear scale. Although Hofstede is considered one of the most famous frameworks for studying the national culture, there are other cultural frameworks for studying the national culture such as the Globe and Trompenaar (Jain & Pareek, 2019).

This study empirically addresses the issues of variations in the cultural and institutional contexts in which corporate governance systems are established and the impact of those variations on its practices. There are theoretical and practical implications arising from the findings of this study and its findings adds to the existing body of knowledge on corporate governance.

Literature Review

Corporate governance

Corporate Governance has turned to be a crucial area in the management discipline as it is the framework that defines the division of power and wealth inside the corporation (Licht et al., 2005). It involves playing a sound role in creating a good relationship between board of directors, shareholders and other stakeholders (Monks & Minows, 2008). CG can be seen as a set of rules aimed to protect minority shareholders against the managerial misbehaviour or misbehaving (large) shareholders (Sheifer & Vishney, 1997).

According to Hensen and Meckling (1976), the separation between ownership and control is one of the major challenges as it creates the agency problem, at this point comes the importance of the board of director's role in the responsibility of monitoring and controlling management, as well as providing strategic direction to the corporation. The board independency is an important criterion for effective governance (Bahgat & Black, 2002). The increasing complexity of the business environment, with the essentiality to manage the demand of different stakeholders including customers, employees, suppliers, and other external parties, make it essential to seek a more comprehensive approach to corporate governance.

Additionally, understanding the importance of corporate governance role it plays when globalizing of business as globalization has turned it essential to have an international standards of corporate governance. In these terms, OECD has developed have developed a set of principles aimed at improving transparency, disclosure, accountability, and fairness (OECD, 2015).

From the aforementioned, it is denoted that CG has emerged to be a crucial aspect of organization operation. Effective CG requires a balance of interests of shareholders and other stakeholders, strong independent board of directors, and a more comprehensive approach that considers social and environmental issue.

Culture

Culture is notoriously difficult term to define, there have been multiple opinions regarding the definition of culture (Spencer-Oatey, 2012). It has been defined as a set of inherited values and ways of living that are embraced by individuals living in a specific society (Kawar, 2012). It has been categorized into two main categories: generic culture which is referred to as the culture shared by all human beings; and as the local culture which is referred to as the one that is shared by a specific social group. In these terms, national culture has been defined as "*the collective programming of the mind that distinguishes members of one group or category of people from another*" (Hofstede,1980: 25).

One of the most famous frameworks for studying the national culture is **Hofstede's Cultural Dimensions framework.** This framework identifies six dimensions of culture, including power distance, masculinity, individualism, long-term orientation, uncertainty avoidance, and indulgence (Hofstede, 1980). This framework has been widely used to explain differences in work behaviors and management practices across cultures. Although several studies have raised philosophical and methodological concerns regarding Hofstede's framework for cultural dimensions, for instance: it has been criticized for oversimplifying culture into a linear scale and for its lack of consideration of cultural variations within countries or regions, it is still widely acknowledged as a key model of cross-cultural differences and has proven useful in analyzing national cultures and examining their impact on the overall enterprises and managerial positions (Chun, Zhang, Cohen, Florea & Genc, 2021).

Another framework for studying national culture is **Trompenaars' Cultural Dimensions** Model. This framework proposes seven dimensions of culture, including individualism vs. collectivism, universalism vs. particularism, specific vs. diffuse, neutral vs. emotional, time horizon, achievement vs. ascription, and environment (Trompenaars, 1993). This framework has been criticized for its lack of empirical support and for its ambiguity in defining the dimensions. As stated by Pirlog (2021) and Stanciu and Stanciu (2023), Trompenaars considers culture as the way in which individuals solve problems. The problems faced by individuals have three sources according to Trompenaars' model which include relationships between people, individuals' attitude towards time and the connection between an individual and nature (Carolina, 2019; Stanciu & Stanciu, 2023). Also, this framework is considered as a valuable tool for managers and practitioners to analyse differences in culture according to Stanciu and Stanciu (2023). The model developed by Trompenaars comprises of seven dimensions and 8841 observations on an individual-level that resulted in this "seven-factor model" (Taras, Rowney & Steel, 2009) .

Trompenaars' model complements value definitions in Hofstede's model (Vindry & Geravis, 2019). By the same token, He and Filimonau (2020) stated that Hofstede and Trompenaars' model share similarities in terms of their dimensions. For example, the achievement dimension of Trompenaars' framework is similar to the Power Distance dimension of Hofstede's framework (He & Filimonau, 2020). Also, Trompenaars' Universalism versus particularism dimension is comparable to Hofstede's Uncertainty avoidance dimension (He & Filimonau, 2020). Even though Hofstede critiqued Trompenaars model (Hofstede, 1996) and Trompenaars and Hampden-Turner responded to the critiques by highlighting the differences between the models (Trompenaars, 1997).

The Global Leadership and Organisational Behaviour Effectiveness (GLOBE), research that investigates the connection between culture and leadership, is another important study. To be clear, even though these studies were done more than ten years ago, they provide a helpful methodology for identifying the distinctive features of a society's culture. moreover, none of these authors examined the connection between culture and entrepreneurial activity (Carolina, 2019).

GLOBE model proposes nine cultural dimensions, including "Power Distance, Uncertainty Avoidance, Institutional Collectivism (Collectivism I), In-Group Collectivism (Collectivism II), Gender Egalitarianism, Assertiveness, Future Orientation, Performance Orientation, and Humane Orientation", to identify the practices that allow categorizing a society's culture (society "is") and cultural values (society "should be") (Stek, 2022). Whereas Hofstede (1980) recognized six cultural aspects as the source of the first six dimensions. For its goal,

the GLOBE project considered two categories of cultural manifestations: practices and moral values. The focus of modal practices, or how "is" society, is on "what is" or "what are" the institutional practices and common behaviors in society. However, the values are given in relation to the "what should be" standard (Palacio, Canino & Collazos, 2020). This framework has been praised for its consideration of cultural variations and for its inclusion of both societal and organizational cultural dimensions. However, this framework has also been criticized for its lack of a clear theoretical basis and for its complexity.

In conclusion, national culture is a complex and multifaceted concept that presents challenges in terms of conceptualization and measurement. Different frameworks have been proposed to study national culture, including Hofstede's Cultural Dimensions Theory, Trompenaars' Cultural Dimensions Model, and the GLOBE Project framework. Each framework has its strengths and weaknesses, and researchers must carefully consider which framework is appropriate for their research question and context.

Empirical Evidence on Corporate Governance and Culture

Corporate governance practices vary significantly across nations, in these terms (Daniel, Cieslewicz & Pourjalali, 2011) posit a suggestion that national culture practices influence the institutional environment which in return has an influence on CG practices. Despite the fact that the CG models and codes are convergence, variations remain in approaches to, and the outcome of CG across the globe. These variations may be explained by variances in country level institutional environments which arise from differing in historical and cultural context (Daniel, Cieslewicz & Pourjalali, 2011). This calls for appreciation of culture as well as institutional factors (Daniel, Cieslewicz & Pourjalali, 2011). That is why there is an increasing attention given to the cultural factors as well as institutional factors (Daniel, Cieslewicz & Pourjalali, 2011).

The idea presented is backed by advocates of the "New Institutional Theory" who argue that both "formal" institutions, such as law, and "informal institutions," such as culture, together provide the framework within which individuals and organisations interact. Therefore, it is well recognised that culture has a significant role in explaining economic results, either directly or indirectly through institutions (Williamson, 2000). Linch (2001) has emphasised the significance of culture in accordance with the institutional theory, referring to it as the "originator of all path dependencies." Arguing that culture has a pivotal role in understanding the global variations in corporate governance.

Numerous studies have been conducted to understand the relationship between corporate governance and culture, whereas scholars have highlighted the vital role that culture plays in shaping the corporate governance norms and practices. One of the studies that analysed the impact of culture on corporate governance practices was conducted by (Griffin, Guedhami, Kwok & Li, 2017). The study examined the association of between two of Hofstede's cultural dimensions: individualism and uncertainty avoidance and CG indicators in a number of countries. The results in this study indicated that there is a positive association between individualism and corporate governance scores on the other side uncertainty avoidance was found to be negatively associated with the corporate governance scores. These findings are found to be stronger in countries with a well-structured financial structure.

In these terms, one of the study that was conducted by (Griffin, Guedhami, Kwok, Li & Shao, 2017) analysed the relationship and found that the cultures that emphasize independence and are tolerant of uncertainty, as proxied by high individualism and low uncertainty avoidance scores, show a preference for the Anglo-Saxon approach.

In addition, Osemeke and Osemeke (2017) conducted a study on how Nigerian culture influences the function of corporate governance in order to secure the long-term financial performance of companies. This study has identified the cultural elements that influence corporate governance in Nigeria, namely, inadequate enforcement, authority, oversight and monitoring procedures, absence of accountability, and an inadequate regulatory framework. This study establishes that cultural influences significantly influence the formation of corporate governance standards and procedures in Nigeria.

For the emerging markets which are extensively known for its poor corporate governance, almost all the researches acknowledged the impact of the national culture on the effective implementation of corporate governance. Through using Hofstede's and Schwartz's cultural models, previous studies suggested a strong correlation between national culture and corporate governance system. As most of the emerging market falls on high power distance, low on individualism (Collectivist), high in uncertainty avoidance and low in masculinity as per Hofstede classification of cultural dimensions, it is common to notice weak corporate governance (Rafiee & Sarabdeen, 2012).

Gryphon et al. (2014) conducted a study to examine the universality of "good" corporate governance using the Anglo-American governance paradigm. They analysed data from Governance Metrics International, which provided detailed information on corporate governance practices in many countries from 2006 to 2011. The study found that individualism, a cultural dimension, is positively related to corporate behaviour standards and transparent disclosure. On the other hand, uncertainty avoidance is negatively related to minority shareholder protection and transparent disclosure.

The literature clearly indicates that a substantial amount of the research overlooks the role of external governance standards in preventing managers from engaging in activities that harm shareholders and the broader organisation, as emphasised by Aguilera et al. (2015).

Data and Methodology

Variables

Annual data from 177 developing and developed countries, the country classification is based on the country income level. Variables used in this study measure culture using three different ways. Full descriptions for each variable are considered. Table 1 summarizes the information on culture dimensions (the detailed definition of each dimension for each model is included in the appendix). Throughout the study, the main aim is to explore the best set of dimensions measuring culture is able to have the best prediction for Governance Efficiency Index/ Score. Governance Efficiency Index/ Score is the score which is measured by 33 quantitative indicators to evaluate the performance of a country's infrastructure environment and regulatory framework to facilitate sustainable competitiveness and it is summarized in the below figure (Figure 1).

Table 1: Predictor Variables in Each Set

Trompenaar Framework	Hofstede culture Dimension	The Globe Dimension
UP	PDI	UASP
IC	IDV	FOSP
SD	MAS	PDSP
NA	UAI	CSPI
AA	LTO	HOSP
PPF		POSP
SS		CSPII
IE		GESP
		ASP

Note: The detailed definition of the frameworks dimensions are listed on the appendix
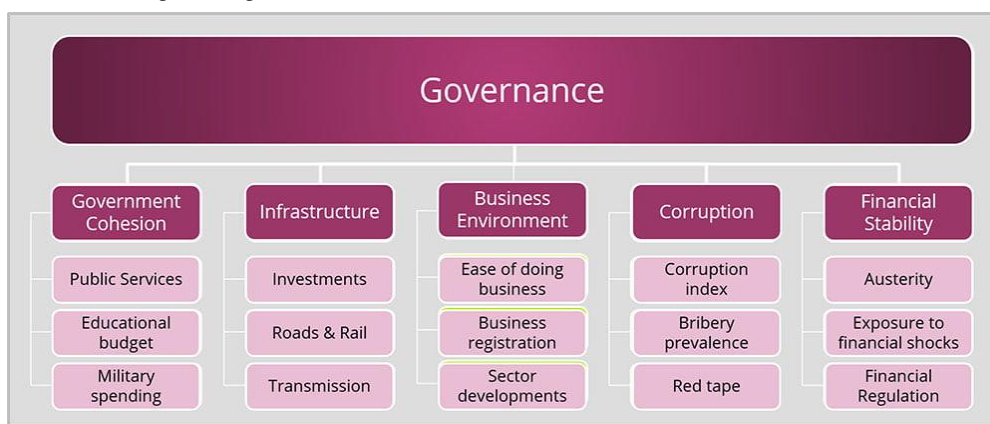

Figure 1: Governance Efficiency Index Components

Descriptive Statistics

The descriptive statistics and the correlation matrix for the variables under study are summarized in Table 2 and Table 3. Table 2 shows that the mean value of the Governance Efficiency Index/ Score is 51, which indicates that most of the data are around 51. For the min. and max. values of the Governance Efficiency Index/ Score and the explanatory variables, the Long-Term Orientation (LTO) has the lowest value among the variables with 0 while the Long-Term Orientation (LTO) has the largest value with 118. Regarding standard deviation values, the third set of predictors represents that culture has the least value of variation compared with the other two sets of predictors. Second, table 3 shows the correlation coefficients among the variables in this research, the outcomes indicate that all the variables are positively correlated with each other.

Table (2): Descriptive Statistics for Trompenaar Framework

Variable	Min	Max	Mean	Std. dev
Governance Efficiency Index/ Score	28.00	67.20	51.1216	9.47324
UP	6.00	95.00	37.7431	22.68766
IC	5.00	95.00	40.9633	24.02966
SD	5.00	95.00	43.1193	25.52875
NA	5.00	95.00	47.4587	25.66902
AA	5.00	95.00	40.3945	24.48054
PPF	5.00	95.00	58.8440	24.29875
SS	5.00	95.00	43.8991	25.62766
IE	5.00	95.00	43.2936	25.19528

Note: Std. Dev. is the standard deviation, min and max are minimum and maximum respectively.

Table (3): Descriptive Statistics for Hofstede culture dimension

Variable	Min	Max	Mean	Std. dev
PDI	11.00	104.00	59.3684	21.33544
IDV	8.00	90.00	42.1579	23.05799
MAS	5.00	95.00	50.0877	17.96453
UAI	8.00	112.00	65.7368	21.51455
LTO	.00	118.00	15.5088	25.39905

Note: Std. Dev. is the standard deviation, min and max are minimum and maximum respectively.

Table (4): Descriptive Statistics for The Globe Dimension

Variable	Min	Max	Mean	Std. dev
UASP	3.10	5.40	4.2098	.57732
FOSP	3.10	5.10	3.8627	.46517
PDSP	3.60	5.80	5.1020	.47434
CSPI	3.20	5.20	4.2627	.44540
HOSP	3.30	5.20	4.1235	.47899
POSP	3.20	4.90	4.0863	.40646
CSPII	3.20	6.40	5.0686	.75881
GESP	2.50	4.10	3.3941	.37811
ASP	3.40	4.90	4.1255	.36870

Note: Std. Dev. is the standard deviation, min and max are minimum and maximum respectively.

Secondly, the correlation matrix among the variables in the three scenarios considered to measure the culture is shown in Table 4, Table 5, and Table 6. Researchers use correlation analysis to measure the direction and the strength of the relationship between two variables. The result ranges from -1 to +1; where -1 means a perfectly negative correlation, +1 means a perfectly positive correlation and 0 means no correlation (Rencher & Schaalje, 2010).

From Table (4), the outcomes indicate that all the variables in the first scenario which is related to Trompenaar framework that is all variables are positively correlated with the governance efficiency index/ Score except the relationship with PPF, which is a negative relationship.

Table (4): Correlation Matrix for the First Set of Predictors

	Governance Efficiency Index/ Score	UP	IC	SD	NA	AA	PPF	SS	IE
Governance Efficiency Index/ Score	1	0.430***	0.558***	0.490***	0.343***	0.418***	-0.675***	0.569	0.225**
UP	0.430***	1	0.541***	0.591***	0.316***	0.704***	-0.560***	0.542***	0.388***
IC	0.558***	0.541***	1	0.640***	0.386***	0.613***	-0.531***	0.670***	0.315***
SD	0.490***	0.591***	0.640***	1	0.400***	0.536***	-0.548***	0.585***	0.202**
NA	0.343***	0.316***	0.386***	0.400***	1	0.313***	-0.456***	0.422***	0.188**
AA	0.418***	0.704***	0.613***	0.536***	0.313***	1	-0.601***	0.587***	0.409***
PPF	-0.675***	-0.560***	-0.531***	-0.548***	-0.456***	-0.601***	1	-0.614***	-0.215**
SS	0.569***	0.542***	0.670***	0.585***	0.422***	0.587***	-0.614***	1	0.241**
IE	0.225**	0.388***	0.315***	0.202**	0.188**	0.409***	-0.215**	0.241**	1

From Table (5), there no significant correlation between MAS, UAI and LTO with the dependent variable, governance efficiency index. On the other side, there is a positive relationship between the governance efficiency score and IDV.

For the third scenario (Table 6), there no significant correlation between GESP and ASP with the dependent variable, governance efficiency index. On the other side, there is a positive relationship between the governance efficiency score and UASP, FOSP, CSPI, POSP and negative relationship with PDSP and HOSP and CSPII.

Table (5): Correlation Matrix for the Second Set of Predictors

	Governance Efficiency Index/ Score	PDI	IDV	MAS	UAI	LTO
Governance Efficiency Index/ Score	1	-0.588***	0.641***	-0.099	0.005	0.158
PDI	-0.588***	1	-0.659**	-.122	0.092	0.034
IDV	0.641***	-0.659**	1	0.047	-0.175	-0.043
MAS	-0.099	0.122	0.047	1	0.157	0.025
UAI	0.005	0.092	-0.175	0.157	1	-0.309**
LTO	0.158	0.034	-0.043	0.025	-0.309**	1

Table (6): Correlation Matrix for the Third Set of Predictors

	Governance Efficiency Index/ Score	UASP	FOSP	PDSP	CSPI	HOSP	POSP	CSPII	GESP	ASP
Governance Efficiency Index/ Score	1	0.465***	0.336*	-0.275**	0.225	-0.336**	0.292**	-0.603**	0.047	-0.160
UASP	0.465**	1	0.727**	-0.437**	0.455**	0.056	0.590**	-0.529**	-0.026	-0.137
FOSP	0.336**	0.727**	1	-0.390**	0.531**	0.128	0.618**	-0.321*	-0.021	0.030
PDSP	-0.275**	-0.437**	-0.390**	1	-0.264	-0.164	-0.318*	0.614**	-0.324*	0.236
CSPI	0.225**	0.455**	0.531**	-0.264	1	0.439**	0.503**	-0.109	-0.149	-0.385**
HOSP	-0.336**	0.056	0.128	-0.164	0.439**	1	0.309*	0.223	-0.192	-0.424**
POSP	0.292**	0.590**	0.618**	-0.318*	0.503**	0.309*	1	-0.102	-0.270	0.010
CSPII	-0.603**	-0.529**	-0.321*	0.614**	-0.109	0.223	-0.102	1	-0.268	0.188
GESP	0.047	-0.026	-0.021	-0.324*	-0.149	-0.192	-0.270	-0.268	1	-0.041
ASP	-0.160	-0.137	0.030	0.236	-0.385**	-0.424**	0.010	0.188	-0.041	1

Regression Analysis

The type of dataset used in this study warrants the use of the Regression Analysis. The regression analysis is best when the dataset is continuous where the dependent variable needs to be predicted from multiple independent variables. The relationship between the dependent and independent variable is determined by the coefficients of the variables in regression equation (1). The regression model takes the following form:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k, \qquad (1)$$

Where,

- X is the set of k predictors/independent variables
- β_0 is the intercept,
- β is the parameter for each predictor variable,

By comparing the three regressions from table 7 to table 9, the third regression has the largest value of the adjusted R-squared. The value of the adjusted R-squared is 0.688, which means that 68.8% of the variations in the Governance Efficiency Index/ Score will be explained by the globe dimensions measuring culture. Moreover, the country level of income has a positive significant effect on the Governance Efficiency Index. This means that when income increases the Governance Efficiency Index increases. Nevertheless, the difference in the value of the adjusted R- Squared between the first framework and the third framework (Trompenaar and Globe) is very minor.

Table 7: Estimate for the First Set of Predictor Variables (Trompenaar)

Predictor variable	Coefficient Estimates
Constant	44.736***
UP	0.023
IC	0.060*
SD	0.014
NA	0.027
AA	-0.064*
PPF	-0.147***
SS	-0.005
IE	0.009
Income	4.023***
Adjusted R-squared	0.648

Dependent variable: Governance Efficiency Index/ Score
*Significant at 0.1; **significant at 0.05; ***significant at 0.01

Table 8: Estimate for the Second set of Predictor Variables (Hofstede)

Predictor variable	Coefficient Estimates
Constant	32.406***
PDI	-0.078*
IDV	0.074*
MAS	-0.046
UAI	-0.010
LTO	0.084***
Income	7.301***
Adjusted R-squared	0.50

Dependent variable: Governance Efficiency Index/ Score
*Significant at 0.1; **significant at 0.05; ***significant at 0.01

Table 9: Estimate for the Third Set of Predictor Variables (The GLOBE)

Predictor variable	Coefficient Estimates
Constant	49.132
UASP	-0.830
FOSP	1.208
PDSP	3.027
CSPI	1.519
HOSP	-4.109
POSP	6.018*
CSPII	-3.861**
GESP	-0.981
ASP	-4.837*
Income	5.178***
Adjusted R-squared	0.688

Dependent variable: Governance Efficiency Index/ Score
*Significant at 0.1; **significant at 0.05; ***significant at 0.01

Machine Learning Models

The main aim is to reach the best set with the best prediction of the Governance Efficiency Index/ Score. Accordingly, the regression model is adopted to discover the factors that affect the Governance efficiency score as a dependent variable as presented in the previous section. Then, the use of machine learning turned to be essential to be able to reach to the best way to predict Governance Efficiency Index based on which set of variables measuring the culture.

Machine learning methods are composed of computational algorithms that connect all or some of a set of predictor variables to an outcome (Governance Efficiency Index/ Score). In order to estimate the model, researchers employ either a stochastic (random) or deterministic search to find the optimal fit. The search procedure varies among the different algorithms.

The machine learning model starts with classifying data into two types, train, and test. Firstly, a collection of samples used to fit the parameters throughout the learning process (e.g., weights). Whereas the testing data is a data set that follows the probability distribution of the former dataset (training dataset) but is independent of it. In the end, we can see to what extent the model has a good ability to predict our outcome variable (Sarker, 2021).

A- **Implementation of Lasso Regression Algorithm in Python**

Lasso regression is also called the Penalized regression method. It provides greater prediction accuracy as compared to the linear regression model. Lasso regression is a regularization technique used in feature selection using a Shrinkage method also referred to as the **penalized regression method**. Lasso is short for **L**east **A**bsolute **S**hrinkage and **S**election **O**perator, which is used both for regularization and model selection. If a model uses the **L1 regularization** technique, then it is called lasso regression and it takes the formula (Chan-Lau, 2017);

$$L_{Lasso}(\hat{\beta}) = \sum_{i=1}^{n} (y_i - \acute{x}_i \hat{\beta})^2 + \gamma \sum_{j=1}^{k} |\beta_j|$$

B- **Implementation of Ridge Regression Algorithm in Python**

To analyze any dataset suffering from multicollinearity the Ridge regression is a model-tuning method that should be used. This method performs L2 regularization. When multicollinearity arises, the least-squares method remains unbiased, but the variances become enormous. Consequently, the projected values deviate significantly from the actual values. Ridge regression, similar to lasso regression, imposes

a comparable constraint on the coefficients by the incorporation of a penalty component. While lasso regression considers the absolute value of the coefficients, ridge regression considers their squared value. (Chan-Lau, 2017).

$$L_{Ridge}(\hat{\beta}) = \sum_{i=1}^{n}(y_i - \acute{x}_i\hat{\beta})^2 + \gamma \sum_{j=1}^{k} w_j \hat{\beta}^2{}_j$$

C- Implementation of Support Vector Machine Algorithm in Python

Support Vector Machine (SVM) is a supervised machine learning algorithm used for both classification and regression. Though our study, it's best suited for regression. The results for these machine learning models are compared with each other in Table 10. Table 10 shows the mean square error for each model and in the three different scenarios.

Table 10: Accuracy Level of Each Set for Predicting Governance Efficiency Index/ Score

	First set of predictors (Trompenaar)	Second set of predictors (Hofstede)	Third set of predictors (GLOBE)
Linear Regression	**29.4**	**31.5**	19.98
Lasso Regression	18.49	27.82	12.9
Ridge Regression	14.3	25.9	9.4
Support Vector Machine	25.73	21.4	34.1

Based on the results in Table 10 presented above, the ridge regression model has the least mean square error. This means that this model has the best way of predicting of the Governance Efficiency Index/ Score.

Discussion and Conclusion

The findings of the current study demonstrate the governance efficiency score across countries worldwide are most likely to be influenced by the national culture. It is evident that the governance efficiency in a given nation is related to the institutional environment of the nation. The study demonstrates that there is a link between cultural measures and governance efficiency index. It illustrates that the cultural values have an impact on the institutional context, that the governments regularly need to develop an effective corporate governance within. It is evident that culture factors are proving to be a major mitigating factor against convergence of corporate governance practices.

The current study demonstrates the significant relationship between the national culture and the governance efficiency score. For the Trompenaar, the cultural measures- individualism was found to be positively related to the institutional environments variable. There are other also other two cultural measures – achievement/ascription and past, present, future was found to be negatively and significantly related to the institutional environment variable.

For the Hofstede framework, power distance cultural measure was found to be negatively and significantly related to the governance efficiency index. On the other side, individualism and long-term orientation were found to be positively and significantly related to governance efficiency index.

For the third cultural framework – The Globe - only the performance orientation was positively relationship that was significant. However, for the assertiveness and collectiveness, they both have negative significant with the governance efficiency index. The above findings from the three different cultural framework are consistent and they lend empirical support to previous studies (Griffin et al., 2017; Griffin et al., 2017; Osemeke & Osemeke, 2017; Rafiee & Sarabdeen, 2012).

For policy makers, these findings suggest that governance practices can be influenced by adjusting the institutional environment by inducing government cohesiveness, investing in infrastructure, controlling corruption, and encouraging financial stability. This suggests that only having a corporate governance code that outlines best practices is not enough. It is also crucial to modify the institutional environment in order to facilitate enhancements in the practice of corporate governance.

The current study has implications for investors and practitioners when evaluating specific investment opportunities; it turned to be essential to consider that national culture has an impact on the institutional environment as a mediating variable when examining the rational of business and employees' behaviours and this can be considered a benefit to academic researchers to consider in the future researches.

In conclusion, the current study confirmed that culture and institutional environment are important, countries may have similar cultural resources; but still they may differ in their institutional infrastructure, laws, regulations...etc. This is a call for researcher to revisit studies who consider the direct relationship between culture and business practices without considering the institutional contexts.

Based on the preceding discussion, it is recommended for future research to further examine the influence of culture on inter-firm corporate governance. This can be done by utilising the governance efficiency index as a mediating variable in this relationship. After completing the initial stage of forecasting and determining that the ridge regression model is the suitable technique for future forecasting, it is advisable to proceed with the next steps in the forecasting process. The study primarily focuses on national culture, but it would be advantageous to additionally take into account the organisational culture.

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Appendix

| Dimension	Definition
Assertiveness (ASTV)	Relates to how much propensity people have to speak up, communicate openly, and act in a direct manner proactive and assured social media relationships between organisations or societies (Abreu, 2023).
Institutional Collectivism (INSTC)	Refers to the degree to which organisational and social practises encourage and reward resource sharing and teamwork (Abreu, 2023).
In-Group Collectivism (INGRC)	Evaluates how strongly members of a group or family demonstrate loyalty, pride, and unity (Abreu, 2023).
Future orientation (FUT)	Reflects the degree to which members of organisations or societies engage in behaviours that prioritise and make future plans, which may include undertaking long-term investments, strategic planning, and being able to put off enjoying one's immediate satisfactions or those of the group (Abreu, 2023).
Gender Egalitarianism (GEN)	Evaluates the degree to which a group or community works to eliminate discrimination based on gender and to advance the equality of all genders in terms of opportunities and treatment (Abreu, 2023).
Humane Orientation (HUM)	Indicates how much people appreciate and foster compassion, generosity, and justice towards others in organisations or society. The value put on showing compassion and consideration for others, as well as the praise and rewards offered to those who do so, is reflected in it (Abreu, 2023).
Performance Orientation (PRF)	Includes the degree to which a company or society promotes an atmosphere that encourages and thanks people for their efforts in achieving better standards of performance and excellence. It demonstrates the significance placed on pursuing continuous improvement, setting, and achieving goals, and recognising exceptional performance within the team (Abreu, 2023).
Power Distance (PD)	Measures the degree to which members of a community or organisation are aware of and resigned to the stratification of power and the concentration of its sources at the top of a company or a governmental structure (Abreu, 2023).
Uncertainty Avoidance (UA)	Refers to the extent to which members of a group make an effort to reduce uncertainty by adhering to accepted social customs, rituals, and administrative processes. People actively seek to lessen the chance of unpredictable future events that could have negative impacts on the operation of an organisation or society in cultures with high levels of uncertainty avoidance, and they take steps to mitigate the effects of such unfavourable outcomes (Abreu, 2023).
Power Distance	It relates to how societies handle the inherent inequality and power distribution among individuals. It examines the extent to which people accept and expect unequal power relations within social and organizational structures (Alqarni, 2022)
Uncertainty Avoidance	It explores how societies deal with ambiguity, uncertainty, and the unknown future. It examines the level of discomfort or stress individuals experience in uncertain situations (Alqarni, 2022).
Individualism versus Collectivism	It focuses on the extent to which individuals prioritize their personal goals and interests over group or collective interests. It examines the degree of interdependence and the emphasis placed on individual rights, autonomy, and self-expression versus social cohesion and collective harmony (Alqarni, 2022).
Masculinity versus Femininity	it explores the distribution of emotional roles between genders and the importance placed on traditionally masculine or feminine traits within a society. (Alqarni, 2022).
Long-Term Orientation versus Short-Term	It pertains the extent to which the orientation of individuals and societies towards time, particularly in terms of planning and investing for the future versus focusing on immediate gratification and traditions (Alqarni, 2022).
Indulgence versus Restraint	It reflects the extent to which societies allow or restrain individuals' desires and impulses. It examines the degree of importance placed on gratifying human desires, such as enjoying life and having fun, versus controlling and suppressing these desires through strict social norms and regulations (Alqarni, 2022).
Universalism versus Particularism	degree to which interactions between individuals are guided by rules and regulations or conversely, the interactions are guided by relationships and trust (PIRLOG, 2021; STANCIU & STANCIU, 2023)
Communitarianism versus individualism	the extent to which the culture values the group over the individual. In other words, communitarist cultures tend to act in favour of the group whilst individualist cultures prioritise their independence from society (PIRLOG, 2021).
Neutral versus Emotional	refers to the level of comfortability in expressing emotions. Neutral cultures hide their feelings and control their emotions, but affective cultures are comfortable openly showing their emotions (STANCIU & STANCIU, 2023)
Diffuse Versus Specific	defines an individuals' inclination to participate in the society and business. Where specific societies have logical relationships through contracts and agreements and diffuse cultures have rely on interpersonal relationships (PIRLOG, 2021; STANCIU & STANCIU, 2023)..
Achievement versus Ascription	refers to how status is achieved which in the case of achievement culture is based on one's performance but in Ascription societies, is based on a status which could be age, family, political inclinations, and gender (PIRLOG, 2021; STANCIU & STANCIU, 2023).
Sequential versus Synchronous	sequential refers to a culture that completes one task at a time and values punctuality, but synchronous culture perceives time as flexible and can perform various tasks at the same time (PIRLOG, 2021; STANCIU & STANCIU, 2023).
Internal direction versus External direction	reflects people's attitude towards their environment where Internal direction societies tend to value the environment and consider it as the most crucial and influential factor while conversely the external direction cultures focus on controlling the environment (PIRLOG, 2021; STANCIU & STANCIU, 2023).

Graphs for the first set of predictors:
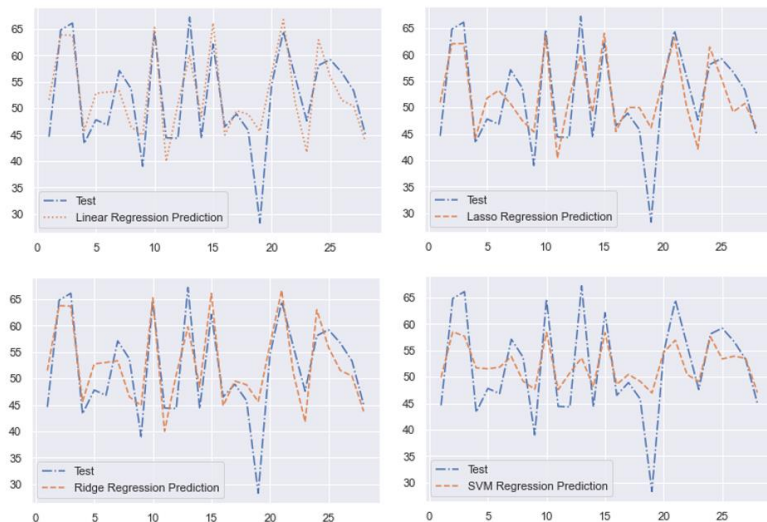
Graphs for the second set of predictors:
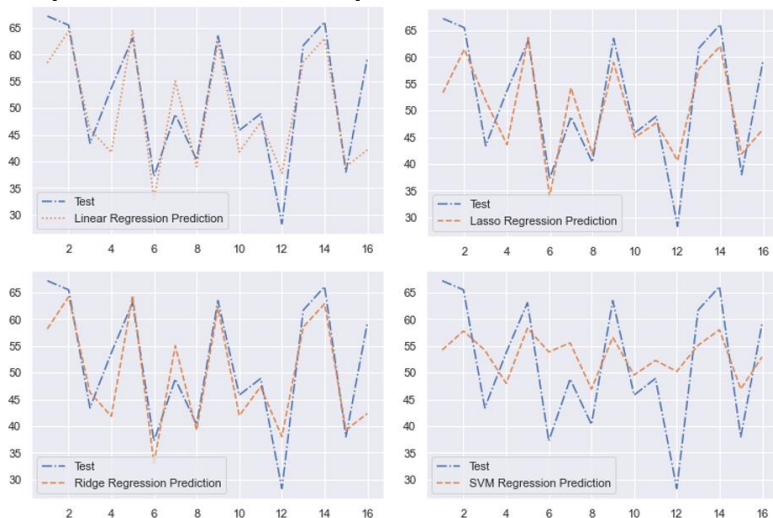
Graphs for the third set of Predictors:
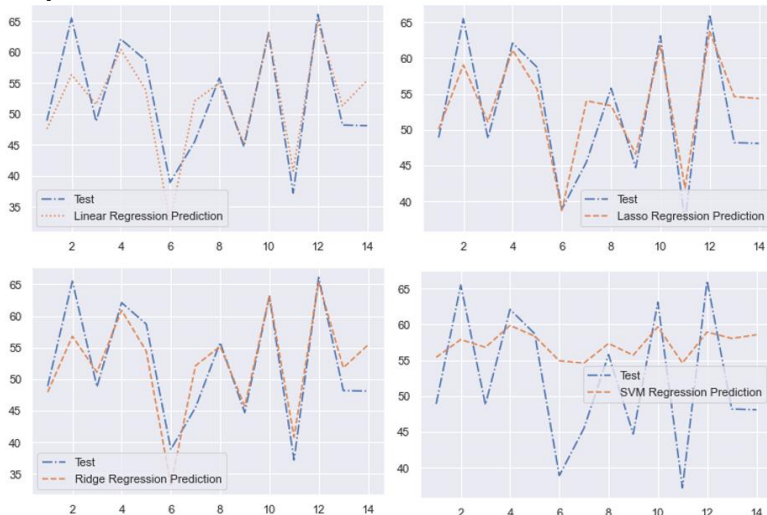
List of Abbreviations

Variable	Abbreviation
Universalism/Particularism	UP
Individualism/Communitarianism	IC
Specific/Diffuse	SD
Neutral/Affective	NA
Achievement/Ascription	AA
Past, Present, Future	PPF
Sequential/Synchronic	SS
Internal/External	IE
Power distance	PDI
Individualism	IDV
Masculinity	MAS
Uncertainty Avoidance	UAI
Long Term Orientation	LTO
Uncertainty Avoidance Societal Practices	UASP
Future Orientation Societal Practices	FOSP
Power Distance Societal Practices	PDSP
Collectivism I Societal Practices (Institutional Collectivism)	CSPI
Humane Orientation Societal Practices	HOSP
Performance Orientation Societal Practices	POSP
Collectivism II Societal Practices (In-group Collectivism)	CSPII
Gender Egalitarianism Societal Practices	GESP
Assertiveness Societal Practices	ASP