Politechnika Częstochowska
Wydział Zarządzania

Zeszyty Naukowe Politechniki Częstochowskiej. Zarządzanie
Research Reviews of Czestochowa University of Technology. Management

No 49 (2023), pp. 22-36, ISSN: 2083-1560
DOI: 10.17512/znpcz.2023.1.02, http://znz.pcz.pl

Received: 09.01.2023; Revised: 21.01.2023;
Accepted: 23.01.2023; Published: 31.03.2023.

MODELLING THE REGULATORY QUALITY IMPACT ON CLOUD COMPUTING USAGE IN THE EUROPEAN UNION MEMBER STATES

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Abstract: Recently, the rapid development of innovative technologies based on cloud computing has been observed. Many countries are not keeping up with the relevant legislation, while cloud computing adoption requires transparent and high-quality regulations. This paper is focused on European Union member states. It checks whether the quality of regulation has an impact on cloud computing usage in EU countries. As regulations, quality data from the World Bank's Worldwide Governance Regulatory Quality 2021 indicator was used. Data on cloud computing usage from Eurostat questionnaires on ICT from 2021 were used. Between these variables, there is a moderate to strong linear correlation and causality. The univariate linear regression model was proposed to explain the impact of regulatory quality on cloud computing usage in a quantitative way. The regulatory quality indicator increased by one resulted in the increase in cloud computing usage by 21.56% by companies *ceteris paribus*. The model presented explains 40% of the variance for cloud computing usage by regulatory quality indicator. These conclusions can be valuable from the management perspective for governments that aim to increase the innovativeness and competitiveness of economies, for enterprises that consider the implementation of cloud computing services, and for non-governmental organizations that can have an impact on legislation to contribute to economic development.

Keywords: cloud computing, innovations, regulatory quality

JEL Classification: M15, L86, O33

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DOI: 10.17512/znpcz.2023.1.02

Introduction

Cloud computing refers to a computing model that provides a broad range of IT resources. These resources are available on-demand through a network (Sunyaev, 2020, p. 195). A well-known definition of cloud computing published by NIST (Mell & Grance, 2011, p. 6) points out five key characteristics of cloud computing: access through a network, on-demand self-service, pool of resources, metering capacity of services, and flexible provision and release of resources. Having these characteristics defined, NIST propose four deployment models:

- a private cloud that is provisioned for the sole use of a single organization,
- a community cloud that is provided for a specific community of organizations,
- a public cloud that is IT infrastructure available for the general public,
- a hybrid cloud that is a combination of one or more cloud deployment models.

This article focuses on the public cloud as it is fully managed by a cloud computing provider and available for a wide range of clients around the world. One of the main users of this deployment method is business. According to Gartner (2022), the biggest public cloud computing providers by market share are Amazon Web Services, Microsoft, Google, Alibaba Cloud and Oracle. The providers mentioned above have headquarters in the USA and Singapore. Regulations in those countries and regions are different compared to the European Union area.

Cloud computing services have been gaining popularity for several years. Gartner (Rimol DeLisi, 2022) forecasts that in 2022 global spending on cloud computing reached 490 billion USD. In 2023 this spending will be raised by more than 20% compared to 2022. This is a significant increase considering raising interest rates that can cause a decrease in the number and value of investments. According to IDC (Zivadinovic & Minonne, 2022), public cloud spending in Europe reaches 113 billion USD in 2022 and this number will double by 2026. The cited report points out that the services industry, consumer goods industry and financial sector spend the most on public cloud services.

Dziubak (2022, p. 55) compares public cloud offerings and strategic technology trends. The main cloud providers deliver innovative cloud services that meet most organizational needs.

Kuyoro et al. (2011, p. 252) list the main cloud computing challenges from a business perspective, i.e. security, costing and charging model, service level agreement, and cloud interoperability. One of the principal factors affecting the cloud security model is regulatory issues. Besides security issues, regulations and compliance are the obstacle to adopting cloud services in around 50% of cases (Sajid & Raza, 2013, p. 38). It is the fourth biggest obstacle, followed by security, integration with existing IT systems, and reliability. Due to the nature of rapidly changing law and IT environments, it is necessary to confront these results with more recent research. Singh (2017, p. 20) discusses regulatory issues as one of the biggest challenges of cloud computing. It is highlighted that regulatory compliances are a significant factor in choosing a cloud provider. M'rhaoaurh et al. (2018, p. 5) discuss cloud computing challenges in a literature review published between 2015 and 2018. In 14.5% of cases, legal jurisdiction is mentioned as a cloud computing issue while for data privacy and protection it is 26.5% and it is the highest value across all issues analyzed. Sururah et al. (2021) claim that regulations have a crucial role in cloud adoption, especially in the EU area. Some cloud providers are certified to be compliant with the local law; however, many of them do not follow the law of specific regions or countries. The organization that implements cloud computing services has to choose a provider with services that are compliant with local law.

Nowadays, many organizations use cloud computing to meet business goals. A business must operate in a legally transparent environment to clearly understand what is allowed and what is prohibited in terms of IT-related issues. European Union has some common regulations that are applicable in all member countries; however, every country has the right to create part of regulations by local authorities.

The purpose of this paper is to analyze the impact of regulatory quality on cloud computing adoption across member states of the European Union. The first part checks the theoretical aspects of innovation regulations in Europe and the way cloud providers address those regulations. This is followed by research that examines the impact of regulatory quality on the usage of cloud computing services across EU countries based on data provided by recognized international institutions. The following research questions were posed: (1) what are the regulations in the EU regarding IT technology and what impact do they have on cloud computing, (2) how do public cloud providers comply with EU regulations, (3) what are the strength and type of the relationship between the regulation quality and the adoption of cloud computing, is it possible to describe this relationship using a statistical model?

Legal issues in the usage of cloud computing services

In this section regulations in the usage of cloud computing are analyzed to answer the first research question regarding the nature and impact of law on cloud computing usage.

Governments work on regulations to address security concerns when adopting cloud computing services (Bertot et al., 2012). Governments should address issues with the adoption of cloud computing regulations and create ecosystems for businesses to overcome cloud challenges (Paquette et al., 2010). That is why regulations are necessary to boost cloud computing usage. Ali & Osmanaj (2020) discuss the role of government regulations in the adoption of cloud computing in the example of Australia. In the research, they prove that regulations have a crucial role in the process of adopting cloud computing services. It is important to provide high-quality law that describes all cloud-related factors with in-depth details. High-quality regulations can be an essential factor in increasing the adoption of cloud computing services.

De Francesco et al. (2012) claim that regulatory innovations called "smart regulations" have a high rate of implementation in Europe. However, this does not imply an equal level of innovation adoption. Pelkmans & Renda (2014, p. 24) analyze the role of regulations in Europe and their impact on innovations. According to the research, regulations can stimulate innovations; however, many regulations can disable innovations. It is important to maintain high-quality regulations to keep low compliance costs and significant benefits of regulations. The EU needs to pay attention to creating a law that supports the development of innovation in all member countries.

All EU member states signed the EU cloud federation that is to advance European cloud offers to increase the competitiveness of the EU business (European Commission, 2020). It is to combine cross-border national and private efforts in creating cloud infrastructure and services. Moreover, it defines the "EU Cloud Rulebook", which provides a framework and rules for cloud adoption, and the "European marketplace for cloud services", which familiarizes users with cloud services that meet EU standards and rules.

Other EU regulations and initiatives related to cloud computing include (European Commission, 2021):

- free flow of non-personal data,
- free flow of personal data across the EU,
- European cybersecurity certification scheme for cloud services,
- data protection in the cloud,
- standardized Cloud SLA,
- cloud use by the financial sector,
- mapping of European data flows.

Personal and nonpersonal data can be stored and processed in cloud computing, which is why it is important for cloud computing.

The General Data Protection Regulation (GDPR) allows companies to migrate personal data across the EU, but outside its area, it is prohibited (European Commission, 2018). Moreover, companies and individuals are eligible to process personal data only for legitimate reasons. The GDPR is valid in all EU countries.

While GDPR is common law, countries like Germany, Netherlands, Denmark, and Finland have their own data protection acts (Dutch Government, 2018; Danish Government, 2022; Finnish Government, 2022; German Government, 2021).

As described in this section so far, regulations play a crucial role in IT and innovation adoption and the situation after implementing the GDPR has changed drastically. Some countries have local regulations that influence cloud computing usage locally instead of the entire EU area.

Taking into account the described regulations, it is important to have a look at the existing cloud infrastructure in the European Union. Microsoft Azure locates infrastructure in sets of data centres called regions. At the end of 2022, Microsoft has regions in the EU in the following countries: Belgium, Ireland (North Europe), the Netherlands (West Europe), Finland, France, Germany, and Sweden (Microsoft Azure, 2022). It is 7 out of 49 regions available globally. The number of regions planned to be released in the EU is higher than in the rest of the world. The presented numbers highlight that for Microsoft the European Union is an important market with the potential for rapid growth.

Amazon Web Services, like Microsoft Azure, has data centres (Availability Zones) grouped in regions. Locations in the EU include Spain, Ireland, France, Italy, Germany, and Sweden. It is 6 out of 30 regions worldwide. At the end of 2022, there are no regions to be released soon.

Google Cloud has zones grouped in regions. In the European Union, Google Cloud provides its computing infrastructure from Finland, Poland, Spain, Belgium, Germany, Netherlands, Italy, and France. It is 8 out of 35 regions available around the world.

Each of the cloud providers delivers services in the EU area. That means that for cloud computing providers, the EU area is an important market and they try to be compliant with EU regulations. However, services are not delivered in every EU member country; thus, local regulations can impact the adoption of cloud computing services among EU countries.

Research method

This section describes the research method to answer the third research question about the correlation between strength and type and the statistical model to describe how regulatory quality affects cloud computing usage.

In the research described in this paper, two datasets were analyzed.

The first one called The Worldwide Governance Indicators – Regulatory Quality dimension, is published by the World Bank. Data for this indicator were collected from a large number of survey responses to measure the ability of the government to create laws that permit and promote private-sector development (Kaufmann & Kraay, 2022). As demonstrated earlier in this paper, regulation and its quality affect cloud adoption. Data released by the World Bank are reliable taking into account the reliability of the organization. The data used in the research was collected in 2021 and are grouped per country. The highest score for governance performance is 2.5 while the lowest score is -2.5, which means weak performance. For each of the analyzed counties, the number of data sources is higher than four.

The second dataset used in the research is about the usage of cloud computing services in European countries in 2021. The publisher of these data is Eurostat. Data are based on annual Eurostat model questionnaires on ICT (Eurostat, 2022). In this dataset there are analyzed enterprises besides the financial sector with more than 10 employees onboard; the indicator is the percentage of enterprises that buy cloud computing services over the Internet. Data are grouped by country. The lowest possible value for the indicator is 0, which means that none of the analyzed enterprises used cloud services, and the highest possible value is 100 which means that all enterprises in a certain country used cloud computing services.

Both datasets were joined by the corresponding country, then only the EU member states were selected. In the results, the data were presented in visual form and used statistical measures of calculation and interpretation.

The correlation indicators were calculated between the regulatory quality indicator and the use of cloud computing. Depending on the fulfilment of the statistical conditions checking the correlation between variables can be done using Pearson Correlation Test or Spearman Correlation Test (Bruce et al., 2020). Pearson's correlation test checks the linear relationship between variables. Assumptions of this test are the following:

– there are no outliers in the dataset,
– distributions of all variables are normal,
– both variables are quantitative.

If the assumptions mentioned above are not met, the Spearman correlation test should be used. It can detect if the relationship between variables is monotonic. In the research, both tests were used to verify the corresponding assumptions. The Pearson correlation is a better indicator because it shows the strength and direction of dependency and assumes linear dependency; thus, using this correlation test is the best choice if all assumptions are met. The verification of statistical assumptions is also supported by visual analysis.

To form conclusions about the scale of the impact of regulatory quality on cloud computing usage, univariable linear regression was used. This type of regression examines the linear relationship between an independent variable X (regulatory quality) and a dependent variable Y (cloud computing usage) (Peng et al., 2020). Building a linear regression model is also supported by a graphical form. After performing linear regression, results were discussed.

For a better understanding of the research method, a graphic diagram is shown in Figure 1.

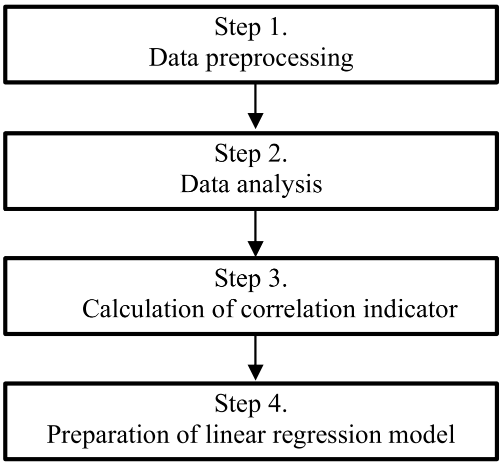

Figure 1. Research Method Steps

Source: Autor's own study

Results

Table 1 presents descriptive statistics of cloud computing usage and regulatory quality indicator. The range for cloud computing usage is 62.2 which means that in the country with the highest value, cloud computing services are used by 62.2% more countries than in the country with the lowest value. The highest values are for Sweden, Finland, and the Netherlands, while the lowest values are for Bulgaria, Romania, and Greece. All values for the regulatory quality indicator are positive, which means that are above the worldwide mean. The lowest regulatory quality indicators are in Romania, Greece, and Bulgaria, while the highest regulatory quality indicator is in Luxemburg, Finland, and Denmark.

Table 1. Statistics of variables

Statistics	Cloud computing usage	Regulatory quality
Mean	42.83	1.12
Standard deviation	17.18	0.51
Minimum	12.80	0.31
25th percentile	30.15	0.77
Median	40.40	1.22
75th percentile	57.30	1.56
Maximum	75.40	1.92

Source: The author's own study based on research

The coefficient of variation measures the variability of the sample and is formulated as follows (Bobowski, 2004, p. 27):

$$V_{Q_1Q_3} = \frac{Q_3 - Q_1}{Q_1 + Q_3} \qquad (1)$$

where Q1 is the value in the 25th percentile and Q3 is the value in the 75th percentile.

For cloud computing usage coefficient of variation described in formula (1) is equal to 0.31. It is low-to-average volatility according to Bobowski (2004, pp. 28-29). For the regulatory quality indicator, the coefficient of variation described in formula (1) is equal to 0.34. It is low-to-average volatility as in the case of cloud computing usage.

Figure 2 presents a standard boxplot of cloud computing usage.

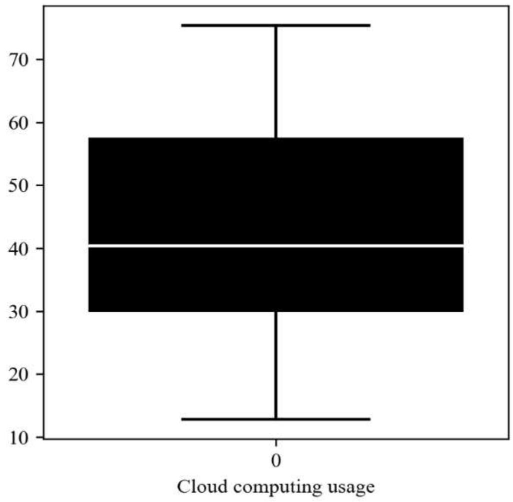

Figure 2. Boxplot of cloud computing usage

Source: The author's own study based on research

Figure 3 presents a standard boxplot of regulatory quality.

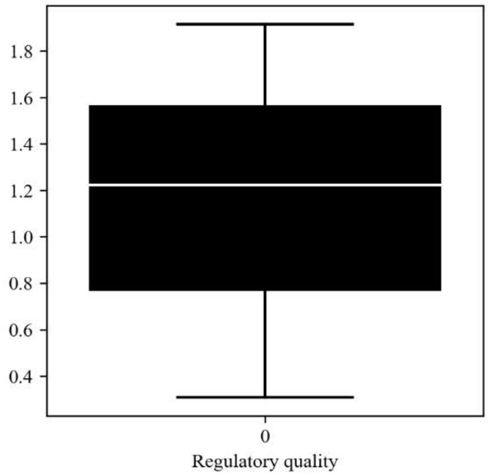

Figure 3. Boxplot of regulatory quality

Source: The author's own study based on research

As shown in Figures 2 and 3, both variables have no outliers. Visual analysis through boxplots is one of the most proper methods to check outliers in data. This conclusion about variables that do not have outliers is necessary for further statistical analysis. The lack of outliers means that in the EU there are not very large deviations in terms of cloud computing usage and regulatory quality. Further analysis of distribution is crucial to understand if distributions are scattered and if there is a clear dominant.

Before calculating the Pearson correlation, it is necessary to check if the data meet assumptions. Data does not have outliers as proved in Figure 2 and Figure 3.

Figure 4 presents a histogram and kernel density estimation of the cloud computing usage variable.

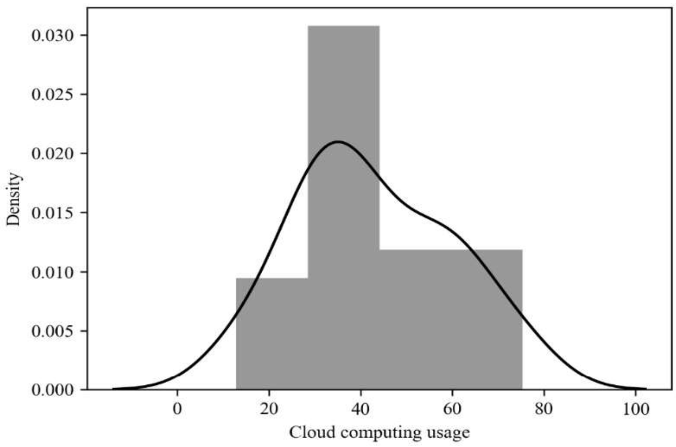

Figure 4. Distribution plot of cloud computing usage

Source: The author's own study based on research

According to the visual analysis of Figure 4, the distribution is similar to normal. It has one vertex, and there is no apparent asymmetry. There are major differences between countries in cloud computing usage value and in most countries, 35% to 50% of companies bought cloud computing services in 2021.

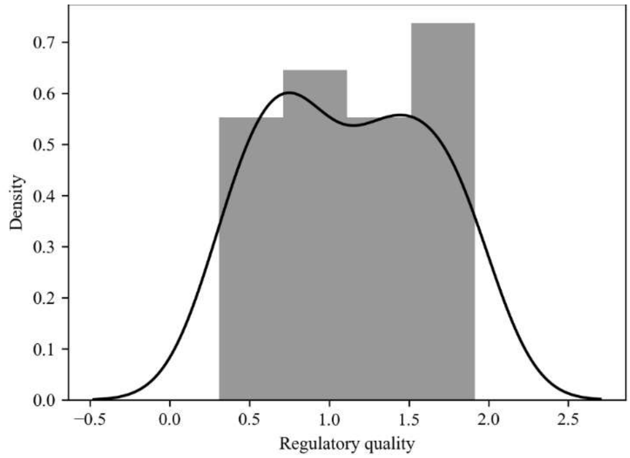

Figure 5. Distribution plot of regulatory quality

Source: The author's own study based on research

Figure 5 presents a histogram and kernel density estimate of the regulatory quality indicator variable. According to the visual analysis of Figure 4, the distribution is similar to normal. There is no apparent asymmetry and one vertex; however, it is less apparent than in Figure 4. There are major differences in regulatory quality among the EU member states, with no clear dominance.

To get a measurable answer to the question whether distributions are normal, the Shapiro-Wilk test was performed. This test has high statistical power to determine a normal distribution (Peat & Barton, 2008, p. 34). The null hypothesis means that the variable is normally distributed. If the p-value is higher than the alpha level (in this research, the alpha level is set to 0.05), then the null hypothesis can be accepted, and the distribution is normal.

Table 2 presents the statistics value and p-value for the Shapiro-Wilk test for cloud computing usage and regulatory quality variables.

Table 2. Results of the Shapiro-Wilk test for variables

Value	Cloud computing usage	Regulatory quality indicator
Statistics value	0.97	0.93
P-value	0.49	0.08

Source: The author's own study based on research

With a 95% probability, the null hypothesis of the normal distribution of both variables cannot be rejected. That means that assumption about the normality of variables is met.

As described in the data set analysis, both variables are quantitative; thus, the third assumption is met. Having the conditions to perform the Pearson correlation test satisfied, an analysis of the Pearson correlation can be performed.

The coefficient of Pearson correlation between variables, regulatory quality indicator, and cloud computing usage is equal to 0.635. To decide whether this result is significant, a correlation coefficient significance test was performed. The null hypothesis means that the coefficient of correlation ρ is close to zero, so there is no dependency between variables. The P-value for the test is 0.00037, so using the alpha level equal to 0.05 null hypothesis is rejected in place of the alternative hypothesis that correlation is significantly different from zero. According to Schober et al. (2018), it is a moderate-to-strong positive linear dependency. The confidence interval of the correlation coefficient is between 0.34 and 0.82, so with a 95% probability, the correlation coefficient will be in that range.

The Spearman correlation test was performed as an alternative to the Pearson correlation test. As proven in analysis, all Pearson Correlation Test assumptions were met; however, using an alternative test is to add certainty about the existence of correlation. The Spearman correlation coefficient determines the nonparametric correlation between variables (Dodge, 2008, p. 502). It checks the ranks between variables; thus, it does not assume linear dependency. The Spearman correlation coefficient is equal to 0.63. The P-value for the test is 0.00038, so using an alpha level equal to 0.05 null hypothesis is rejected in place of the alternative hypothesis, which stands that the correlation is significantly different from zero.

The analysis of both correlation tests leads to the conclusion that cloud computing usage and regulatory quality are correlated. To answer the question about causality, the results of the literature review done in this paper must be used. According to the literature, regulations and regulatory quality affect the adoption of innovations including cloud computing adoption. The direction and existence of the correlation analysis may be obvious but the value of correlation and the conclusion that it is a moderate-to-strong linear dependency is valuable from the perspective of the root of the problem.

Knowing that causality exists and knowing its direction, the conclusion that an increase in regulatory quality will increase cloud computing usage can be drawn.

Table 3 shows Pearson correlation indicator values for other years. These are calculated in the same way as before in this section. Data for 2019 were not collected.

Table 3. Pearson correlation indicator values

Year	2014	2015	2016	2017	2018	2020	2021
Pearson correlation value	0.496	0.747	0.685	0.695	0.751	0.65	0.635

Source: The author's own study based on research

The indicator value increased rapidly in 2015 compared to 2014. In the next years, there was neither a significant change nor a trend. The increase in 2015 may indicate the start of preparation for GDPR implementation in organizations. There is no apparent change in 2021 in comparison to 2020 that could be caused by the COVID-19 pandemic outbreak.

Figure 6 presents a scatterplot with two variables and a fit of the linear regression model.

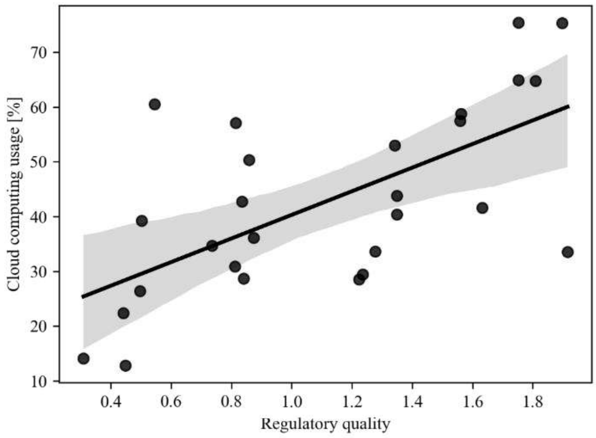

Figure 6. Regression plot of regulatory quality and cloud computing usage

Source: The author's own study based on research

Axis X presents the regulatory quality variable, while axis Y presents the cloud computing usage variable. A visual analysis of data marked as black dots leads to the conclusion that the higher the value of the regulatory quality indicator for a given observation, the higher percentage of enterprises that use cloud computing services. The regression model in Figure 6 also shows a positive direction of dependency.

A univariate linear regression model was prepared to measure the scale of impact of the independent variable on the dependent variable. The coefficients of linear regression are the following:

- intercept: 18.73,
- slope: 21.56.

In order to interpret the coefficient, the following additional assumptions need to be checked (de A. Lima Neto et al., 2004):

- homoscedasticity is present,
- residuals are normally distributed.

To check homoscedasticity, a white test was performed. The null hypothesis says that homoscedasticity is present. Test statistic χ^2 is equal to 2.24 and the p-value is equal to 0.33. With a 95% probability, the null hypothesis cannot be rejected, so homoscedasticity is present in the data (the residues are equally dispersed).

The Shapiro-Wilk test can be used to check if the residuals have a normal distribution. The P-value is equal to 0.96 which gives no reason to reject the null hypothesis that residuals have a normal distribution.

All assumptions are met, so creating and analyzing a linear regression model is valid.

An intercept equal to 18.73 means that for a regulatory quality indicator equal to 0 cloud computing usage will be 18.73 with all other conditions unchanged. A slope equal to 21.56 means that a change of the regulatory quality indicator by one will increase the usage of cloud computing by 21.56 *caeteris paribus*. Both coefficients are significant because the p-value for both is lower than 0.05, so with 95% probability, both coefficients are significantly different from zero. R^2 is equal to 0.40, so 40% of the variance for cloud computing usage is explained by the regulatory quality indicator.

The mean absolute error (MAE) is defined as follows (Wang & Lu, 2018):

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|y_i - \hat{y}_i| \quad (2)$$

MAE measures absolute differences between the predictions and the observed values. Based on the predictions done in the dataset using the linear regression model, the Mean Absolute Error defined as formula (2) is 10.8. This means that the regression model has an average error of 10.8 regardless of the direction.

Conclusions and results discussion

This section concludes the paper and describes the findings and results of the research. Next, it answers the research questions. A paragraph about further research questions is also included.

Cloud computing is a disruptive innovation facing many challenges. One of the main challenges is a regulatory issue. A high level of regulatory quality and transparency affects cloud computing usage. The member countries of the European Union have local regulations as well as regulations imposed by the European Union. These regulations most often concern data storage and processing. European Union aims to amplify economic competitiveness and innovation; thus, many initiatives focus on this. The main public cloud computing providers deliver services from infrastructure located in the EU area to comply with the regulations. However, data centers are available only in a few EU countries.

Regulatory quality and cloud computing usage correlation were analyzed, and results were presented. A positive linear correlation between these two variables is present and it is moderate to strong. In the case of the data presented, correlation also means causality, so improving regulatory quality led to a higher number of enterprises that use cloud computing services. All assumptions of the Pearson correlation are met; thus, the results of the analysis are valid.

The univariable linear regression model was prepared to measure how regulatory quality affects cloud computing usage. It is especially important for businesses and governments to adjust management decisions about regulatory quality improvement and cloud computing adoption projects. Improving the regulatory quality indicator by one leads to an increase of the cloud computing usage percentage by 21.56%, so implementing regulations like cloud computing requires transparent and high-quality regulations. It can be a guide for countries with a low percentage of cloud computing usage to improve their regulatory quality. For example, Romania should create transparent and high-quality laws as the Czech Republic has (both countries are in a similar geographic area – Central and Eastern Europe) to increase the number of enterprises that use cloud computing services by 22.5% with other conditions unchanged to increase competitiveness and innovation of their economy. For enterprises, it is important to lobby for a higher quality of regulations and take part in government consultations to improve their own business.

Literature review and research were performed to answer research questions which concerned: (1) the impact and type of regulations on cloud computing adoption in EU member states, (2) public cloud computing provider's compliance with EU regulations, (3) quantitative measures, correlation, and linear regression, that concerned impact of regulations quality on cloud computing usage. The following are the answers to the research questions. The EU has implemented multiple regulations that affect cloud computing adoption among member states. On top of these regulations is GDPR which was implemented in 2018. Between regulations and regulatory quality and cloud computing usage there is a causality where regulations and regulatory quality have an impact on cloud computing usage. Public cloud providers, primarily AWS, Microsoft Azure and GCP, share computing resources from infrastructure located in the EU area to comply with EU regulations. However, it may not be sufficient to meet local laws in the member countries because those have their own regulations, and infrastructure is located not in every EU country. Between the regulatory quality indicator and cloud computing usage, there is a moderate-to-strong Pearson correlation value. Knowing the existence of causality, it can be concluded that regulatory quality linearly affects cloud computing usage in a moderate-to-strong way. The linear correlation indicator increased in 2015 in comparison to 2014; however, there is no apparent trend. The linear regression model between those variables can be built and all assumptions are valid.

It is worth noting the limitations of this research. Regulatory quality data reflect general law issues, not IT law specifically. This assumption is made because of the nature and availability of the data.

Issues for further research can include analyzing the impact of regulation quality on cloud computing usage over time. For IT management decisions, it can be crucial to confront the use of other IT technologies with regulatory quality or check other regulatory indications with cloud computing usage. Further research may lead to the creation of the adoption of a comprehensive model of cloud computing by companies.

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Authors' Contribution: 100%.

Conflict of Interest: The author declares that there is no conflict of interest.

Acknowledgements and Financial Disclosure: The author declares that this work did not receive any funding.

MODELOWANIE WPŁYWU JAKOŚCI REGULACJI NA UŻYCIE CHMURY OBLICZENIOWEJ W KRAJACH UNII EUROPEJSKIEJ

Streszczenie: W ostatnim czasie można zaobserwować dynamiczny rozwój technologii opartych na chmurze obliczeniowej. Wiele krajów nie nadąża za odpowiednimi wytycznymi, podczas gdy adopcja chmury obliczeniowej wymaga przejrzystych przepisów o wysokiej jakości. Niniejszy artykuł koncentruje się na krajach Unii Europejskiej. Sprawdzono, czy jakość regulacji wpływa na wykorzystanie chmury obliczeniowej w krajach UE. Jakość regulacji charakteryzują dane ze wskaźnika The Worldwide Governance Regulatory Quality opublikowanego przez Bank Światowy. Stopień użycia chmury odzwierciedlają dane z kwestionariuszy Eurostatu dotyczących ICT. Pomiędzy tymi zmiennymi istnieje umiarkowanie wysoka korelacja liniowa i przyczynowość. Zaproponowano jednowymiarową regresję liniową, aby wyjaśnić wpływ jakości regulacji na wykorzystanie chmury obliczeniowej w sposób ilościowy. Wzrost wskaźnika jakości regulacji o 1 prowadzi do wzrostu wykorzystania chmury obliczeniowej o 21,56% przez przedsiębiorstwa *ceteris paribus*. Przedstawiony model wyjaśnia 40% wariancji wykorzystania przetwarzania w chmurze przez regulacyjny wskaźnik jakości. Wnioski te mogą być cenne dla rządów, które dążą do zwiększenia innowacyjności i konkurencyjności gospodarek, dla przedsiębiorstw rozważających wdrożenie usług opartych na chmurze obliczeniowej oraz dla organizacji pozarządowych, które mogą wpływać na ustawodawstwo, aby przyczynić się do rozwoju gospodarczego.

Słowa kluczowe: chmura obliczeniowa, adopcja innowacji, jakość regulacji