Digital Economic and Social Evolution of Tunisia

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Abstract. As we are living in twenty-first century the use of ICT is raised day by day and the internet of things is promoting innovation, raising productivity and increasing economic growth. Having concentrated on the digital revolution and its impact on economic growth (Antón et al., 2015; ECLAC, 2015), this paper aims to evaluate the digital performance of Tunisia in comparison to the European countries (European Commission, 2014). This comparison is important, because it defines Tunisian's performance at a global scale with regards to her digital maturity. Tunisia has the ambition to embrace the digital economy, with the aim of enhancing Tunisia's competitiveness, creating employment and strengthening Tunisia's industrial leadership especially after the spring revolution.

To do so, we have adopt an indicator system in particular the new composite index International Digital Economic and Social Index (I-DESI) introduced by the European Commission in 2016 (European Commission, 2016). This index is covering five principal policy areas which represent more than 28 indicators including overall connectivity, human capital, use of Internet, integration of digital technology and digital public services.

Our findings indicate that Tunisia has a score of 0.39 which shows that Tunisia is digitally poor performed comparing to the average of the EU member states. Identifying the areas requiring priority investments and action in order to create a truly opportunity for Tunisia to track the digital market is one of the main contribution of this paper.

Keywords: I-DESI, Tunisia, digital revolution, economic growth

1 Introduction

The digital technologies help improve the national economic development, the productivity of businesses across all industries and increase quality of life for human beings. However, the challenges of ensuring a successful deployment of future digital infrastructure are just as substantial. In addition, digital technologies are already transforming the essential social services, such as education and healthcare and how people interact with their governments. In addition, the potential for massive improvements in utilitarian universal services such as transportation and energy and power delivery is clear. As technological advances and their applications race forward, they create new needs to be addressed and new issues to be resolved in all markets. The digital economy depends on sufficient infrastructure to carry all that traffic and process all that data. In many geographies and population segments, the business case does not work, despite substantial societal returns. In this context, we deal with the quantitative aspects of digital economy. Firstly, we have to define what we understand the concept of new economy and then we can express its quantitative aspects.

In fact, the digital economy concept was defined by OECD as covering the full range of our economic, social and cultural activities supported by the Internet and the related ICT. However, the digital economy is a generic term used to describe markets that are based on digital technologies. This new economy is a vital sector and an important engine of growth. In particular, the development of mobile devices has greatly expanded the reach of the Internet in society. The internet already plays an indispensable role in the everyday life of billions of people. Yet, while many benefits could have their

biggest impact in emerging markets, these are unfortunately countries where internet penetration and use often lag.

So how we can evaluate the digital economic and social evolution of Tunisia and how it can be a solution for her economic crises?

2 Measurement of the digital economy

Beyond the revolutions of agriculture, industry and information, a multidisciplinary technological revolution seems to be taking place in which the synergy and the mutual advantages between the technologies allow the realization of great advances and new applications and concepts (Antón et *al.*, 2015). Due to the continued development of broadband access networks, the ubiquity of access to multiple devices, cloud computing and the big data, these technologies should change the platform of the world economy by 2020 and represent opportunities for innovation in services and the provision of more developed business models. However, the combinaison of use of the creative innovations emerge in the functioning of firms, facilitating the development of intelligent solutions that can be applied in all economic sectors, such as household automation, creation smart Cities or the industrial Internet. This combination extends beyond businesses and markets- it is also a tool for innovation in the governmental field such as allocation of services and the availability of timely information for making good decision (ECLAC, 2015).

To adapt the concept of the digital economy into a practical measure, some of the studies cluster the ICT-producing sectors together (i.e. those providing the Internet infrastructure) with those using the infrastructure (e.g. Internet services), including sometimes provisions such as the value of electronic commerce of traded goods that are difficult to justify. These measurement problems reflect the conceptual difficulty of clearly separating the numerical dimension of economy from other dimensions (European Commission, 2014).

On the other hand, the accurate measurement of the new economy is crucial in order to understand the diverse dimensions of its impacts on micro and macroeconomic policies.

In addition, the measures assess the relative contributions of various factors to economic growth and evaluate the ways in which technology is transmitted and affected by various industries. Although policy-makers have been aware of the rising economic importance of the Internet, there is no widely accepted method for assigning economic value to the Internet. Decision makers employ data from broadband networks and mobile networks as platforms for innovation and development. Governments are increasingly funding the deployment of broadband, either through direct public investment or through the modification of universal service programs, in order to spread out access since they are aimed as new remedies for achieving economic growth.

Pohjola (2002) has shown that the measurement of the digital economy can be carried out according to three methods, either from the measurement of ICTs as inputs or outputs to production, or by measuring the degrees of use of ICTs or by measuring the size of the Internet.

Otherwise, the OECD (2013) attempts to find new methodologies of measurement for the new economy. One of the main results of this research was that the term "digital economy" refers to different types of quantifiable economic impacts of the Internet which vary in the scope of countries. As a result, the OECD has adopted to measure the direct impact, the dynamic impact and indirect impact of the Internet. The direct impact brings together studies that measure the size of the digital economy expressed as a share of GDP. Studies that follow this approach examine the parts of the economy that are closely related to the Internet. The second approach focuses on the dynamic impact that the Internet could have on industries and on the growth rates of productivity eventually on GDP growth. The field the study of this approach includes the effects that the Internet has on the productivity and profitability of firms. The latest global approach, takes into account the indirect impact of the Internet. Studies within this approach examine the effects of the Internet on economic phenomena such as consumer surplus or how the Internet contributes to welfare gains.

In this perspective, statistical and research institutes have modeled so indicator systems. These indicators are developed by different structures, each using a number of criteria for each type of given indicator. The main purpose of these systems is to find quantitative characteristics for this new economy.

In this study we adopt the International Digital Economy and Social Index (I-DESI) elaborated by the European Commission in 2016 which combine all approaches mentioned previously in order to measure the Tunisian digital economy and its evolution.

3 Methodology

The digital economy is not a typical European phenomenon, but a global one. In order to take advantage of the potential of Europe's digital economy and identify opportunities for improvement, it is important to examine Tunisia's progress towards a digital economy and society compared to the European Union countries. This study enables Tunisia and national policymakers to draw international comparisons regarding the digital performance of others countries. These comparisons are important because they define Tunisian's performance at a global scale with regards to her digital maturity. Tunisia realizes that digital economy may be a solution for the economic crises with the aim of enhancing Tunisian's competitiveness, creating employment and strengthening her industrial leadership.

In fact, Tunisia is a privileged partner of the European Union. It is located in the center of the Mediterranean and therefore has close social and cultural ties and economic cooperation agreements with Europe. Tunisia is the first country in the southern Mediterranean that ratifies the partnership agreement and the free trade agreement with the European Union in 1995. For this reason, we have distinguished in this work, the I-DESI (European Commission, 2016) which makes it possible to compare Tunisia with the countries of the European Union and others at the level of the economic and social numerical evolution.

In this context, we followed the same method of calculating the I-DESI index for the Tunisian context for the year 2015. Thus, the data concern our study were collected from the National Institute of Statistics and from the Ministry of Technology and the Digital Economy.

In fact, the I-DESI is a composite index that evaluates the evolution of five key dimensions of the Digital Economy in EU member states in order to understand what these reforms should address. Each dimension reflects a relevant policy area: Connectivity, Human Capital, Use of Internet (citizens), Integration of Digital Technology (businesses), and Digital Public Services. Each dimension consists of both supply and demand indicators (European Commission, 2016).

To compare the Tunisian digital performance, we have used a sample of 44 countries including 28 ones of EU and others. The I-DESI index has a three-layer structure. Each dimension of the five main dimensions mentioned, is divided in a set of sub-dimensions, which are in turn composed by individual indicators. The I-DESI calculating is based on three steps such standardization (in order to aggregate indicators into the sub-dimensions and main dimensions of the I-DESI, the indicators were normalized), weighting (some dimensions, sub-dimensions and individual indicators are more relevant than others, and for this reason they were given higher weight in the computation of the final index score for each country) and then aggregation (the aggregation of indicators into sub-dimensions, of sub-dimensions into dimensions, and of dimensions into the overall index was performed from the bottom up using simple weighted arithmetic averages) (European Commission, 2015).

Results of the I-DESI are divided in two tiers: Tier-1 includes Japan, Korea, the United States, Norway, Canada, Australia, Iceland and Switzerland. Tier-2 includes Brazil, China, Israel, Mexico, New Zealand, Russia and Turkey, using a smaller set of indicators. The average of the three best performing EU member states (EU28-top) is included in each graph in this paper, as well as the average of the three worst performing EU member states ('EU28-bot'), the overall EU28 average and the country score of the non-EU countries. The values of the I-DESI score range from 0 (worst) to 1

(the best). The main ranking of the Tier-2 countries is identical to that of the Tier-1 countries, which shows that the best European performances are also the leaders on the global digital scene. Tunisia can be compared with the Tier-2 countries of this index since this level includes the Tier-1 countries and other countries outside the EU marked by their lack of data such as the Tunisian case. This allows us to know the main ranking of the I-DESI index of Tunisia for the year 2015.
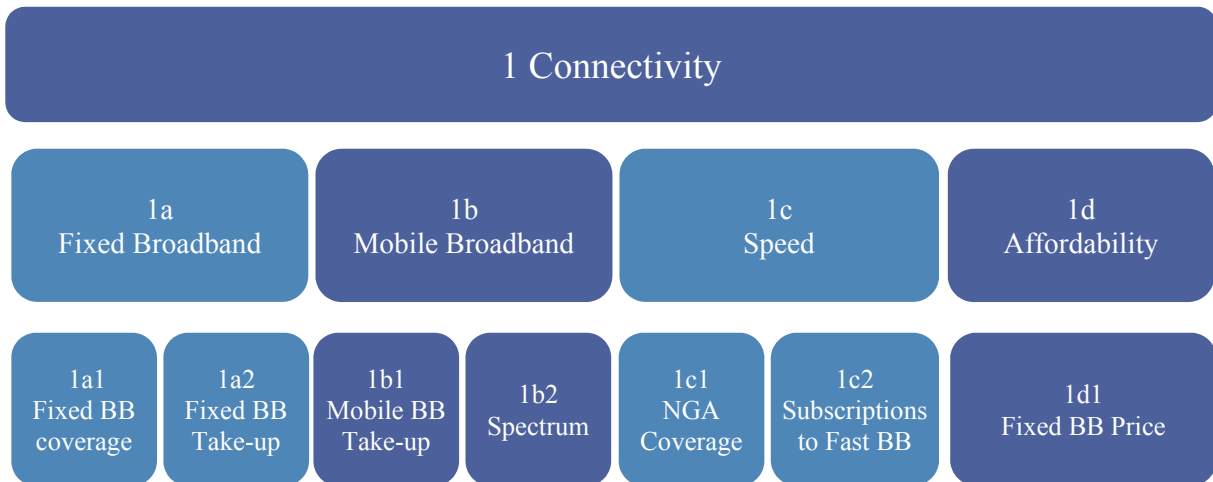
4 Results

The results are elaborated by dimension which allows identifying the situation of Tunisia in each key element of the digital economy.
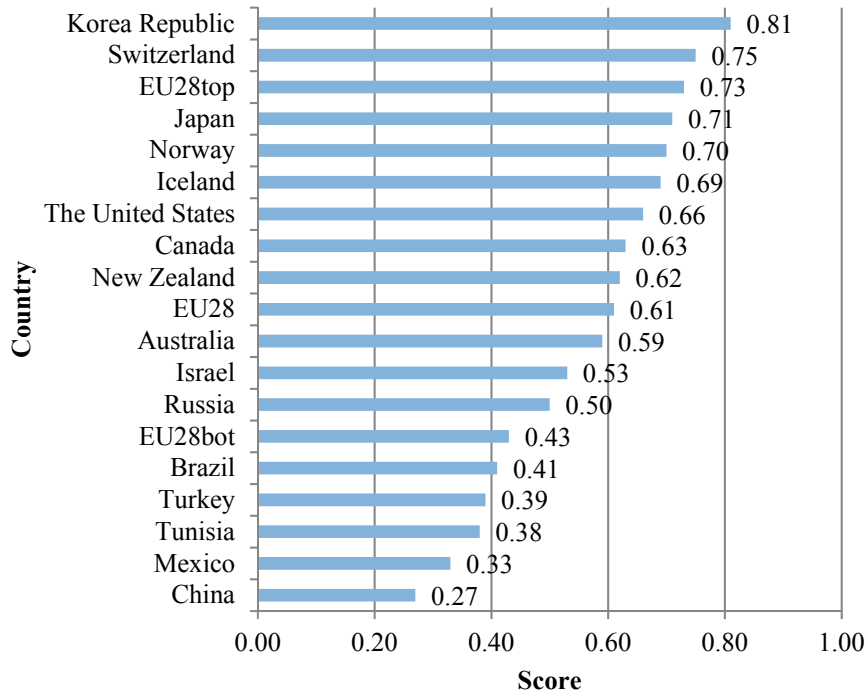
4.1 The connectivity score

A prerequisite for developing a digital society is to have a digital infrastructure in place. Broadband and accessibility of Internet connections are essential to the transition to a digital economy. Indeed, a simple Internet connection is no longer sufficient, a high-speed Internet connection is necessary. The Connectivity dimension is divided into four sub-dimensions, each focusing on a relevant aspect of connectivity to the Internet.

Figure 1: Connectivity dimension

As a result, it is clear from Figure 2 that Korea is ahead of Europe and all other countries in terms of connectivity. Korea is among the most performing countries on all sub-dimensions and excels at the speed of their Internet connections.

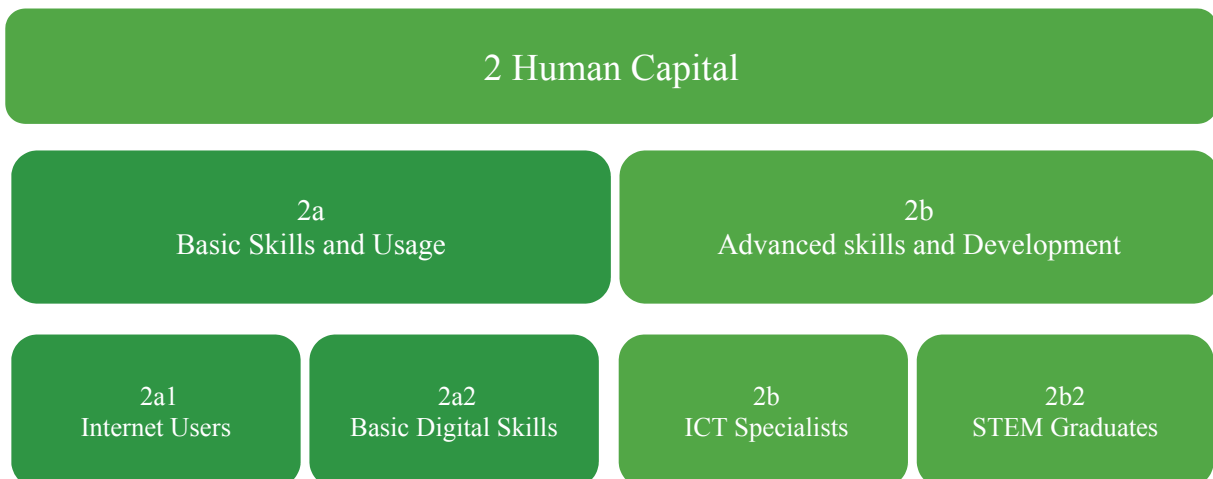Figure 2: Performance of the "Connectivity" dimension by country

The United States and Canada are just above the European average, while the EU is ahead of Australia (EU marking 0.61 and Australia 0.59). Among the poor countries are Brazil (0.41), Turkey (0.39), Mexico (0.38) and especially China (0.27). At the level of this dimension Tunisia marks a too low score of the order of 0.38 comparing by Korea. However, it is too close to Brazil and Turkey and it is at the same level as Mexico.
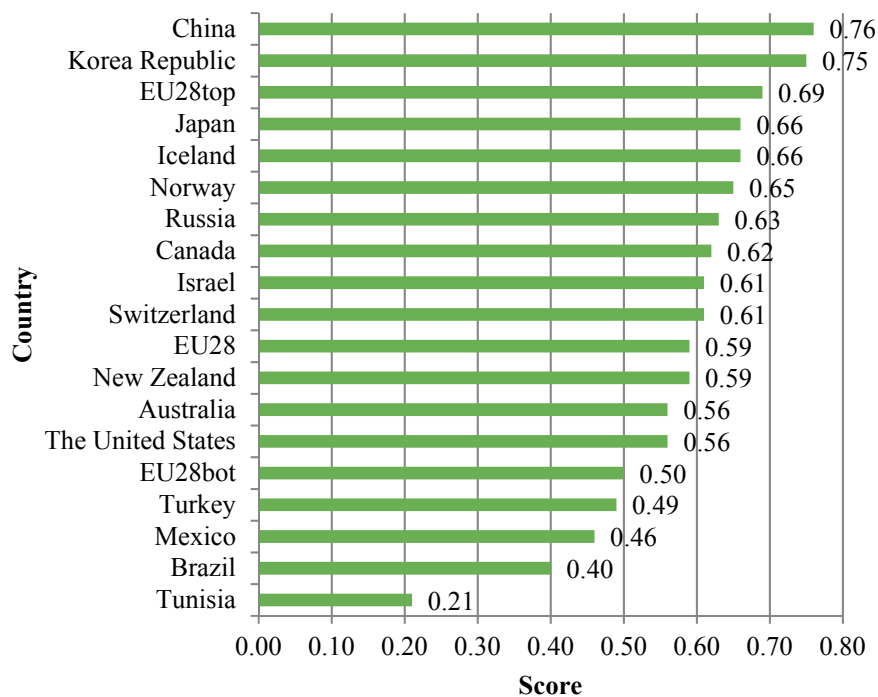
4.2 The human capital score

Physical infrastructure is not the only prerequisite for a digital society. It must be complemented by the knowledge and skills needed to take advantage of the opportunities offered by the Internet and the digital society. The Human Capital dimension is divided into two sub-dimensions.

Figure 3: Human Capital dimension

China (0.76) and Korea (0.75) set the example for human capital followed by Sweden, Finland and the United Kingdom (EU28top) (Figure 4). Although Turkey, Mexico and Brazil lag behind this dimension, they are below the three least performing countries. Concerning Tunisia, it points out a score very far from the three least performing countries even away from Brazil with a score of 0.22. This deficiency is mainly due to the small size of the population.
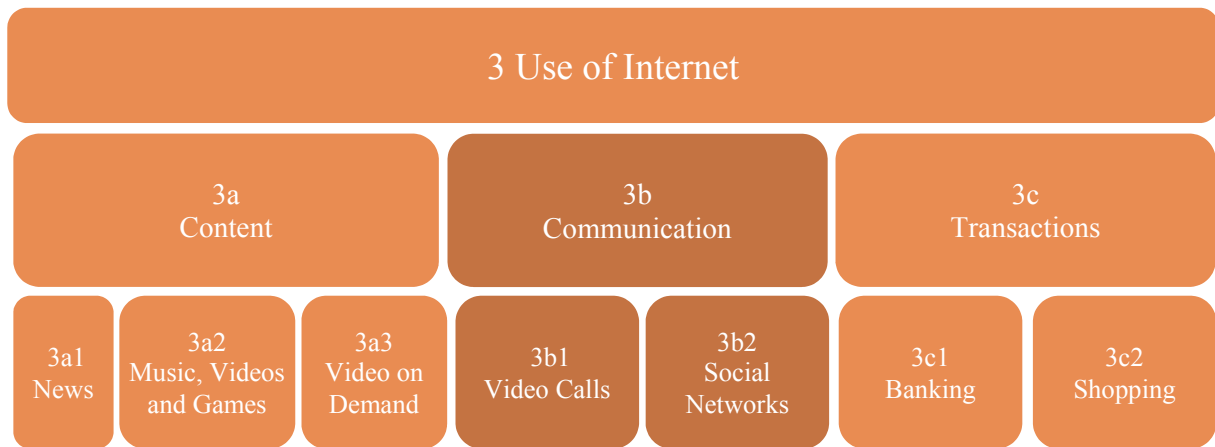
Figure 4: Performance of the "Human Capital" dimension by country

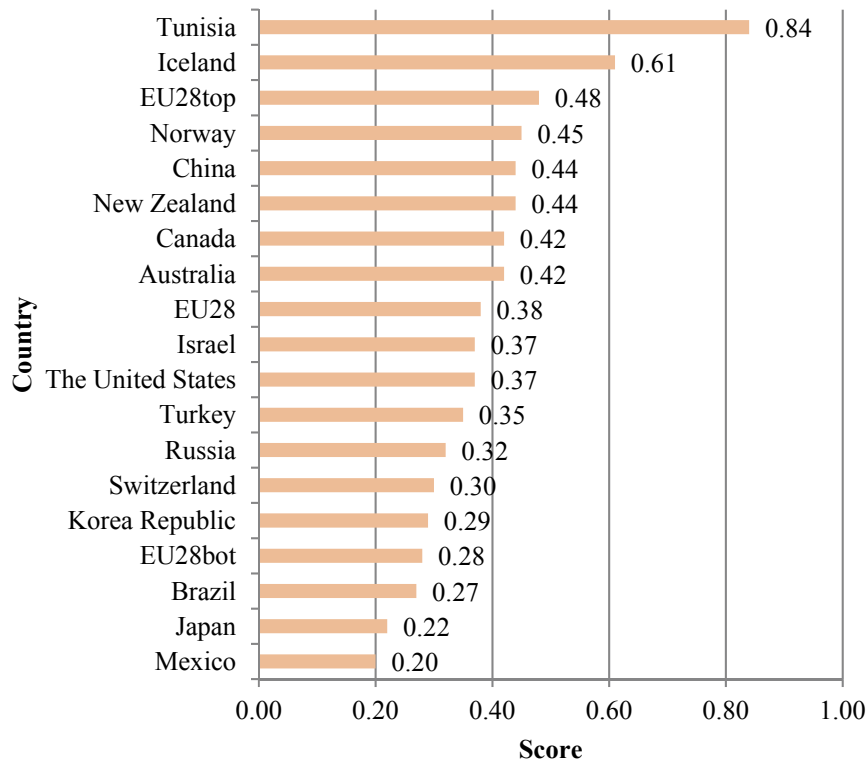*4.3 The score of using the Internet*

With the broadband connectivity provided and the core competencies leveraging this connectivity, a wide range of online activities can be enjoyed by citizens and businesses alike. These elements allow citizens to consume online content such as music, videos, games, online shopping and banking. The Use of Internet dimension is divided into three sub-dimensions.

Figure 5: Use of Internet dimension

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│                        3 Use of Internet                              │
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┌──────────────────────┐  ┌──────────────────────┐  ┌──────────────────────┐
│          3a          │  │          3b          │  │          3c          │
│        Content       │  │     Communication    │  │     Transactions     │
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┌─────┬──────────┬────────┐ ┌──────────┬──────────┐ ┌──────────┬──────────┐
│ 3a1 │   3a2    │  3a3   │ │   3b1    │   3b2    │ │   3c1    │   3c2    │
│News │ Music,   │Video on│ │  Video   │ Social   │ │ Banking  │ Shopping │
│     │ Videos   │ Demand │ │  Calls   │ Networks │ │          │          │
│     │and Games │        │ │          │          │ │          │          │
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On average, the EU is ahead of Korea (Figure 6), Brazil, Russia, Turkey and Mexico in this dimension. In particular, consumption on-line content is relatively low in Korea, however it is striking in Japan. However, Tunisia performs best in the dimension concerning the use of the Internet, which is even higher than the score of the best performing countries in the EU with a score of 0.84. This is always relative to the size of the population. In other words, this score is high for Tunisia because the population is small and the accessibility of mobile phones (in quantity and quality influencing their prices) as well as the important network offers (caused by strong competition from network providers). The content score essentially comes back to the massive use of music, games and demand for videos with low use of content to know the daily news. Concerning communication, social networks penetrate Tunisian society with a utilization rate of 42% for a total of 53% of Tunisian Internet users according to the Tunisian Institute Survey; however, Face book includes 4.6 million following users.
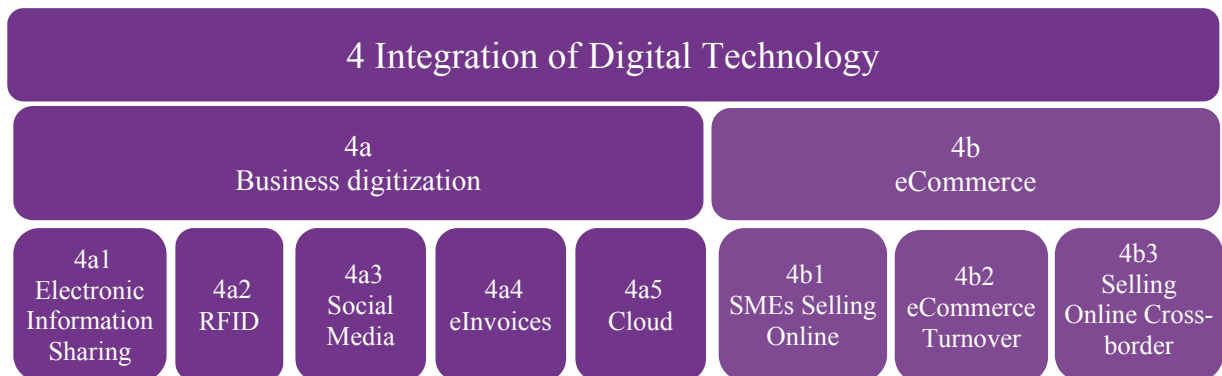
Figure 6: Performance of the "Use of Internet" dimension by country

4.4 The score of the integration of digital technology

The adoption of digital technologies can make a significant contribution to the modernization of companies and then promoting their competitiveness and enhancing economic growth. Therefore, it is important to see how European companies perform better than other major emerging economies and global economies.
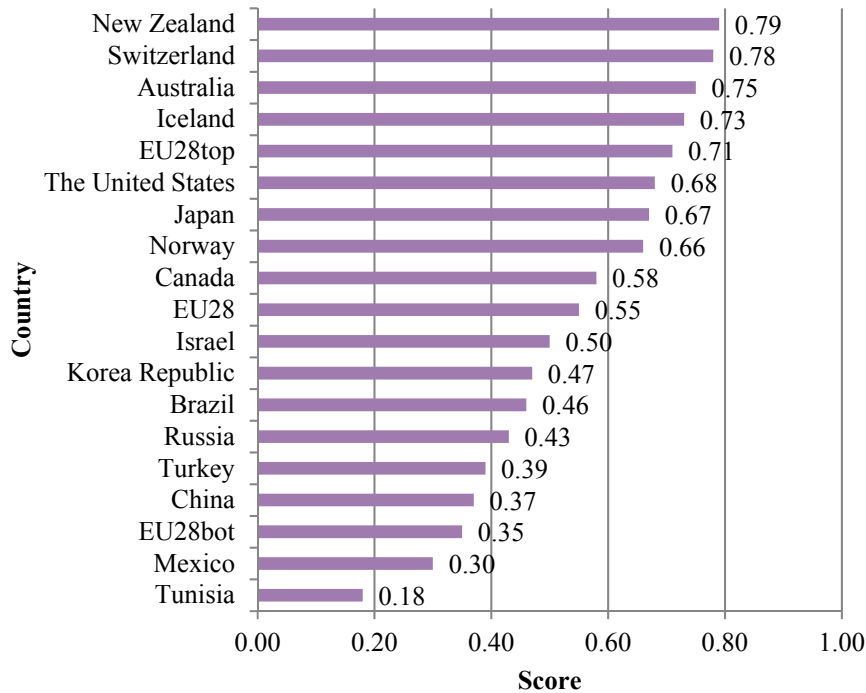
Figure 7: Integration of Digital Technology dimension

At the Tier-2 level, the integration of digital technologies into enterprises is captured by the percentage of businesses with online presence and the percentage of Small to Medium-sized Enterprise that sell online. Turkey and China as shown in Figure 8 are still ranked above the three least performing EU

member states (Romania, Bulgaria and Latvia) while Tunisia is far behind these three countries. This weakness is due to the limited size of companies and a relatively small market of enterprises adopting digital culture as well as the fragility and financial difficulties that prevent them from investing in high-tech innovations and whose profitability is marked by uncertainty.
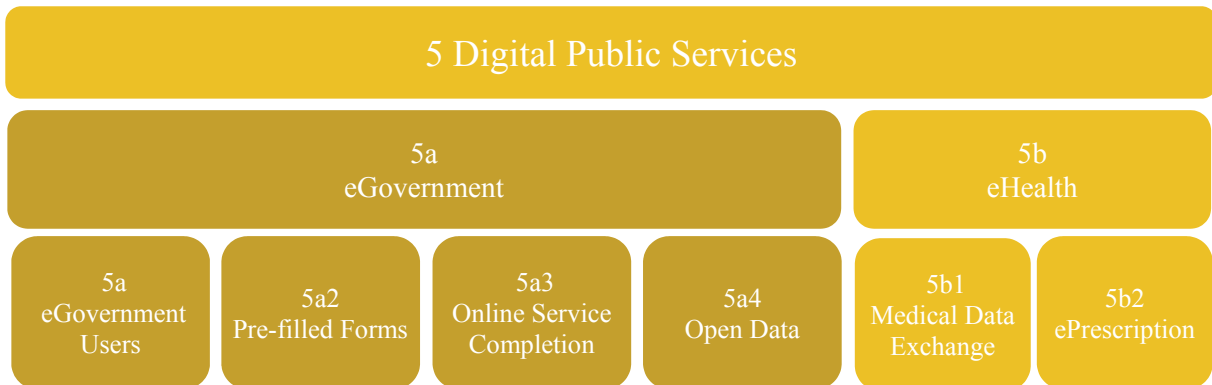
Figure 8: Performance of the "Integration of Digital Technology" dimension by country

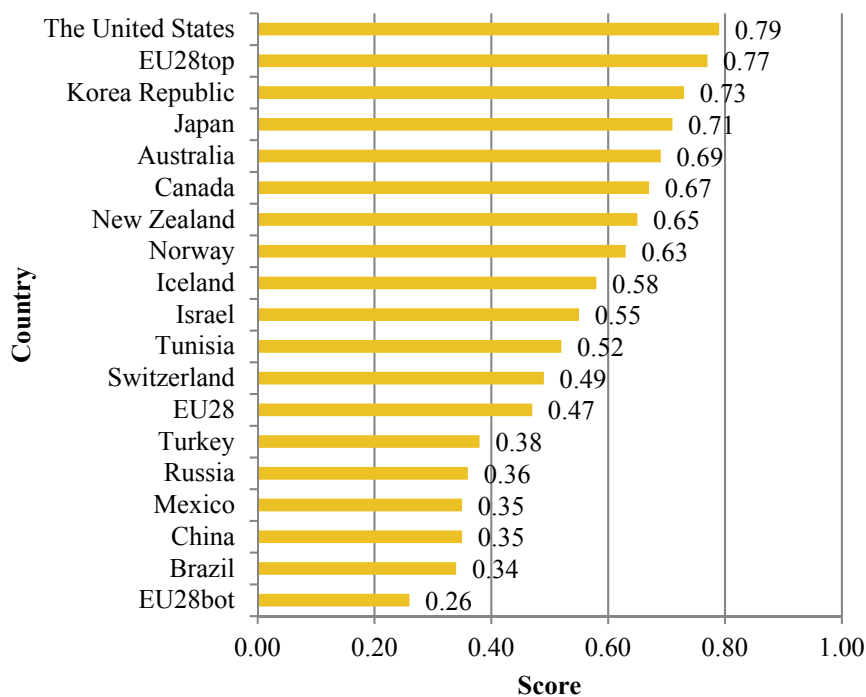### 4.5 The score of digital public services

The interaction of business and citizens with the public sector can be improved and made much more efficient through the use of digital technologies. These efficiencies are realized both on the public administration side and on the commercial side. Consequently, efficient delivery of public services enhances Tunisia's competitiveness, while at the same time achieving significant cost reductions.

Figure 9: Digital Public Services

Tunisia performs well in this dimension with a score (0.52) that exceeds the EU average (0.47) as indicated in figure 10. The increase in adoption of e-government could be explained by the perceived administrative delivery of adoption of e-government services, the political nature of online applications, the government's organizational capacity in adoption new information technology and the effect of the diffusion of E-government service technology. According to the UN E-Government Survey in 2014, Africa is headed by Tunisia which has shown enormous progress since 2012, Tunisia has climbed 28 places and it is now ranked 75 comparing globally at 103 in 2012.

Figure 10: Performance of the "Digital Public Services" dimension by country

In sum, Tunisia is said poorly performed in the digital world by achieving a score of 0.39 which is lower than the score of the three least performing countries in the EU such Romania, Bulgaria and Poland. However, Tunisia's results are close to those of Turkey and superior to the scores of Mexico and Brazil. After identifying the areas requiring the priority investments and action in order to create a truly opportunity for Tunisia to track the digital market, it is necessary that the government starts to interfere and propose some action in this context.

5 The public intervention in the Tunisian economy

The ICT sector in Tunisia is still characterized by a restricted local market, a weak culture of sharing the information technologies accepted by economic agents, and the financial fragility and difficulties of small businesses alongside other shortcomings which requires adequate public policy while making. Thus, the national ICT strategy is defined under the project "Smart Tunisia 2018" which has a vision for Tunisia to become an international digital reference and make ICTs an important tool for socio-economic development. The project "Smart Tunisia" as part of a Public-Private Partnership, responds

to the revitalization of off-shoring through the provision of incentive mechanisms. In order to converge demand and supply labour.

However, in order to ensure the transition to a digital Tunisia according to our results found by the calculation of I-DESI and from the strategic axes proposed by the national project "Smart Tunisia 2018", several approaches are proposed:

- Ensure social inclusion and reduce the digital divide through better access to information and knowledge, democratization of access to infrastructure and to the broadband. This implies a civil society which is towards a knowledge society and the increasing adoption of modern technologies, especially since Tunisia scores has very low score of connectivity compared to the least performing country in this dimension.
- Implement digital culture through the widespread use of ICTs in curriculum and digitalization of content, though the Internet use dimension has the highest score in the I-DESI. This does not reflect a good result as this increase is due to the excessive access to social networks and online gaming and other leisure networks rather than to more profitable goals.
- Having digital government at the service that is fair, transparent, agile and effective for the citizens. Thus, e-government has several advantages such as improving efficient services to businesses and individuals, and having more transparent government administration with low taxes for its payers.
- Improving the competitiveness of the company in all sectors through investment in ICTs and positioning in the digital economy. To do so, the Tunisian state has allocated for the five years, a budget equivalent to 500 Million Euro as incentives, to support international and local operators in their growth and development strategies of their activities.
- Infrastructure development through the provision of high-speed network, facilitating the access of businesses and citizens to these networks and the opportunity of potential business to information services (government and others) through facilitating the ownership of computers.

6 Conclusion

The I-DESI allow to analyze how Tunisia is progressing in its digital development and figure out the potential steps to help improve national digital performance and remove obstacles which prevent her to make the most of digital opportunities (United Nations, 2014).

Tunisia is rated low performing in terms of the digital evolution comparing to the EU countries.

This is mainly due to the infrastructure and provision of existing electronic services by governments and also to the structural problems related to institutional, cultural and economic factors. Perceptions and utility of services provided by government websites and their consistency with the needs of individual users, which are influenced by age and life cycle factors, are also key elements. The ease of access and use of a website appear to be strategic factors in promoting the use and satisfaction of potential users. For this, governments are reluctant to take hardy steps to foster the necessary environment for the development of the ICT industry due to many concerns.

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