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# Digital, social, and human development sustainability, and well-being

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## Abstract

The paper focuses on how the digital revolution affects the EU27 countries. We have examined the Digital Economy and Society Index and its relationship with economic and sustainable development indicators to capture the impact of digital development in the past six years. Some researchers are sceptical, about whether digitalization has positive, or negative effects on the economy and sustainability. We wanted to contribute to this debate by examining related indicators. Our findings show that digitalization has a strong correlation with the main economic indicators, however, does not contribute to a sustainable economic and social environment in a 6 years' timeframe.

Keywords: economic development, Digital and Society Development Index, DESI, sustainability, well-being

## Introduction

Digitalization cannot solve sustainable development goals on its own. Our findings show that a longer time is needed than just a governmental cycle to reach a higher level of sustainable economic development level. On the other hand, the more a country's economic development, the more its digital development. The value of our research could be useful for policymakers. A one-time investment in digitalization could not solve both social and economic problems. Policymakers and government officials should concern about focusing on a long-term economic and digitalization development plan, which could contribute not just to economic development, but also to the well-being of the inhabitants.

## Literature review

*Digitalization, quality of life and well-being*

Digitalization itself does not directly affect quality of life and purchasing power, but digital technologies stimulate innovation (Falk & Biagi 2015); moreover, the integration of digital technologies into the operation of companies improves productivity. Entrepreneurial managers (Hortoványi 2012) are making a number of new digital products and services available to a wide range of consumers that improve their quality of life and purchasing power. Quality of life and purchasing power can also be improved by creating new jobs, but it is important that if this is the case ('growth model'), it only can be sustainable if it is employment-intensive (Georgescu & Herman 2019). On one hand, digitalization brings about a higher standard of living, but on the other hand, a higher standard of living enables to achieve a higher digitalization level by meeting rich customer's higher expectations (Hecht 2018). This could lead to a vicious spiral, where the rich become even richer.

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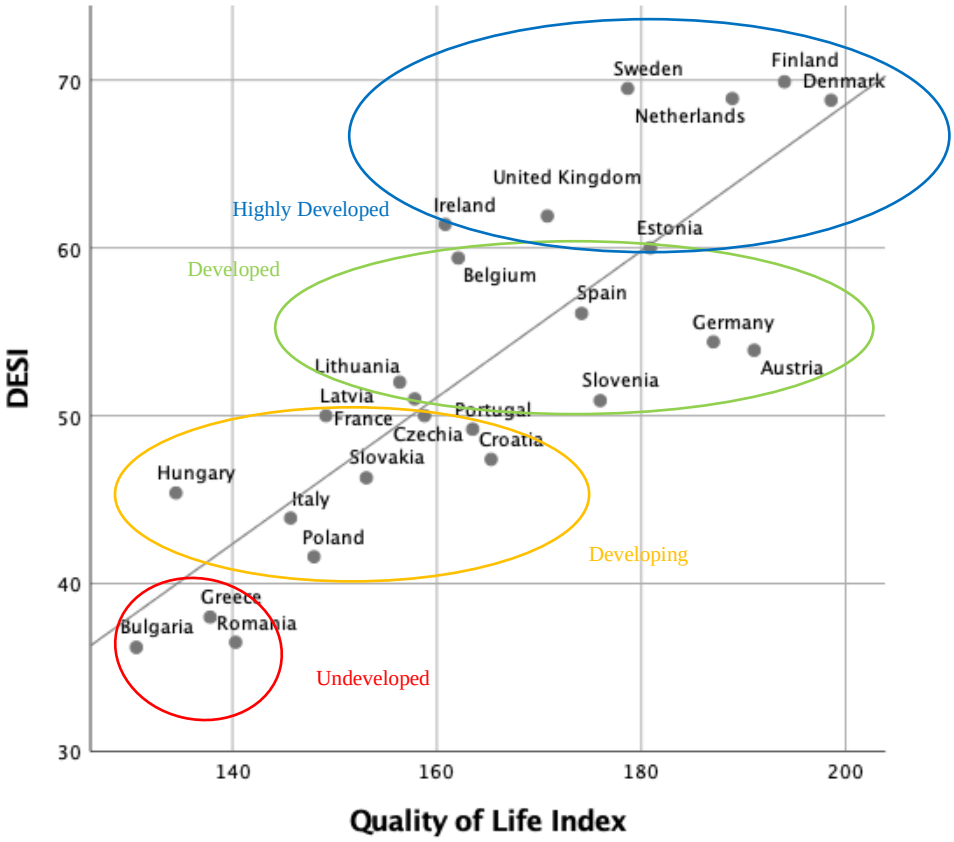
In their study, Nevado-Peña et al. (2019) discovered a clear link between the assessment of the quality of life of the inhabitants of a given country and the technological characteristics of the affected (geographical) area. Niebel (2018) also suggests that economic development strongly correlated with digitalisation (ICT usage). Accordingly, the life satisfaction rate increases in parallel with the achievement of different technologies and higher levels of ICT readiness. Citizens living in cities with higher ICT capacity or a high uptake of digital solutions are more in need of sustainable and inclusive economic growth. Finally, the use of ICT by technology users leads to a better assessment of the efficiency and governance of public administration, emphasizing the importance of understanding between users and public services in the virtual sphere. However, Pozdnyakova et al. (2019) see a further restructuring in employment. From their perspective Industry 4.0 ends up in further (specialist) job losses due to the machine-induced reduction in human participation in production.

## Research results and methods

### Connection between digitalization and the main economic indicators

In the following, I will present the connection between the level of ditalization and social welfare, using data of the EU member countries. The results are represented in a scatterplot diagram with regression lines. I used this kind of method in order to capture how “digitalization affect each country’s economy in different ways. In other terms, I am observing whether digitalization (DESI) can be an explanatory variable, if digitalization can truly enhance the changes in each economy. For demonstrating the results simply, I only observed data from 2019. In my future research path I am planning to do a more widespread (involving more variables, involving time series) research concerning the ‘digitalization-effect’.

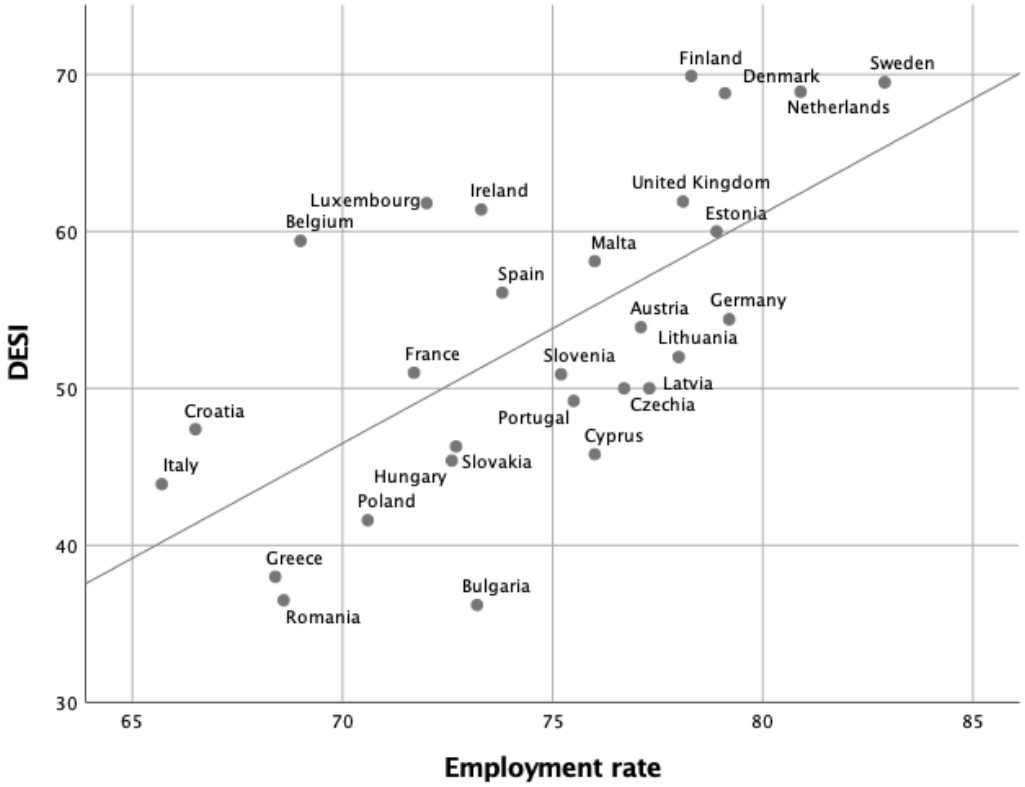
Figure 1. Scatterplot of DESI and Quality of Life




Source. Own calculations based on data from Eurostat and Numbeo (2019).

The scatterplot analysis of digital development (2019) and quality of life (2019) clearly shows that the observed countries show (the regression fit line) a strong relationship ($R^2 = 0.7$) ( (Figure 1.). In order of consistency, I have created four categories for the examined countries based on their digital development (DESI) values. These are groups of “undeveloped” (from 30 to 40), “developing” (from 41 to 50), “developed” (from 51 to 60) and “highly-developed” (from 61 to 70+) countries.

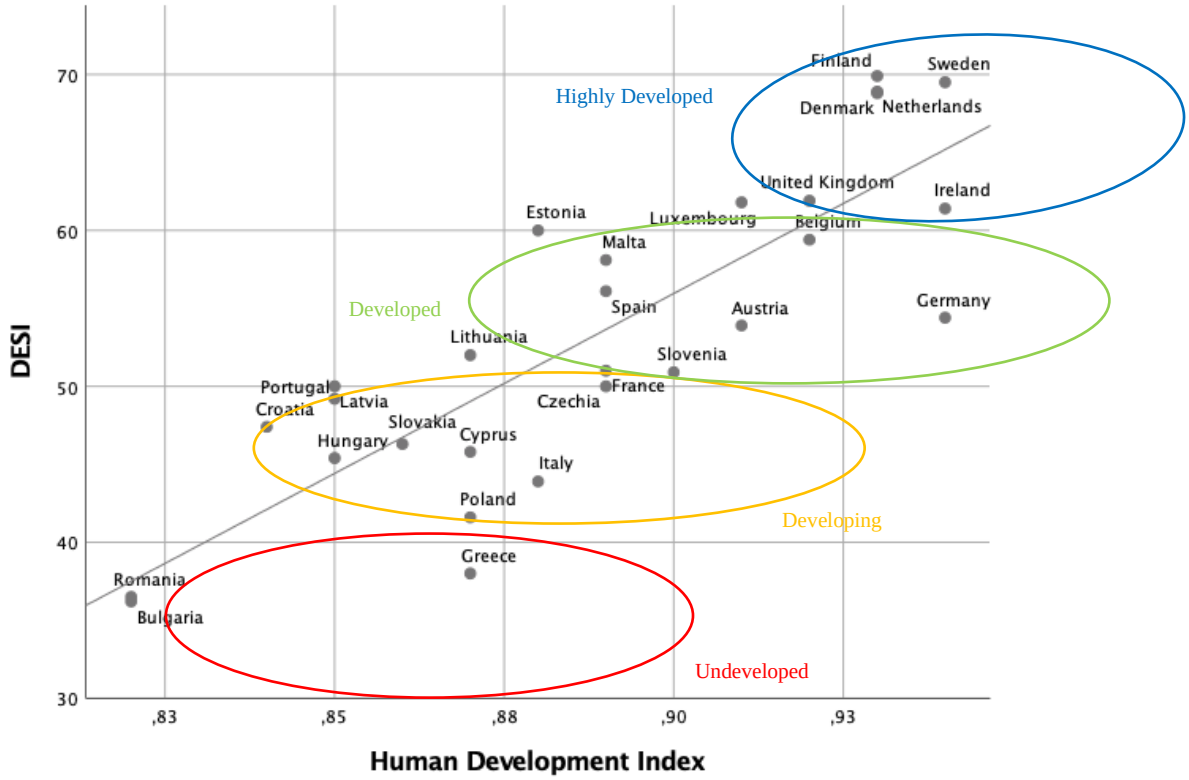
Figure 2. Scatterplot of DESI and Employment rate




Source. Own calculations based on data from Eurostat (2019)

The employment rate (2019) and digital development (2019) also show strong correlation ($R^2 = 0.424$) (Figure 2.). In terms of digital development and employment rate, less-developed countries can be distinguished. This is true for both the group of high and low development countries. Regarding digital development (thus indirectly productivity) and employment issues, Király and Köves (2015) states in their book review that technological development reduces employment only temporarily, but later, as a result of these processes, the employment rate not only returns to its original level but exceeds. Furthermore, they see a strong link between advances in digitisation processes (robotics and possession of different technologies) and growing disparities in economic development. Losonci et al (2019) also strongly related to this train of thought. They highlight the importance of the integration of individual companies into international knowledge-transfer, the digital development it brings, and the resulting improvement in labour productivity. Concerning the two observed variables, the Nordic countries (Netherlands, Denmark, Sweden, Denmark, Finland, Ireland) has also performed well. Countries with a significant share of gross domestic production from tourism showed lower values in both digital and employment terms. This is partly due to the fact that these countries have less strict rules on the provision of statistics and as mentioned earlier, the problem of employment statistics. Bulgaria is also one of the countries with low digital development, but it can still show a high(er) employment rate.

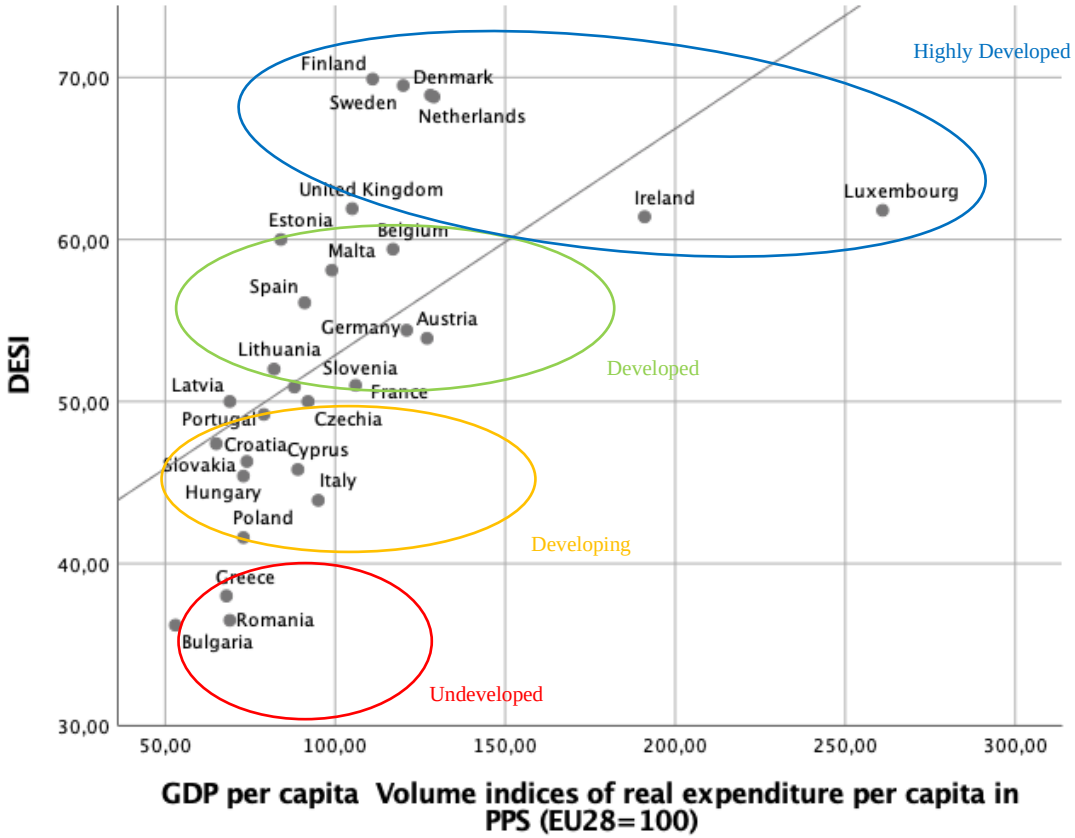
Figure 3. Scatterplot of DESI and Human Development




Source. Own calculations based on data from Eurostat (2019) and The United Nations (2019).

Human development and digital development also show a strong correlation ($R^2$ = 0.701) (Figure 3.). Although digitalization leads to higher productivity, it can eliminate existing jobs according to Csoma (2018) but also transform them. Digitalisation can create higher added value, new jobs and help create new positions, which can also support economic recovery. At the same time, there is a danger that the competitiveness of less developed countries may deteriorate further, and the development gap may widen further. This is partly due to the fact that less developed countries (in many cases) can only gain additional working capital inflows through lower wages, and consequently one of the keys to economic development. Undeveloped countries include Romania, Bulgaria and Greece, which performed poorly on both variables examined. The 'developing' group consists of, Slovenia Croatia, Hungary, Slovakia, Latvia, Portugal, Poland, Italy, Cyprus, Slovakia, and the Czech Republic. Developed countries include Austria, Malta, France, Spain, Lithuania, Slovenia, Belgium, Germany and Estonia. The highly developed group consists mainly of Nordic countries (Finland, Denmark, Sweden, the Netherlands) and the United Kingdom and Ireland.

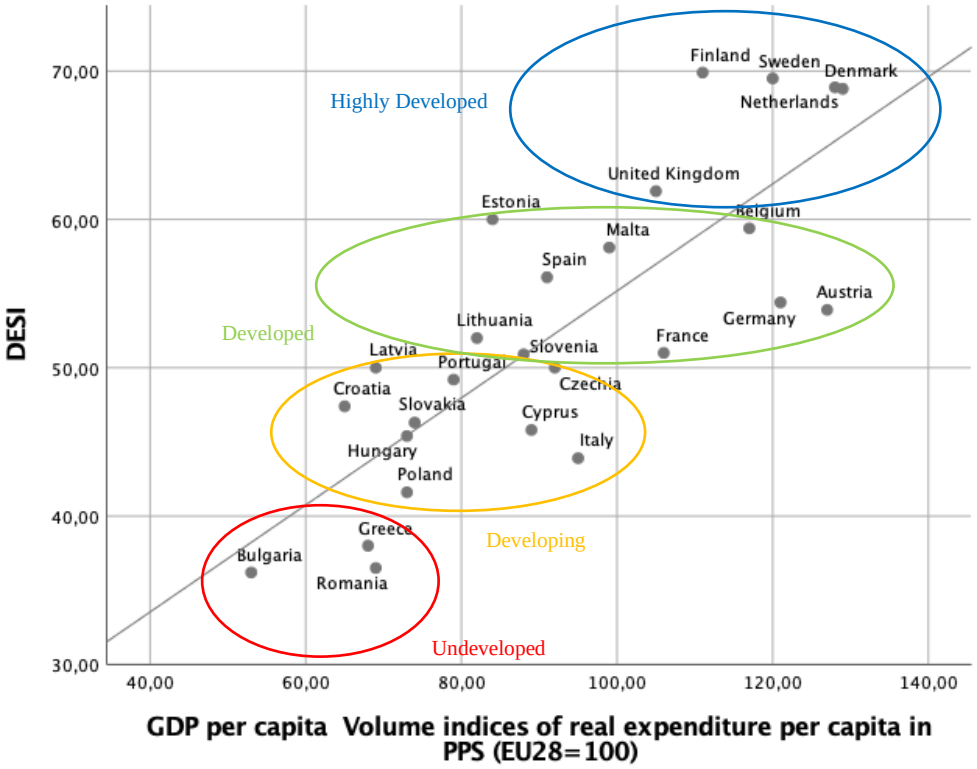
Figure 4. Scatterplot of DESI and GDP per capita (PPP)




*Source*. Own calculations based on data from Eurostat (2019).

There is a moderately strong correlation between digital development and GDP per capita (0.354) (Figure 4.). In this case, different groups can also be distinguished when examining the variables. The Nordic countries (Finland, Denmark, Sweden and the Netherlands) clearly create a separate group with inclusion of the UK, Ireland and Luxemburg. Developed countries include Estonia, Malta, Belgium Lithuania, Spain, Austria, Germany, Slovenia, and France where digital development is lower than in the previous group, but in terms of GDP per capita are more developed. Other EU countries are mostly on (or close to) the trend line, with lower values for both indicators. The standard deviation of the two variables examined shows that Luxembourg and Ireland are outliers (due to their extremely high level of GDP per capita), distorting the results (correlation). Therefore, I have also performed an analysis omitting these countries.

Figure 5. Scatterplot of DESI and GDP per capita (PPP)[14]




*Source*. Own calculations based on date from Eurostat (2019).

Excluding Luxembourg and Ireland as an (outlier) country (Figure 5.), the scatterplot has changed significantly. Most of the EU28 countries fits the trend line. With the exclusion of Luxembourg and Ireland, the correlation index also rose from 0.354 to 0.64 (Figure 5.).

**Digitalization and SDG goal results**

We have also observed the 17 SDG goals of EU compared to DESI (Digital and Society Development Index). We wanted to find out, what connection is between digital development and the different sustainability figures. We have examined the development of DESI and the different SDG goal scores.

We can conclude that there is a strong correlation between digital development (DESI), social welfare, and sustainability.

[14] Without Luxemburg and Ireland.

Table 1. The relationship between Digital Economy and Society Index (DESI) and SDG components

| | | DESI_21_16 |
|---|---|---|
| DESI_21_16 | Pearson Correlation | 1 |
| | Sig. (2-tailed) | |
| | N | 27 |
| no poverty | Pearson Correlation | .635** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |
| zero hunger | Pearson Correlation | .407* |
| | Sig. (2-tailed) | .035 |
| | N | 27 |
| good helath and well-being status | Pearson Correlation | .778** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |
| quality education status | Pearson Correlation | .732** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |
| gender equality | Pearson Correlation | .442* |
| | Sig. (2-tailed) | .021 |
| | N | 27 |
| clear water and sanitation | Pearson Correlation | .509* |
| | Sig. (2-tailed) | .044 |
| | N | 16 |
| affordable and clean energy | Pearson Correlation | .107 |
| | Sig. (2-tailed) | .596 |
| | N | 27 |
| decent work and economic growth status | Pearson Correlation | .627** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |

| | | |
|---|---|---|
| industry, innovation and innovation status | Pearson Correlation | .750** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |
| reduced inequalities | Pearson Correlation | .299 |
| | Sig. (2-tailed) | .146 |
| | N | 25 |
| sustainable cities and communities | Pearson Correlation | .613** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |
| responsible consumption and production | Pearson Correlation | .681** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |
| climate action | Pearson Correlation | .335 |
| | Sig. (2-tailed) | .095 |
| | N | 26 |
| life below water | Pearson Correlation | .c |
| | Sig. (2-tailed) | . |
| | N | 0 |
| life on land | Pearson Correlation | .038 |
| | Sig. (2-tailed) | .878 |
| | N | 19 |
| peace justice and strong institutions | Pearson Correlation | .683** |
| | Sig. (2-tailed) | <.001 |
| | N | 27 |
| partnership for the goals | Pearson Correlation | .068 |
| | Sig. (2-tailed) | .735 |
| | N | 27 |

Source: Eurostat

## Conclusions

We can see from the scatter-plot figure, that there is a strong linear correlation between social welfare and digitalization, however there is also a strong connection between quality of life and digital development. From this perspective, we have started to investigate further these connections, therefore, we moved further through the EU sustainability (SDG) goals.

Most of the 17 SDG goals have a strong correlation with DESI. We can conclude the following from the correlation table:

1. The more digitalized each country is, the least poverty can be seen there.

2. The more digitalized each country is, the better its inhabitants' health and well-being.
3. The higher digitalization development is achieved, the higher is each country's workers decency, and the higher is their economic growth status.
4. The higher digitalization development is achieved by a country, it is more innovative and can provide a more sustainable economy.
5. The more digitalized each country is, the more responsible of its inhabitant's consumption is.
6. The more digitalized each country is, the more its legal development is.

Also, it is important to mention that digital development has its barriers, it does not solve everything at once. From the time series data, we can state two things:

1. Digitalization and sustainability do go together hand-in-hand, but it takes a long time to show its effects on each economy.
2. Therefore, we would recommend policymakers to consider and develop a long-term digital development policy, because it takes a long time, to see the investment and afterwards the first steps.

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