The impact of national culture on innovation performance of European countries and application of this impact by universities and other institutions

Wpływ kultury narodowej na innowacyjność krajów europejskich oraz wykorzystanie tego wpływu przez uniwersytety i inne organizacje

Michał Ryś
AGH University of Science and Technology
Faculty of Management
e-mail: michalrys86@gmail.com

Abstract: Different countries attain different levels of innovation performance, what can be seen in many reports, statistical data, rankings and literature published. Analysis of the previous research suggests that this could be caused by the dissimilarities in their cultures. The goal of this article is to investigate whether a relation between a country's culture and its innovation performance level indeed exists. The research is focused on European Economic Area countries and Switzerland.

By applying the models of multiple linear regression to the selected and statistically verified secondary data taken from reliable sources and further quality assurance of these results, it has been proven that there is an influence of national culture on innovation performance. Characteristics of cultures with a low value of Power Distance and high value of Indulgence might be seen as characteristics demanded by organisations like universities – suggested areas of changes are divided into two main ones, which are positively related with innovation performance: employees (partnership between them and happiness of them) and workplace (flexible working hours as well as optimistic and friendly atmosphere).
Keywords: Innovation Performance, Culture, Hofstede, Power Distance, Indulgence

Abstrakt: Różne kraje osiągają różne poziomy wydajności innowacyjnej, co można zaobserwować w wielu raportach, danych statystycznych, rankingach i publikowanej literaturze. Analiza wcześniejszych badań sugeruje, że może to być spowodowane odmiennością ich kultur. Celem tego artykułu jest zbadanie, czy relacja między kulturą danego kraju i jego poziomu wydajności innowacyjnej rzeczywiście istnieje. Badanie koncentruje się na krajach z Europejskiego Obszaru Gospodarczego i Szwajcarii.
Stosując model wielokrotnej regresji liniowej dla wybranych i statystycznie zweryfikowanych danych

pozyskanych z wiarygodnych źródeł i dalszej weryfikacji jakości uzyskanych wyników, udowodniono, że istnieje wpływ kultury narodowej na wydajność innowacyjną. Charakterystyka kultur o niskiej wartości Dystansu Władzy i wysokiej wartości Satysfakcji mogą być postrzegane jako cechy pożądane przez organizacje takie jak uniwersytety – proponowane obszary zmian zostały podzielone na dwa główne, które są pozytywnie skorelowane z wydajnością innowacyjną: pracownicy (partnerstwo między nimi i ich szczęście) i miejsce pracy (elastyczne godziny pracy, jak również optymistyczna i przyjazna atmosfera).
Słowa kluczowe: wydajność innowacyjna, kultura, Hofstede, dystans władzy, satysfakcja

Introduction

Over the years, many definitions of *innovation* have been created. Based on the most popular ones, Baregheh et al. (2009, pp. 1323-1339) introduced a multidisciplinary definition of innovation, stating that it is "the multi-stage process whereby organisations transform ideas into new/improved products, services or processes, in order to advance, compete and differentiate themselves successfully in their marketplace". Hagedoorn & Cloodt (2003, pp. 1365-1379) show that some organisations cope with innovation better than others and what distinguishes them is their innovation performance. Halim et al. (2014, pp. 107-125) explain that innovation performance is a combination of two independent parameters: a) the quality and quantity of ideas, and b) the efficiency and effectiveness of implementation of those ideas. It is noteworthy, innovation performance as an indicator could be used regarded to plenty of organizations and institutions such as universities, firms, but also countries.

1. Literature review – national culture versus innovation performance

"Innovation Union Scoreboard 2016" report (Hollanders et al., 2016) demonstrates a comparison of European countries' innovative performance. The report uses a composite indicator called *Summary Innovation Index*, which summarizes the performance of a range of 25 indicators. The final research outcome provides a unique rank of 36 countries' innovation performance. The differences between countries are significant, the best score is 4.5 times higher then the worst one. It is worth considering what could cause such differences between countries. Hofstede et al. (2010) proved that those might be due to cultural differences and created six Cultural Dimensions, which might be seen as a successful way of quantifying a culture. These Dimensions are:

- Power Distance – a degree of acceptance and expectation of unequal distribution of power by less powerful members of society.
- Individualism – the level of integration of individuals into groups. Cultures with lower score are more based on mutual, long-term relations between group (e.g. family) members.
- Masculinity – an extent to which gender determines roles in a society.

- Uncertainty Avoidance – a degree of anxiety about unknown and insecure situations and circumstances.
- Pragmatism – the long-term approach, persistence in achieving assumed goals and saving money for the future. Cultures with lower scores are more focused on the past and the present.
- Indulgence – a cultural attitude to enjoy life and have fun. Lower score in this Dimension means that a culture is stricter about the norms and regulations.

Europe is a multicultural continent and each country has a different culture, as demonstrated by the Cultural Dimensions (Hofstede et al., 2010). Comparison of *Summary Innovation Index* also shows significant differences between countries, although data are limited mostly to European Economic Area and Switzerland. Considering these two observations, the hypothesis for this research is that there is a relation between culture and innovation performance of European Economic Area countries and Switzerland.

There have been plenty of studies that investigated the relation between characteristics and statistical data of different countries and their innovation performance (e.g. Nelson, 1993; Furman et al. 2002, pp. 899-933), but not many of them take into account a national culture. Shane (1992, pp. 29-46) shows that countries with higher value of Individualism and lower value of Power Distance have higher numbers of patented inventions per capita. Shane (1993, pp. 59-73) confirmed this relationship for trademarks per capita, which additionally is negatively correlated with value of Uncertainty Avoidance. However, it seems there were only a few studies about possible impact of national culture on countries' innovation performance measured by groups of indicators or more complex indicators such as Summary Innovation Index. Rinne et al. (2012, pp. 91-108) examined the influence of Power Distance, Individualism and Uncertainty Avoidance on the country's score in Global Innovation Index and confirm the findings of Shane (1992, pp. 29-46). Herein, the Global Innovation Index calls for an explanation. It is a wider ranking than Summary Innovation Index, because it consists of 82 indicators for 128 countries. It also seems to be a reliable source of data, since it is "the result of a collaboration between Cornell University, INSEAD, and the World Intellectual Property Organisation (WIPO) as co-publishers, and their Knowledge Partners" (Cornell University et al., 2016).

According to the previous research, Power Distance and Individualism have an impact on innovation performance. However, the sixth Cultural Dimension, Indulgence, has only been presented several years ago, so it is quite a new metric, thus its potential impact on innovation performance also needs to be investigated. Therefore the goal of this study is to explore the relationship between the culture of European Economic Area countries and Switzerland represented by the Hofstede dimensions and their innovation performance based on the *Global Innovation Index* and *Summary Innovation Index* and the research hypothesis is as follow: <u>the national culture has an impact on innovation performance of European countries</u>.

2. Methodology

The investigation is conducted by using the models of multiple linear regression applied to the secondary data about the culture, which were taken from a book titled "Cultures and Organisations: Software of the Mind" (Hofstede et al., 2010), and the data about innovation performance of the countries – from "The Global Innovation Index 2016: Winning with Global Innovation" (Cornell University et al., 2016) and "Innovation Union Scoreboard 2016" (Hollanders et al., 2016).

The research consists 30 countries with complete dataset, i.e. *Global Innovation Index (GII), Summary Innovation Index (SII)* and values of all six Cultural Dimensions. The final set of data represents Switzerland and 99,8% of population and almost all the countries from European Economic Area (EEA) – only Cyprus and Liechtenstein were excluded due to lack of data for their Cultural Dimensions.

It is noteworthy that although *GII* and *SII* were built independently by different institutions that used different methodologies and took into account different number of various indicators (82 vs. 25), the correlation between them is very strong (r=0.944). On one hand, it seems to be a good predictor for this research, because both indexes of innovation performance, although calculated differently, provide data that are consistent with each other. On the other hand, such a strong correlation is expected to influence the models of linear regression and lead to similar results. To use these pro and cons as an advantage for this research, the new index, which is based on *GII* and *SII* has been prepared.

The construction of a new index, named for the purpose of this research as *Combined European Innovation Index* (CEII) is based on an arithmetic mean of a score of the given country in GII and in SII, with an adjustment, that the maximum score in SII is 1 and in GII is 100, thus to have a proper data to compare, SII score needed to by multiply by 100.

Only findings confirmed in a models at significance level of 0.05 and with correlation between given variable and CEII, which is visible on scatter diagram are seen as a proof of an impact of the national culture on the countries' innovation performance.

All the variables were tested for normality by Shapiro-Wilk test, which showed that in case Individualism the data tested are not normally distributed and this Cultural Dimensions needs to be excluded from the research.

At the final stage, to estimate the impact of the national culture on the European countries' innovation performance, the data from Table 1 have been used to create the model of linear regression.

Table 1. Innovation performance and cultural dimensions of 30 European countries

No.	Country	CEII	Power Distance	Masculinity	Uncertainty Avoidance	Pragmatism	Indulgence
1	Austria	55.86	11	79	70	60	63
2	Belgium	56.11	65	54	94	82	57
3	Bulgaria	32.78	70	40	85	69	16
4	Croatia	33.17	73	40	80	58	33
5	Czech Republic	46.38	57	57	74	70	29
6	Denmark	64.26	18	16	23	35	70
7	Estonia	48.25	40	30	60	82	16
8	Finland	62.42	33	26	59	38	57
9	France	55.42	68	43	86	63	48
10	Germany	60.53	35	66	65	83	40
11	Greece	38.11	60	57	100	45	50
12	Hungary	40.08	46	88	82	58	31
13	Iceland	56.58	30	10	50	28	67
14	Ireland	59.93	28	68	35	24	65
15	Italy	45.22	50	70	75	61	30
16	Latvia	36.22	44	9	63	69	13
17	Lithuania	35.01	42	19	65	82	16
18	Luxembourg	58.46	40	50	70	64	56
19	Malta	47.06	56	47	96	47	66
20	Netherlands	60.72	38	14	53	67	68
21	Norway	49.14	31	8	50	35	55
22	Poland	34.69	68	64	93	38	29
23	Portugal	44.13	63	31	99	28	33
24	Romania	27.93	90	42	90	52	20
25	Slovakia	38.36	100	100	51	77	28
26	Slovenia	47.23	71	19	88	49	48
27	Spain	42.66	57	42	86	48	44
28	Sweden	67.00	31	5	29	53	78
29	Switzerland	72.72	34	70	58	74	66
30	United Kingdom	61.04	35	66	35	51	69

Source: own construction based on Hofstede et al., 2010; calculation of CEII based on Cornell University et al., 2016 and Hollanders et al., 2016

3. Results and analysis

The table below presents the key statistics of the multiple linear regression model, demonstrating the impact of the country's culture identified by Cultural Dimensions on innovation performance of each country measured by the *Combined European Innovation Index (CEII)*.

Table 2. The multiple linear regression statistics – CEII

Regression Statistics – Model for CEII			
Multiple R	0.90901		
R Square	**0.82630**		
Standard error of residuals	5.40986		
F 5, 24	22.83390		
Significance F	**2,11e-08**		
Observations	30		
	Coefficients	*Standard Error*	*P-value*
Intercept	31.7412	7.73809	0.0004
Power Distance	**−0.144759**	0.0676926	**0.0429**
Masculinity	0.0114876	0.0418526	0.7861
Uncertainty Avoidance	−0.0828684	0.0604534	0.1831
Pragmatism	**0.181659**	0.0650838	**0.0101**
Indulgence	**0.432630**	0.0674615	**1,25e-06**

Source: own calculation

The analysis of results seems to prove the existing impact of the culture of a given country on its innovation performance. The statistically significant ($F5,24 = 22.83390$, $F < 0.01$) and very well-adjusted model was obtained – the Cultural Dimensions explain the *CEII* results of a given country in more than 82.6%.

The negative impact of Power Distance as well as positive impact of Pragmatism and Indulgence are statistically significant at level of 0.05. In order to ultimately confirm these findings, the scatter diagrams of the correlations between these Cultural Dimension and *CEII* have been created.
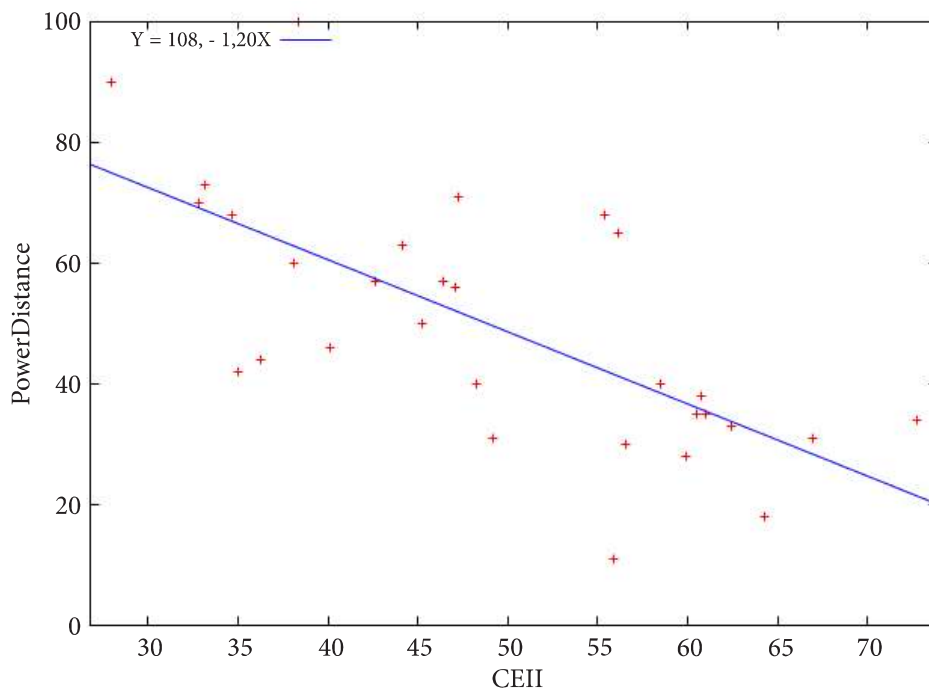
Fig. 1. Scatter diagrams as a visual interpretation of correlations
between Power Distance and *Combined European Innovation Index*
Source: own work

The analysis revealed the existence of correlation, thus a <u>negative impact of Power Distance</u> on innovation performance <u>is confirmed</u>.
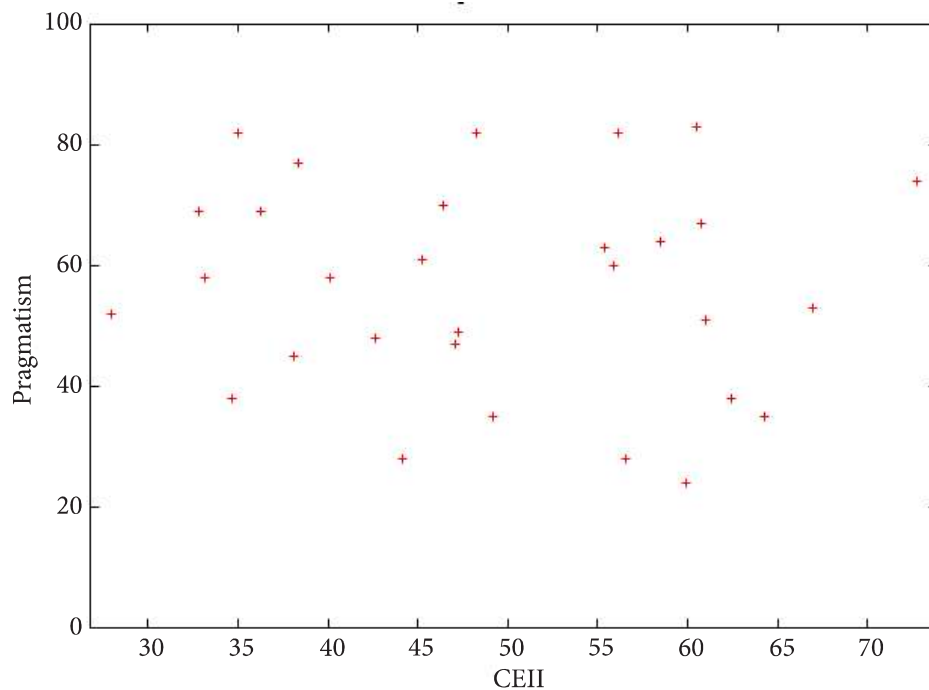

Fig. 2. Scatter diagrams as a visual interpretation of correlations
between Pragmatism and *Combined European Innovation Index*
Source: own work

The analysis revealed the lack of correlation, thus an impact of Pragmatism on innovation performance is <u>not confirmed</u>.
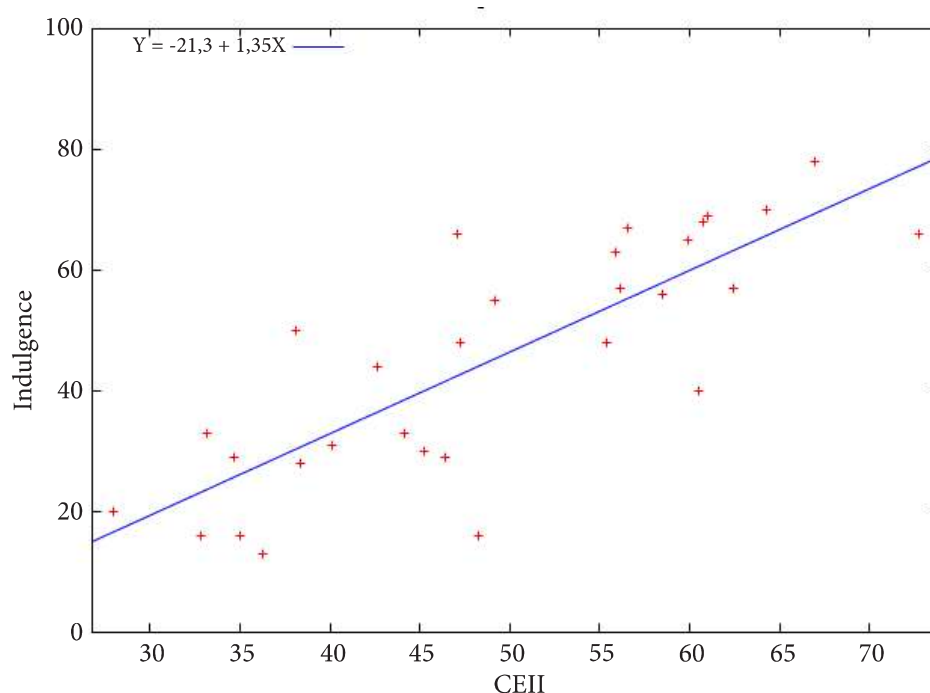

Fig. 3. Scatter diagrams as a visual interpretation of correlations between Indulgence and *Combined European Innovation Index*
Source: own work

The analysis revealed the existence of correlation, thus a <u>positive impact of Indulgence</u> on innovation performance <u>is confirmed</u>.

The main finding of this research is that Cultural Dimensions, Power Distance and Indulgence, have an impact on the European country's innovation performance measured by *CEII*, what proves that <u>the national culture has an impact on innovation performance of European countries</u>.

4. Discussion, practical implications and research recommendations

The results are partly in line with Shane (1992, pp. 29-46) and Rinne et al. (2012, pp. 91-108). The data for Individualism are not normally distributed, therefore were not taken into account in the research, but the negative impact of Power Distance on innovation performance has been confirmed.

Hofstede et al. (2010) have indicated the characteristics that might be assigned to cultures with a lower value of Power Distance and a higher value of Indulgence, i.e. to those cultures that (as was proven in this study) have higher innovation performance levels. Moreover, it could be assumed that these characteristics, if developed in an

organisation, might increase its innovation performance. Shane (1993, pp. 59-73) also noticed such an association.

Thus, characteristics that seem to be worth considering in managing European organisations such as universities aiming at a high innovation performance are presented below.

Countries with lower score for Power Distance are more democratic and open to listen to the voice of their citizens; the distance between people in government and others is shorter (Hofstede, 2010). Czerwonka (2015) highlights several characteristics for cultures with low Power Distance, but especially noteworthy for discussion focused on the universities seem to be the following: pupils treat their teachers as partners, there is lower supervision in the workplace and the relation between the superior and subordinate is pragmatic and less hierarchical – both parts understand the benefits of cooperation.

These characteristics could be converted into desired directions for the European universities. Professors and other researchers are university's employees, but has a different position in the organization and its hierarchy. This research showed, that the relation between them should become the partnership's one. The professor becomes a mentor, not only a supervisor. Other researchers must be more keen to start their own initiatives, not only waiting for the orders. The knowledge must be shared with no obligations amongst parties – the professor probably knows way more than other researchers in a given field, but does not know everything, so might also learn and benefits for this proces. To achieve an increase in innovation performance of given European university, the relations between its employees must be built more on <u>partnership</u> than it used to be.

The second Hofstede's Dimension that has been proven to be a factor influences innovation performance is Indulgence – the higher score, the higher innovation performance. Indulgence is the newest Hofstede's Dimension, therefore the least known in the literature. For the purpose of herein discussion, selected characteristics related to high score in Indulgence will be widely presented.

Firstly, he higher the value of Indulgence, the more important free time is. Dumazedier (1960, pp. 522-531) explains that "leisure consists of a number of occupations in which the individual may indulge of his own free will – either to rest, to amuse himself, to add to his knowledge or improve his skills disinterestedly or to increase his voluntary participation in the life of the community after discharging his professional, family and social duties". In order to increase the innovation performance of universities' employees, it is necessary to allow them to have their free time, even during the working hours – more <u>time flexibility</u> in that matter is needed.

In countries with a higher value of Indulgence, people have more sense of control over their lives, i.e. they believe that they can have some impact on themselves and their surroundings. Taking that into consideration, management of the universities should do all is needed that the people working there believe that they can achieve

a lot and any limitations are only in themselves. Employees should see the world more optimistically, which also is characteristic of countries with a higher value of Indulgence. In general, such countries are characterized by a positive attitude. Moreover, Patterson (2000) indicated that extrovert nature is related to innovation performance. The present analysis confirms such hypothesis, since in countries with a higher value of Indulgence a higher number of extrovert personalities can be observed (Hofstede et al., 2010). Extroverts have more positive attitude towards others and are more enthusiastic (Wilt & Revelle 2009, pp. 27-45), so universities should have at least one such a person in each team working on innovative research. It all allows to create a <u>optimistic and friendly atmosphere</u> at universities, which has an impact on better innovation performance.

Hofstede et al. (2010) proves that there is a higher percentage of very happy people in countries with a higher value of Indulgence, i.e. having a higher index of subjective well-being, which is defined by OECD (2013) as "good mental states, including all of the various evaluations, positive and negative, that people make of their lives and the affective reactions of people to their experiences". European universities shall let to an increase in the subjective well-being of their employees, because it seems there is a positive relationship between <u>happiness of employees</u> and innovation performance of universities.

To summarize the discussion, it is noteworthy its results can be divided into two groups:

- Employees – partnership between them and happiness of them.
- Workplace – flexible working hours as well as optimistic and friendly atmosphere.

A growth in these aspects is expected to give an increase of innovation performance. The correctness of this direction seems to be confirmed by the style of working in the most innovative companies in the world such as Google or Facebook.

However, it seems to be a very rare approach at the European universities. Usually, instead of partnership there is a very hierarchical model of relations, instead of happiness there is a discouragement of employees, instead of flexible working hours, optimistic and friendly atmosphere there is a strict system of rules – to achieve a higher innovation performance universities from European Economic Area and Switzerland should consider to change these attitudes.

There are some limitations to this research. Use of an accessible, very comprehensive secondary data from reliable sources and two indexes of innovation performance combining into one limited this study to European Economic Area countries and Switzerland. It is a demanding challenge to carry out a similar research in other continents and on a global scale.

Moreover, due to the subjective character of the idea of well-being (or an equivalent idea of happiness), it is expected that although the directions will be consistent with the research results, the mechanisms of happiness management

must be adopted to the requirements of a European universities. It is noteworthy that just now we see an increase of the importance of happiness in management of the organisations, and also development of the idea of happiness management in academic literature (Guojuan et al., 2010).

Possible directions described above seem to be only a part of the large catalogue, which remains open and surely new research will result in the identification of new ones. There appears to be a very wide area for academic research, both as regards the managerial recommendations and as regards concrete methods and techniques of management that should allow for a full application of the above findings and increase of innovation performance.

Conclusions

This research has managed to prove that the culture has an impact on innovation performance. Furthermore, characteristics linked to countries with low score in Power Distance and high score in Indulgence highlight the directions for the universities and other organizations that led to an increase of their innovation performance.

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