

Digital Competitiveness of Smart Cities in India: Current Perspective

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Abstract - The Government of India launched 84 smart city projects in June 2016 (current count is 98) to boost urbanization and consider it as an opportunity to mitigate poverty. One of the major features of smart cities is extensive use of digital technology for improving the quality of governance and public services. This study aims at developing a model for assessment of digital competitiveness of smart cities which is the ability to adopt and explore digital technology for the above stated purpose, and also to assess the current status digital competitiveness of Indian smart cities. The data available for 37 smart cities across India was analyzed and presented in this study. Total eight types of digital services offered to the citizens were examined. Results showed that digital technology is currently available for 70.4% of various services and information needs of the citizens in these smart cities. There is scope for further research in this area as the data becomes available for remaining smart cities, over the period.

Keywords: Digital competitiveness, Smart cities, e-Governance, Digital technology

I. INTRODUCTION

The Government of India launched 84 smart city projects in June 2016 to boost urbanization and consider it as an opportunity to mitigate poverty. This study is carried out in March-April 2020, when the current number of smart cities has risen to 98. These smart cities were expected to be strengthened through comprehensive and inter-connected approach combined with increased public participation. One of the major focus areas in achieving these goals was extensive use of digital technology, for improving the quality of governance and public services. The current study aims at assessing the current status of digital competitiveness of smart cities.

The IMD World Digital Competitiveness Ranking (2017) defines Digital Competitiveness as “the capacity of an economy to adopt and explore digital technologies leading to the transformation in government practices, business models and society in general”. There has been increasing use of Information and Communication Technology (ICT) in all walks of life, for the significant benefits that are derived from it, in terms of improving productivity and quality of operations. With this view in mind, there has been strong focus on use of ICT for governance of smart cities. Digital competitiveness, which is a measure for adoption of ICT, therefore assumes significant importance in the management of smart cities.

II. BACKGROUND AND SIGNIFICANCE OF THE STUDY

The Prime Minister of India Hon. Shri Narendra Modi launched the smart city projects in September 2017. At that time 84 cities all across India were identified for development into smart cities. The objective behind this initiative was to use urbanization as a tool for pushing economic growth and mitigating poverty. The Hon. Prime Minister also suggested that there is a need to take a comprehensive, inter-connected, and vision-oriented approach towards this project. One of the major focus areas in the smart city project was use of digital technology for improving the quality of governance and public services in smart cities. Accordingly, measures were taken by the Government for building the necessary infrastructure and adoption and proliferation of digital technology in the smart cities.

Several articles have been published on the topic of development of smart cities and measuring their competitiveness in relation to their performance objectives.

Dorin Lixăndroiu (2018) has discussed about Digital Economy and Society Index (DESI) in the Romanian context. This composite indicator which measures digital performance has 5 dimensions, namely, connectivity, human capital, use of internet services, integration of digital technology, and digital public services. Each of these dimensions were assigned a weight and the weighted score was calculated. DESI was adopted by members of European Union for measuring digital competitiveness at country level. Further to this, the United Nations had generated e-government development index (EGDI) consisting of three factors – online service index, telecommunication index, and human capital index.

Zuti B. (2018) argued that digital government is vitally important for enhancing the public value. Again in his article on Digitalization, Regional Competitiveness, and the Governments of the Future, Zuti B. (2018) stated that with digitalization, there is an opportunity for governments to be improve inclusiveness, transparency and trustworthiness, hence operating in a more effective manner. Zuti mentions that Kloes, Piat and Ghislain (2015) define digital governments as follows: “Digital government refers to the production of and access of data, services and content, sourced and distributed across the digital ecosystem, to create public value”. The seven

principles involved in digital government are: digital by default, once only principle, inclusiveness and accessibility, openness and transparency, cross-border by default, interoperability by default, and trustworthiness and security.

Digital competitiveness of smart cities

Veselica R. (2019) has explained the impact of digital innovation on national competitiveness in Croatian context. The three dimensions of digital competitiveness by the Institute of Management Development (IMD) are: Knowledge, Technology, and Future Readiness, and Croatia has been actively focusing on these dimensions, for improvement. Salem F. (2016) gives an account of how Dubai was turned into a Smart city through organizational, technological, cultural, and regulatory reforms. Digital transformation is the key factor in transforming cities into smart cities that add public value. For Dubai, this digital transformation took 15 years and now out of 1000 services offered by the Government, 95% are being offered as online services. Dubai ranked second worldwide in 2015 in the category of Government success in ICT promotion in the data published by WEF. This indicates the importance of digital competitiveness in the management of smart cities.

Jucevičius, R., et al (2014) have attempted to examine the difference between digital and smart cities and developed a conceptual model for evaluation of the digital dimension of a smart city using 28 to 400 indicators. Madakam S. and Ramaswamy R. (2013) have reviewed the evolution of smart cities in India and also identified the probable causes that hinder the development of smart cities.

Paskaleva K. (2013) has argued that E-Governance is a strong enabler of competitiveness and sustainability of smart cities. The author has explained that competitiveness in the context of smart cities amounts to a) the ability and capacity of a city to provide a vibrant urban economy and society, b) an overall city attractiveness which benefits all consumers – business, citizens, and visitors, and c) the effective organization of local innovation systems which enhance the management of urban resource and improve both situational conditions and market performance.

Chatterjee, S., & Kar, A. K. (2018) have examined the effect of adoption of digital services in smart cities from a user perspective. They have claimed that such adoption of digital technologies has the potential to transform the lives of the citizens substantially and hence they are strategically important. This study therefore assumes importance because the focus of the study is to develop a quantitative model for assessment of digital competitiveness, which could be used by administrators and policy makers for monitoring the digital competitiveness of Indian smart cities in particular, on an ongoing basis.

Smart Cities of India

The Indian Liaison office of the International Association of Public Transport (UITP) has published and maintained the list of smart cities, and the currently 98 cities have been earmarked for development into smart cities (<https://india.uitp.org/list-smart-cities-india>). The Ministry of Housing and Urban Affairs of the Government of India has been maintaining and publishing data related to smart cities in India (<https://smartcities.data.gov.in/cities>). The data is presented in several catalogues for each city. Each catalogue contains information about a specific aspect such as population, water supply, road safety etc. Since this study is focused on digital competitiveness, the data provided in catalogue number 45-Digital-Availability has been considered for analysis. This parameter describes the extent to which the smart cities have adopted digital technology in providing services and information to the citizens.

Research Objectives

This study aims to examine the current status of digital competitiveness of smart cities in India. The research objectives are stated as below:

- 1) To understand the dimensions and measures of digital competitiveness adopted by the Government of India for smart cities.
- 2) To evaluate the current status of digital competitiveness of smart cities as measured on the dimensions mentioned above.

III. RESEARCH DESIGN AND METHODS; DATA COLLECTION

This study is a cross sectional study based on the secondary data published by the Ministry of Housing and Urban Affairs of the Government of India (<https://smartcities.data.gov.in/cities>). The data is published in several catalogues, each focusing on a specific parameter. As mentioned earlier, the data provided in catalogue number 45-Digital-Availability has been considered for analysis since this study is focused on digital competitiveness. The following eight dimensions have been considered in this catalogue for measuring digital competitiveness (Table 1):

Table 1 Dimensions of Digital Competitiveness of Smart Cities

Sr.	Dimension of digital competitiveness
1	Online Payment of taxes (property / water) [Yes / No]
2	Online Payment against traffic violations (challans, fines, etc.) [Yes / No]
3	Online request for Service Connections (gas, water supply) [Yes / No]
4	Online request for Certificates / Licenses (marriage, driving, birth & death certificates) [Yes / No]
5	Online display of Tenders (for various works) across various departments/ utilities [Yes / No]
6	Online Grievance management (tracking of complaints) [Yes / No]
7	Online buying of Tickets and passes (e.g. public transport, cultural events) [Yes / No]
8	Online request of Disclosure of documents (e.g. budgets, plans, RTI requests) [Yes / No]

Out of the 98 smart cities, data for the above mentioned catalogue is available for only 37 cities so far. Partial data is available for some of the remaining cities and hence it was not considered for this study. The list of these 37 cities is given below in Table 2:

Table 2 List of Smart Cities under consideration

Sr. No.	City	State
1	Ahmedabad	Gujarat
2	Aurangabad	Maharashtra
3	Bilaspur	Chhattisgarh
4	Chandigarh	Chandigarh
5	Chennai	Tamil Nadu
6	Dahod	Gujarat
7	Diu	Diu
8	Faridabad	Haryana
9	Gwalior	Madhya Pradesh
10	Itanagar	Arunachal Pradesh
11	Jammu	Jammu
12	Kakinada	Andhra Pradesh
13	Kanpur	Uttar Pradesh
14	Kota	Rajasthan
15	Mangaluru	Karnataka
16	Muzaffarpur	Bihar
17	Nashik	Maharashtra
18	New Delhi	New Delhi
19	Patna	Bihar
20	Pune	Maharashtra
21	Atalnagar	Chhattisgarh
22	Ranchi	Jharkhand
23	Rourkela	Odisha
24	Saharanpur	Uttar Pradesh
25	Salem	Tamil Nadu
26	Shillong	Meghalaya
27	Shimla	Himachal Pradesh
28	Silvassa	Dadra & Nagar Haveli

29	Solapur	Maharashtra
30	Surat	Gujarat
31	Thane	Maharashtra
32	Tiruchirappalli	Tamil Nadu
33	Tirupati	Andhra Pradesh
34	Tumakuru	Karnataka
35	Udaipur	Rajasthan
36	Vadodara	Gujarat
37	Visakhapatnam	Andhra Pradesh

Development of model for Digital Competitiveness Index of smart cities

Since, as per the literature mentioned above, digital competitiveness is defined as the extent to which digital technology is used in the governance and citizen services of smart cities, this concept is used for defining digital competitiveness index of smart cities in India as the ratio of number of dimensions in which the digital services are provided to the total dimensions, which is 8. In case partial services are offered under some dimension, it will be considered as 50%.

Thus,

$$\text{Digital Competitiveness Index of a smart city (\%)} = \frac{(N1+0.5N2)100}{8}$$

where N1 = Number of dimensions in which digital technology is used in all services

N2 = Number of dimensions in which digital technology is used in some of the services,
i.e. partial coverage

The Overall digital competitiveness of all cities taken together will also be calculated.

IV. DATA ANALYSIS AND DISCUSSION

State wise distribution of the 37 smart cities selected for data analysis is presented below in Table 3.

Table 3 State wise distribution of Smart Cities

State	Cities
Andhra Pradesh	3
Arunachal Pradesh	1
Bihar	2
Chandigarh	1
Chhattisgarh	2
Dadra & Nagar Haveli	1
Diu	1
Gujarat	4
Haryana	1
Himachal Pradesh	1
Jammu	1
Jharkhand	1
Karnataka	2
Madhya Pradesh	1
Maharashtra	5
Meghalaya	1
New Delhi	1
Odisha	1
Rajasthan	2
Tamil Nadu	3
Uttar Pradesh	2
Grand Total	37

It may be observed that 21 out of 29 states have been covered in the study sample, which may be considered as reasonably representative sample for the country.

Now the availability of digital technology for each of the 8 dimensions is presented below:

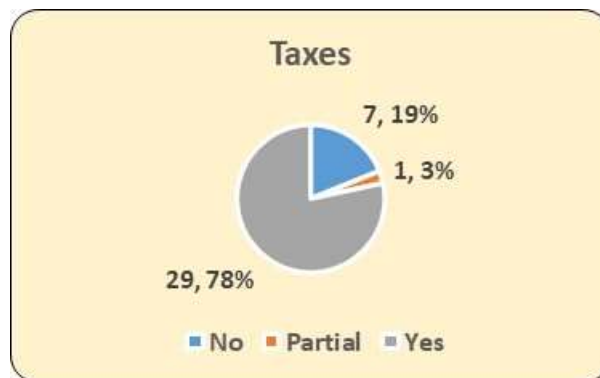


Fig. 1 Dimension 1: Online Payment of taxes (property / water)

It may be seen that 78% of the cities are providing the facility of online payment or taxes, and 3% (1 city) is providing the facility for one of these taxes.

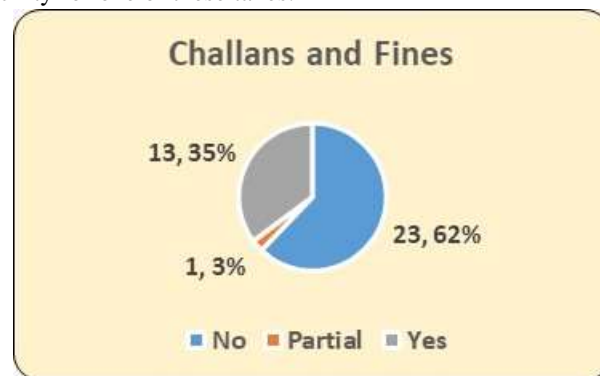


Fig. 2 Dimension 2: Online Payment against traffic violations (challans, fines, etc.)

Only 35% of the smart cities are allowing digital payments of fines and challans, and only 1 city is allowing payment of some of the fines or challans. So, there is still scope for improvement in this area.

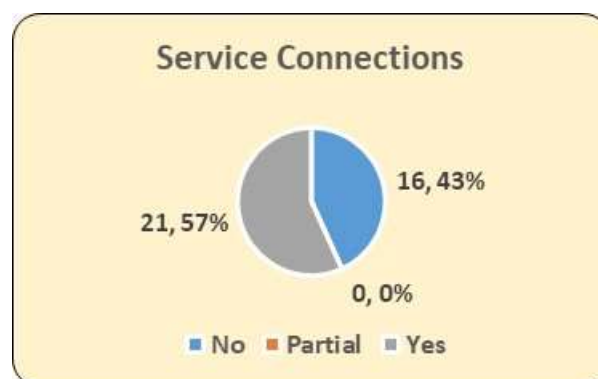


Fig. 3 Dimension 3: Online request for Service Connections (gas, water supply)

It is seen that 57% of the cities are providing digital facility for registration of service connections such as cooking gas and water supply, which indicates that there is considerable scope for improvement here.

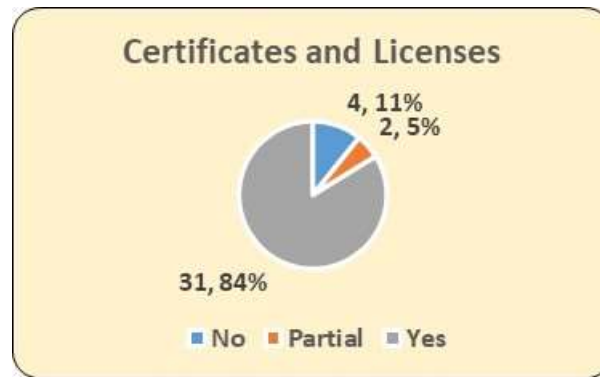


Fig. 4 Dimension 4: Online request for Certificates / Licenses (marriage, driving, birth & death certificates)

It may be seen that almost 89% of the companies are providing digital services for issuing some certificates and/or licenses. So, digital availability is quite good for this dimension.

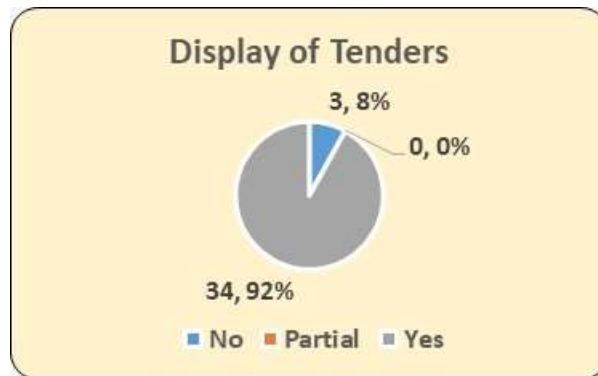


Fig. 5 Dimension 5: Online display of Tenders (for various works) across various departments/ utilities

The facility of online display of tenders is provided by 92% of the smart cities considered in the sample, which is quite a high level of digital availability.



Fig. 6 Dimension 6: Online Grievance management (tracking of complaints)

Like online display of tenders, use of digital technology is also offered by 92% of the smart cities to the citizens for recording and addressing their grievances and complaints.

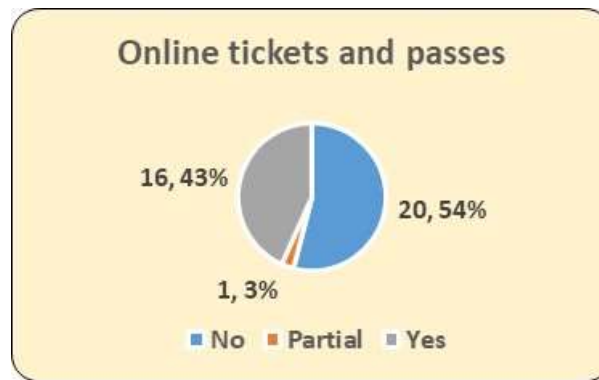


Fig. 7 Dimension 7: Online buying of Tickets and passes (e.g. public transport, cultural events)

Only 43% of the smart cities are providing the facility for booking online tickets and passes for public transport or cultural events. Thus, there is considerable scope for improvement in this area.

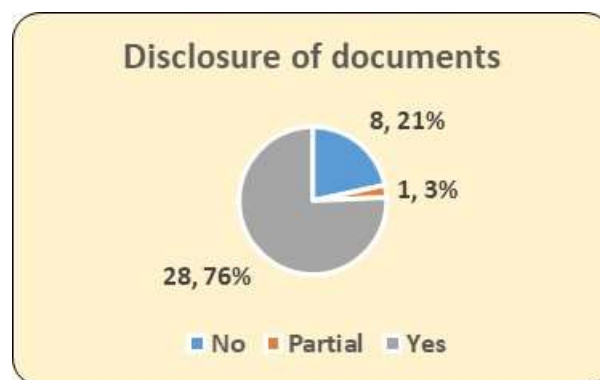


Fig. 8 Dimension 8: Online request of Disclosure of documents (e.g. budgets, plans, RTI requests)

As far as online disclosure or submission of documents is concerned, 76% of the smart cities are allowing this facility to the citizens, while 1 city is providing this facility for some documents. So, the smart cities' performance seems to be reasonably good in this aspect.

The digital competitiveness index for the city and the overall competitiveness index is presented in the table 4 below. The competitiveness index is calculated based on the model explained in this article before.

Table 4 Digital Competitiveness Index of Smart Cities

Sr.No.	City	State	No. of Services offered	Services not offered	Services partially offered	Digital Competitiveness Index
1	Ahmedabad	Gujarat	3	5	0	37.5%
2	Aurangabad	Maharashtra	5	3	0	62.5%
3	Bilaspur	Chhattisgarh	6	2	0	75.0%
4	Chandigarh	Chandigarh	4	2	2	62.5%
5	Chennai	Tamil Nadu	4	4	0	50.0%
6	Dahod	Gujarat	0	8	0	0.0%
7	Diu	Diu	4	4	0	50.0%
8	Faridabad	Haryana	8	0	0	100.0%
9	Gwalior	Madhya Pradesh	8	0	0	100.0%
10	Itanagar	Arunachal Pradesh	4	4	0	50.0%
11	Jammu	Jammu	4	4	0	50.0%

12	Kakinada	Andhra Pradesh	8	0	0	100.0%
13	Kanpur	Uttar Pradesh	7	1	0	87.5%
14	Kota	Rajasthan	5	3	0	62.5%
15	Mangaluru	Karnataka	6	2	0	75.0%
16	Muzaffarpur	Bihar	6	2	0	75.0%
17	Nashik	Maharashtra	7	1	0	87.5%
18	New Delhi	New Delhi	5	2	1	68.8%
19	Patna	Bihar	5	3	0	62.5%
20	Pune	Maharashtra	6	2	0	75.0%
21	Atalnagar	Chattisgarh	5	3	0	62.5%
22	Ranchi	Jharkhand	8	0	0	100.0%
23	Rourkela	Odisha	3	4	1	43.8%
24	Saharanpur	Uttar Pradesh	6	2	0	75.0%
25	Salem	Tamil Nadu	7	1	0	87.5%
26	Shillong	Meghalaya	2	6	0	25.0%
27	Shimla	Himachal Pradesh	8	0	0	100.0%
28	Silvassa	Dadra & Nagar Haveli	2	6	0	25.0%
29	Solapur	Maharashtra	7	1	0	87.5%
30	Surat	Gujarat	8	0	0	100.0%
31	Thane	Maharashtra	5	1	2	75.0%
32	Tiruchirappalli	Tamil Nadu	8	0	0	100.0%
33	Tirupati	Andhra Pradesh	8	0	0	100.0%
34	Tumakuru	Karnataka	5	3	0	62.5%
35	Udaipur	Rajasthan	6	2	0	75.0%
36	Vadodara	Gujarat	5	3	0	62.5%
37	Visakhapatnam	Andhra Pradesh	8	0	0	100.0%
Overall			206	84	6	70.6%

It is observed that out of 37 smart cities there are 9 cities (24%) that are offering 100% digital services in all the 8 dimensions, 30% of the cities are offering digital services for 75% to 99% dimensions, 32% of them are offering services for 50% to 75% of the dimensions and remaining 14% cities are offering services for below 50% of dimensions. Overall digital competitiveness of the 37 smart cities is currently 70.6%.

The above analysis shows that the Indian smart cities have currently reached a reasonable level of digital competitiveness, however, there is a scope for improvement in some dimensions such as online payment of challans and fines. So also, there are 14% cities who are offering less than 50% of services in digital format, which means there is a considerable challenge for these cities to reach a satisfactory level. In view of the fact that out of 98 smart cities, only 37 cities are reporting the data in the prescribed format, there is a need for establishing the necessary mechanism of data collection and reporting in the remaining cities.

There is scope of further research in this area in terms of refining the competitiveness model by adding more dimensions for measurement and deciding relative importance of each dimension on the basis of their strategic impact. However, it will be necessary to institutionalize the measurement of those additional dimensions as a part of regular monitoring process by the Government.

V. CONCLUSION

In this article, a model for measuring digital competitiveness of smart cities in India is proposed and its implementation is demonstrated for a sample of 37 smart cities out of a total of 98 cities. The digital competitiveness of smart cities was measured on the basis of availability of digital services in 8 dimensions. It was observed that the current level of overall competitiveness of the 37 cities is 70.6%, which may be considered reasonably well. There are 9 smart cities out of 37 which are offering 100% digital services across all the 8

dimensions and there are 5 cities which are offering less than 50% of the services in digital format. There is good potential for extending this research further by refining the model by adding more dimensions and also deciding their relative importance from strategic perspective.

VI. REFERENCES

1. Lixăndroi, D. (2018). Digital Competitiveness Indicators and the E-Government Process in Romania. *Journal of Smart Economic Growth*, 3(2), 107-122.
2. Zuti, B. (2018). Digitalization and regional competitiveness (presentation slides). Available at SSRN 3164113.
3. Zuti, B. (2018). Digitalization, regional competitiveness and the governments of the future. *University of Szeged Doctoral School of Economics Journal*.
4. Veselica, R. (2019). THE IMPACT OF DIGITAL INNOVATION ON NATIONAL COMPETITIVENESS. *Economic and Social Development: Book of Proceedings*, 441-448.
5. Zuti, B. Digitalization and Regional Competitiveness. *University of Szeged Faculty of Economics and Business Administration*, 13-14th April 2018.
6. Salem, F. (2016). A Smart City for Public Value: Digital Transformation through Agile Governance-The Case of Smart Dubai'. *World Government Summit Publications*, Forthcoming.
7. Paskaleva, K. (2013). 3 E-governance as an enabler of the smart city1. *Smart Cities: Governing, modelling and analysing the transition*, 33, Routledge, 22-Aug-2013
8. Jucevičius, R., Patašienė, I., & Patašius, M. (2014). Digital dimension of smart city: critical analysis. *Procedia-Social and Behavioral Sciences*, 156(26), 146-150.
9. Chatterjee, S., & Kar, A. K. (2018). Effects of successful adoption of information technology enabled services in proposed smart cities of India. *Journal of Science and Technology Policy Management*.
10. Ramaswamy, R., & Madakam, S. (2013). The state of art: Smart cities in India: A literature review report. *International Journal of Innovative Research and Development*, II, 12, 115-119.
11. List of Smart Cities in India, Retrieved from <https://india.uitp.org/list-smart-cities-india>
12. News article: PM Modi launches Smart City projects, Retrieved from https://economictimes.indiatimes.com/news/economy/infrastructure/pm-narendra-modi-launches-smart-city-projects/articleshow/52916581.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
13. Open Data Platform: India Smart Cities, Retrieved from <https://smartcities.data.gov.in/cities>
14. The IMD World Digital Competitiveness Ranking (2017), Retrieved from <https://www.imd.org/research-knowledge/articles/the-imd-world-digital-competitiveness-ranking/#:~:text=Digital%20competitiveness%20is%20defined%20as,models%20and%20society%20in%20general.>