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Is Digitalization Improving Governance Quality? Correlating Analog and Digital Benchmarks

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Abstract: The digitalization of public governance and the resulting concept of electronic governance is a characteristic feature of contemporary information society. Both can be defined as the process and outcome of digital transformation: transformation of the “analog” version of governance into “digital” governance. Measuring both versions of governance against typical performance measures of efficiency, effectiveness, equity, openness and others, we expect comparable levels of advancement on both sides. The aim of this paper is to check the validity of this assumption using four international instruments to measure analog and digital governance: E-Government Survey (EGS) provided by the United Nations, Global State of Democracy Index (GSD) provided by International IDEA, Network Readiness Index (NRI) provided by the World Economic Forum and Worldwide Governance Indicators (WGI) provided by the World Bank. Three WGI indicators – Government Effectiveness, Regulatory Quality, Voice and Accountability, and two GSD indicators – Civil Society Participation and Direct Democracy were selected to measure analog governance; and two EGS indicators – Online Service Index and E-Participation Index, and three NRI indicators – Laws Relating to IT, ICT Use and Government Efficiency, and Importance of ICT to Government’s Vision were selected to measure digital governance. All data is from 2016, except GSD which is from 2015, and mostly covers all 193 United Nations member states. Prior to analysis, 11 analog-digital pairs were recognised for expected positive correlations based on conceptual or theoretical arguments, and various correlation coefficients were calculated for them. The results partly confirm expected correlations, including strong positive correlations between digital indicators and the analog indicators of Government Effectiveness, Regulatory Quality and, partly, Voice and Accountability. The results also show unexpected weak correlation between E-Participation and the analog indicators of Civil Society Participation and Direct Democracy. The paper concludes with discussion on the nature of the analog-digital relationships and on design of reliable governance benchmarks in the digital era.

Keywords: governance, digitalization, digital transformation, benchmarks, correlation, measurement

1. Introduction

Digitalization is transforming how government organizations perform their internal operations, how they make and execute decisions, how they interact with citizens, businesses and each other, and how they govern and administer territories and sectors under their jurisdiction. Conceptually, we view digitalization as transformation of the traditional “analog” governance into contemporary “digital” governance. Beyond merely digitizing traditional government structures, processes and culture, digitalization is also aimed at improving governance performance. The difference is captured through progression from digitalization to transformation stages of the digital government evolution (Janowski, 2015).

The potential of digitalization to improve governance performance extends across various performance measures including efficiency, effectiveness, equity, openness and others. The literature is vocal on such potential including efficiency of internal government operations, provision of tools for digital democracy, promotion of innovation among entrepreneurs, etc. (Wirtz and Daiser, 2017). Consequently, we assume that the performance levels of analog and digital governance should be comparable, e.g. high-performance analog governance should generally coincide with high-performance digital governance. Lack of empirical confirmation of this comparability, e.g. group of countries exhibiting low-performance analog governance but high-performance digital governance, would raise concerns about the design of digital transformation for this group, the adequacy of performance measures applied, or both.

The aim of this research is to validate this assumption quantitatively. The basis for this validation is country-level data provided by the latest editions of four international benchmark instruments: EGS provided by the United Nations (2018), GSD provided by International IDEA (2018), NRI provided by the World Economic Forum (2016), and WGI provided by the World Bank (2018). Five indicators of analog governance were selected: three WGI indicators – Government Effectiveness, Regulatory Quality, Voice and Accountability, and two GSD indicators – Civil Society Participation and Direct Democracy. Also five indicators of digital governance were selected: two EGS indicators – Online Service Index and E-Participation Index, and three NRI indicators – Laws Relating to IT,

ICT Use and Government Efficiency, and Importance of ICT to Government's Vision. Among 25 possible pairs of analog-digital indicators, 11 pairs were identified based on theoretical arguments for expected positive correlations, and three correlation coefficients (Pearson's, Spearman's and Kendall's) were calculated for them. The results generally satisfy the assumption, albeit with different strengths: strong confirmation for pro-efficient digitalisation and weaker confirmation for pro-participation digitisation. Such results may be interpreted twofold: as a confirmation that digitalisation of governance "works" or as a contribution to the discussion on new generation of benchmarks, tailor-made to the needs of digital society.

The rest of this paper is structured as follows. Section 2 provides theoretical background. Section 3 presents research methodology. Section 4 presents research findings. Section 5 includes discussion of research findings. Finally, Section 6 provides some conclusions.

2. Background

The aim of this section is to provide theoretical background to underpin the research described in this paper. The background includes the concept and dimensions of governance, governance and digitalization, and various performance measures of traditional and digital governance.

2.1 Governance

Governance is the pivotal concept of this paper. In general view, governance refers to the structures and decision-making processes that are oriented at conducting various affairs that are not an exclusive domain of state governments (Bruce-Lockhart, 2016). Fukuyama (2016) states that there are at least three different meanings of governance, among which public administration, taken as an effective implementation of state policy, seems to be particularly relevant. It is often noted that the term itself does not have precisely determined semantic borders (Welch, 2013, p. 255). However, governance is most often regarded to constitute actions and arrangements, formal or informal, rather than static institutional bodies (OECD, 2011).

A key difference between governance and government is that the former covers the entire spectrum of decision-making and -implementing processes, while the latter is just one of the governance actors. This actor is distinguished (UNESCAP, 2009) as "one arm of modern society" along with business and non-profit sectors (Weil, 2015). In this paper, we regard governance as a broad landscape of decision- and policy-making processes in modern society, and government as its leading institutional actor.

The complex nature of governance implies its multidimensionality – various aspects must be taken into consideration to describe, measure, evaluate and compare its various cases. Kaufmann et al (2010) divides governance into three aspects that encompass six dimensions of evaluation: the range of society's control over government comprises dimensions of voice and accountability and political stability; government capacity and efficiency comprises government effectiveness and regulatory quality; and law and order comprises the rule of law and control of corruption. These dimensions constitute the WGI framework by The World Bank (2018).

In addition, Brunet and Aubry (2016) point at three similar aspects of governance – efficiency, legitimacy and accountability – in their conceptualization of governance. A different approach is presented by Treib et al (2005, pp. 7-9), where governance is defined using three dimensions and nine modes: policy contains the modes of legal bindingness, approach to implementation, presence of sanctions, nature of regulation, and character of norms; politics contains the character of the actors involved; and polity contains hierarchy versus market, locus of authority, and institutionalisation of interactions.

An effort to identify the desired features of governance has brought a concept of good governance. OHCR (2018) lists transparency, responsibility, accountability, and participation and responsiveness as attributes of good governance. UNESCO (2018) expects good governance to be participatory, transparent, accountable, effective, equitable and promoting the rule of law. In particular, good governance is an essential condition for achieving Millenium Development Goals (Ghaus-Pasha, 2007). The US Millenium Challenge Account defines good governance using three categories: ruling justly, investing in people and economic freedom (Knoll and Zloczynski, 2012). The ambiguity of good governance, and different institutions emphasising different aspects of good governance, from fundamental civil rights to economic indicators, is problematic (Gisselquist, 2012).

2.2 Governance and digitalisation

Digitalization – the increasing use of digital technology – is one of the leading trends in modern society, with a massive impact on how we live and work (World Economic Forum, 2018b). This paper is not targeted at examining this phenomenon en bloc, but in regard to its influence on governance.

It is noted that digital transformation modifies the relations between citizens and governments (Accenture, 2014, p. 8), supports citizens in controlling their government's actions and decisions (Freeman, 2013, p. 354), reformulates citizen's roles in political communication (Casero-Ripolles, 2017, p. 14) and even lets Chinese Government score their citizens with "behaviour rating" (Helbing and Pournaras, 2015, p. 34). The investment into digitalization of governance is expected to bring measurable benefits, i.e. advance desirable features. However, conceptual estimations are of mixed character. Hereunder goes a brief of different views.

According to WEF (2002), the sole implementation of modern technologies into governance is insufficient – it should be supported by a reform of obsolete bureaucratic habits with more approach towards citizens. ITU (2009, pp. 1-2) associates e-government with "a change towards a more customer friendly culture" and points at reduction of administrative costs in public procurement, efficiency advancements in streamlining public services, greater public consultation, etc. as potential benefits. Hu et al (2009, p. 972) cite a number of digital government concepts, varying from government services available at all times, through utilisation of digital technology for the sake of cost optimisation, to a deep transformation resulting in citizen empowerment. Various authors adopt digital government as a primarily technical and economic tool to generate operational benefits and improve performance, or a chance to achieve social or ethical goals. Navarra and Cornford (2012, pp. 37-38) put much hope in the reform potential of digital government, stating that digital transformation may lead to reshaping of governmental legitimacy, promoting social welfare and helping society embody democratic ideals. On the other hand, Simon et al (2017, p. 8) argue that despite technological progress, democratic governance is a domain impervious to the effects of digital transformation, what is reflected in the crisis of democracy and passivity of citizens. Bannister and Conolly (2011) suggest that the enthusiasm towards potential of digitalization in governance should be mitigated, since there is no proof that it may transform governance into a better form. While its contribution is undeniable, the actual impact varies. For instance, digitalization brings substantial benefits to structural change and transparency, but not to accountability.

Such polarisation can be partially explained by Janowski's (2015) model of digital government evolution where, along with the sophistication of technology usage, digital government tends to evolve into full governance – from initial rise of bureaucratic efficiency through facilitation of internal governmental procedures, to constant dialogue and collaboration between various governance actors, to full support to Sustainable Development Goals provided digital government has reached a sufficient level of advancement (Janowski, 2016).

Despite diversity of views, the generally positive impact of digital transformation on governance is a matter of consensus. So is the actual scope of this impact, from pragmatic – focusing on efficiency to more idealistic – focusing on democracy. The occurring conceptual clashes may be verified by data.

2.3 Traditional governance performance

As stated before, governance covers a spectrum of issues, most expressed using conceptual terms such as accountability, legitimacy or the rule of law. Generally, none of them can be measured directly, so various indicators intended to record the relevant aspects of governance are being constructed and used.

The most comprehensive governance benchmarking project is The World Bank's WGI report. Its construction follows the evaluation framework that examines six dimensions of governance and assesses their performance with relevant benchmarks. The data is captured annually for over 200 countries, using more than 30 sources (Kaufmann et al, 2010). The presence of categories such as Participation or Voice and Accountability implies that democratic principles and respect for citizen rights are part of good governance.

Besides WGI, a fair selection of instruments exists: Democracy Index by the Economist Intelligence Unit (2017), the Polity insight by Polity IV Project (2014) or Freedom in the World insight by Freedom House (2018). A comprehensive study of democracy and citizen rights is conducted by IDEA (2018).

2.4 Digital governance performance

As showed before, there is a number of views towards the role, scope and character of digital governance in comparison to traditional governance. Hence various authors raise substantial issues, e.g. excessive “product orientation” with focus on access, usability, interactivity etc. in measurement (Amoretti, 2007, p. 136), lack of reliable quantification in many areas of information society (Salem, 2007, p. 16), limitations of current approaches to benchmarking causing quality issues (Jansen, de Vries and van Schaik, 2010, p. 214), etc.

The main international instrument for measuring digital government is the United Nations’ EGS (United Nations, 2018d). The survey comprises two benchmarks: E-Government Development Index that focuses on building digital infrastructure and delivering public services through digital means (United Nations, 2018a) and E-Participation Index that measures digital interaction between government and citizens (United Nations, 2018b). The approach adopted by EGS somehow follows the main dimensions of good governance, with efficiency dimension covered in parallel with democracy and participation.

A report of existing digital government benchmarks, Tinholt (2017, pp. 4-5) demonstrates that most cover limited set of countries and address part of the spectrum of digital governance compared to EGS. Nonetheless, one can point at complementary surveys. The World Economic Forum’s NRI is a comprehensive benchmark of “the factors, policies and institutions that enable a country to fully leverage [ICT] for increased competitiveness and well-being” (World Economic Forum, 2016). Another report assessing digital government ecosystem is issued by Waseda Institute (Obi and Iwasaki, 2010, p. 15). An example of geographically-focused instrument is the European eGovernment Benchmark, evaluating public service delivery in Europe using user-centricity, transparency, cross-border mobility and key enablers dimensions (Tinholt *et al.*, 2017, p. 5).

3. Methodology

The aim of this research is to verify the assumption about comparability of performance measures of analog versus digital government, introduced in Section 1. The method adopted to verify this assumption is to calculate the strengths of correlations between pairs of analog and digital measures that represent various aspects of governance, each pair belonging to the efficiency or participation dimensions of governance, based on reliable, internationally-comparable data.

The data for this research originates from four international benchmarks instruments: EGS by the United Nations, GSD by the IDEA Institute, NRI by the World Economic Forum, and WGI by the World Bank Group. The latest 2016 editions of such instruments were used with the exception of GSD, which comes from 2015. The data mainly covers all 193 member states of the United Nations, the population of this study.

The selection of indicators among such instruments was carried out with four criteria in mind: 1) the indicators should cover the largest possible number of governance dimensions, both digital and analog; 2) each indicator should be well-defined and provide specialised coverage; 3) the indicator values should be allocated on at least interval scale; and 4) the indicators should be mutually independent. The selection of the indicators together with their codes, sources, scales and numbers of countries is described in Table 1.

Table 1: Selection of indicators for measuring digital and analog governance

Code	Indicator	Type	Source	Scale	Countries
DEP	E-Participation Index	Digital	E-Government Survey (United Nations, 2018d)	0 – 1	193
DOS	Online Service Index			0 – 1	193
DLI	Laws relating to ICT		Networked Readiness Index (World Economic Forum, 2018a)	1 – 7	137
DIE	ICT use and government efficiency			1 – 7	137
DIV	Importance of ICT to government vision			1 – 7	137
Code	Indicator	Type	Source	Scale	Countries
AGE	Government Effectiveness	Analog	Worldwide Governance Indicators (The World Bank, 2017)	-2.5 – 2.5	191
ARQ	Regulatory Quality			-2.5 – 2.5	191

Code	Indicator	Type	Source	Scale	Countries
AVA	Voice and Accountability		The Global State of Democracy (IDEA, 2018)	-2.5 – 2.5	193
ACS	Civil Society Participation			0 – 1	151
ADD	Direct Democracy			0 – 1	152

Table 2 presents descriptions of the indicators selected in Table 1. On this basis, the table also classifies the indicators into two dimensions: the first referring to governance efficiency and the second to citizen participation and democracy. Both categories are represented among digital and analog indicators.

Table 2: Descriptions of selected indicators with dimensions

Indicator	Description	Dimension
DEP	Measures „promoting participation of the citizenry ... in public decision-making”. Three maturity stages: e-information, e-consultation and e-decision-making.	participation
DOS	One of three parameters of the UN’s EGS. Four maturity stages: emerging, enhanced, transactional and connected.	efficiency
DLI	Assesses country’s ICT laws, e.g. e-commerce or digital signatures.	efficiency
DIE	Assesses to what extent the use of ICT by the government improves the quality of government services to the population.	efficiency
DIV	Assesses to what extent the government has plans for utilizing ICT to improve country’s competitiveness.	efficiency
AGE	Captures "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation". Includes bureaucratic quality, infrastructure, civil service, etc.	efficiency
ARQ	Captures „perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development”. Includes trade policy, investment freedom, market and competition, etc.	efficiency
AVA	Captures perceptions whether “country’s citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media”. Includes democracy index, political rights, policy-making, etc.	participation
ACS	Denotes „the extent to which organized, voluntary, self-generating and autonomous social life is dense and vibrant”.	participation
ADD	Denotes to what extent „citizens can participate in direct popular decision-making”.	participation

We assume that within both dimensions of efficiency and participation, the analog indicators correlate positively, i.e. with coefficient value ≥ 0.5 , with digital indicators. For example that DEP correlates positively with AVA. This assumption is depicted in Table 3: the cells marked with “x” represent expected positive correlation between the corresponding rows and columns. In total, 11 digital-analog pairs are expected to show positive correlations: 8 pairs related to efficiency and 3 related to participation.

Table 3: Expected correlation of analog and digital indicators

Digital indicators	Scope	Analog indicators				
		Efficiency		Participation		
		AGE	ARQ	AVA	ACS	ADD
DEP	Participation			x	x	x
DOS	Efficiency	x	x			
DLI		x	x			
DIE		x	x			
DIV		x	x			

For each of the 25 pairs of digital versus analog indicators, correlation strength was calculated using Pearson’s coefficient of linear correlation and validated by two rank-based methods: Spearman’s and Kendall’s. Data and results were visualised on with scatter plots, correlograms and numerical data tables. Missing data was handled with pairwise elimination. The primary tool was the R environment including additional libraries.

4. Findings

The dispersion of values for all 25 pairs of indicators is presented in the scatter plot graphs below. Dots represent countries. Horizontal and vertical position of dots is based upon the relevant indicator values.

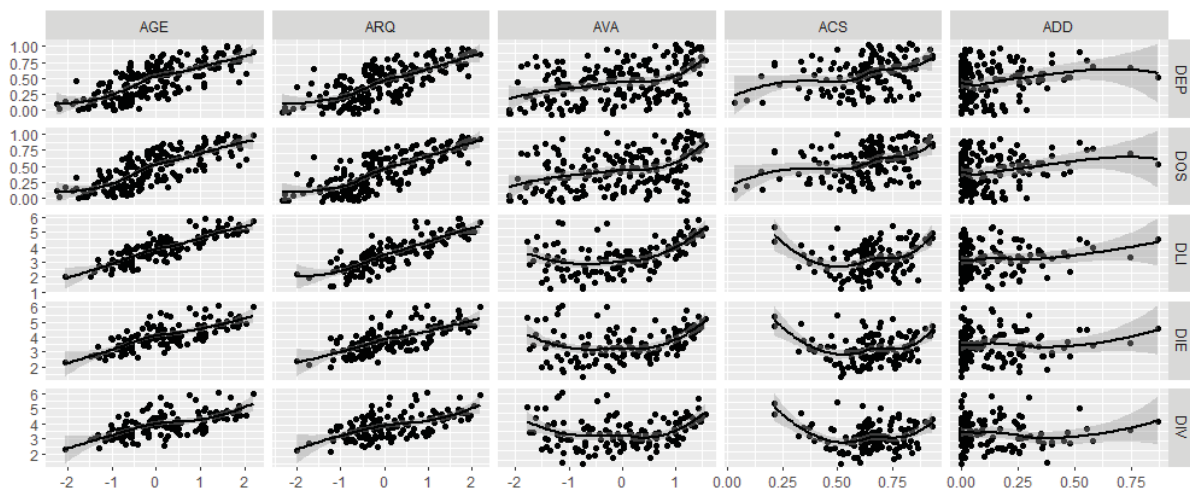


Figure 1: Dispersion of values for each digital-analog indicator pair

A visual assessment of the graphs in Figure 1 indicates the presence of significant positive correlation between all digital indicators DEP, DOS, DLI, DIE and DIV, and the analog indicators of AGE and ARQ as the points are grouped along the diagonal of the graphs. On the other hand, the graphs for all digital indicators and the analog indicators of ACS and ADD indicate weak correlation due to the dispersion of points. Finally, the graphs for digital indicators and the analog indicator of AVA indicate weak to moderate correlation.

This visual assessment is confirmed by the correlation calculation depicted in Figure 2. Three correlograms are depicted: Pearson correlation on the left, Spearman’s correlation in the middle and Kendall’s correlation on the right. All three correlograms use the blue colour to represent positive correlation, red to represent negative correlation, and apply colour intensity and circles sizes proportionally to the correlation strengths.

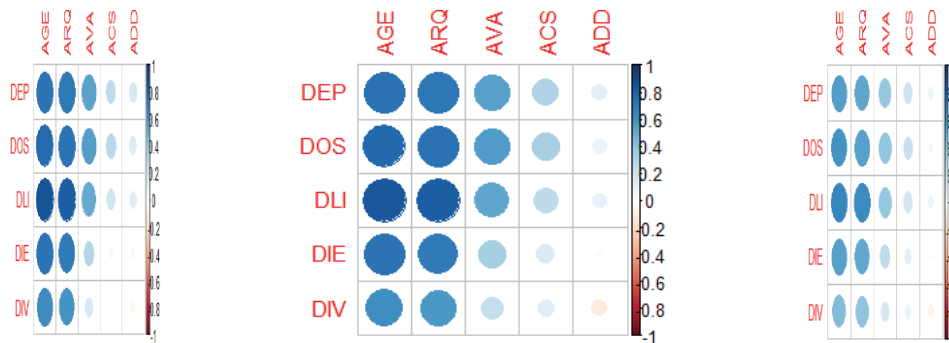


Figure 2: Pearson’s, Spearman’s and Kendall’s correlation coefficients for 25 pairs of digital-analog indicators

Showing consistent results and sharing roughly the same distribution patterns, all three correlograms reveal: strong positive correlations between all digital indicators and analog indicators of AGE and ARQ; moderate correlations between three digital indicators of DEP, DOS and DLI and the analog indicator of AVA; and weak correlations between digitals indicators of DIE and DIV and the analog indicator of AVA as well as weak correlations between all digital indicators and the remaining two analog indicators of ACS and ADD.

Considering the Pearson correlation values and taking the value of 0.5 as a positive verification threshold, 9 out of 11 expected digital-analog pairs are positively verified as shown in Table 4 below.

Table 4: Verified correlation of analog and digital indicators with Pearson correlation coefficient. Values compatible with expectations are marked in bold

Digital indicators	Scope	Analog indicators				
		Efficiency		Participation		
		AGE	ARQ	AVA	ACS	ADD
DEP	Participation			0.54	0.26	0.17
DOS	Efficiency	0.78	0.74			
DLI		0.85	0.83			
DIE		0.74	0.70			
DIV		0.62	0.59			

Concerning division of indicators into efficiency and participation dimensions, all efficiency-related pairs are strongly correlated, with Pearson coefficient ranging from 0.85 for DLI-AGE down to 0.59 for DIV-ARQ. However, only one participation-related pair satisfies the positive verification threshold: DEP-AVA with the Pearson coefficient value of 0.54.

5. Discussion

More generally, digital indicators of governance quality are strongly correlated with the analog indicators of government effectiveness and regulatory quality – which justifies the premise that investing in traditional governance quality and quality of legislation are sound strategies to ensure value from digital transformation, c.f. Mahmoodi and Nojehdeh (2016), Dutta and Geiger (2015).

On the participation side, the situation is less obvious. First, smaller correlation values of the digital indicators with Voice and Accountability could explain how non- or less-democratic states such as Singapore with DEP 0.92 and DOS 0.97 but AVA -0.28, or Bahrain with DEP 0.75 and DOS 0.83 but AVA -1.45, are able to build effective digital mechanisms. A question however is to what extent such mechanisms are conceived for benchmarking purposes only, rather than for improving governance quality and people's living conditions.

Second, lack of correlation between digital indicators and Direct Democracy indicates that digital transformation need not correspond to the participation ladder, as proposed by (Arnstein, 1969), for which the highest level is direct democracy. The digitally-advanced countries are not necessarily those that introduce direct expression of citizen voice, e.g. USA with DEP 0.90 and DOS 0.93 but ADD 0, Germany with DEP 0.76 and DOS 0.84 but ADD 0.01, or Mauritania with DEP 0.05 and DOS 0.07 but ADD 0.20.

Such disparities highlight the need for accurate benchmarks for the digital era, preferably the benchmarks that adjust technical assessment of digital performance with traditional governance measures. One of such attempt, a proof of concept, has been proposed by Lidén (2015).

6. Conclusions

The research has revealed that digital benchmarks closely reflect traditional concepts of governance on the side of governance efficiency but fail to closely reflect such concepts on the side of participation. One aspect worth further study is questionable connection of digitalisation with the measures of direct democracy and citizen society, as opposed to firm connection of digitalization with general efficiency of the state.

When designing and performing our analysis, we were aware of some its limitations. One limitation is selection of existing benchmark instruments, which represent just a segment of the complex field of governance. Another limitation is a static approach to data collection – the data refers just to one moment in time, without possibility of tracing possible tendencies. Finally, more sophisticated set of statistical methods could be used to give a more comprehensive picture of digital-analog connections.

Nonetheless, we expect that this research may be beneficial to researchers, policymakers and government managers who are concerned with: the outcome of digital transformation on governance and policy-making, analysis of dependencies between digitalization and progression of governance quality, integrity and reliance of insight coming from popular benchmarking instruments, and design of new tailor-made benchmarks to address the needs of the information society.



This effort may be treated as an initial part of a longer-term scientific project. This project can have a number of further paths: research on a wider group of countries using more elaborate sets of variables, time series analysis to track dependencies between digital and analog governance in an evolutionary context, examination of benchmark instruments to identify and map substantive and technical dependencies between them, or study of alternative approaches to benchmark design, tailor-made for digital era.

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