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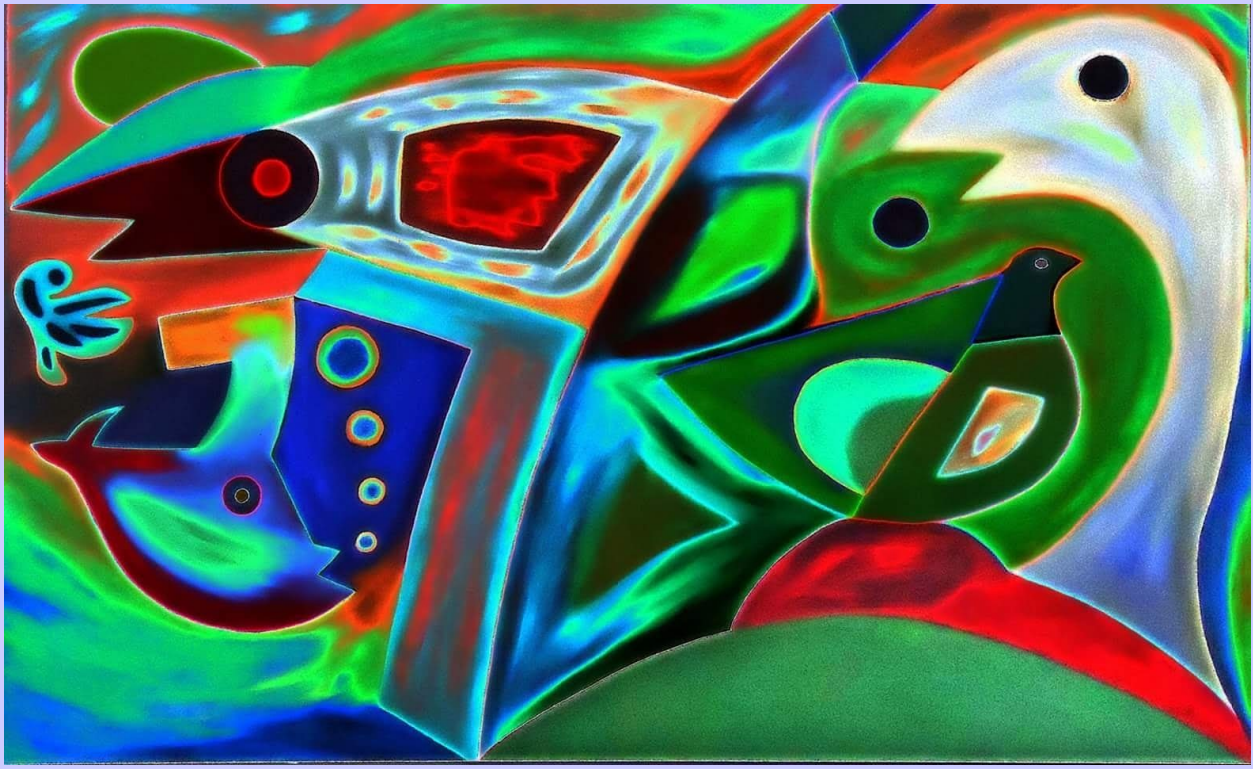

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CONTENTS

The Current Landscape of Digital Transformation. An Overview, and Prospects in Romania

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Abstract. Many scientific papers, articles, and books related to digitization, digitalization, and digital transformation have been published, and many issues are defined, researched, and discussed for two decades already worldwide, yet with timid application in real life. However, the digital transformation process in many countries has been significantly accelerated by the Covid-19 difficult situations due to social distance restrictions, and especially the lockdowns imposed by governments. The paper summarizes the roadmap to digital transformation in 193 countries according to EGDI (United Nations E-Government Development Index), the EU's main areas for multi-projects, and Romania's e-Government and e-Business current situation. There are also presented a number of examples of successful e-Government and e-Business projects in Romania.

Keywords: public sectors, digitalisation, e-business, e-government, digitization, digital transformation.

1. About Digital Transformation

1.1. Digitization, digitalization and digital transformation

The digitization is the process of transforming information from a physical format (analogue data, such as images, video, text) to a digital version, while the digitalization is the practice of utilizing technology to enhance one organization processes [1] Therefore, digitization relates to information, whereas digitalization relates to the internal optimization of processes, such as work automation with the aim to improve business and the general well-being of people [2]. Tilson et al. define digitalisation as "*the socio-technical process of applying digitizing techniques to broader social and institutional contexts that render digital technologies infrastructural*" [3].

The main goal of digitization is to make information more easily accessible, storable, maintained, and transferred. Organizations can only increase their business operations efficiency and automate their day-to-day activities through digitalization [4]. These two conceptual meanings of digitization (digitization) and digitalization (digitalisation) are closely linked and often used interchangeably across a wide range of literature.

Although discussions regarding digitalisation (directions, areas to be developed, benefits and drawbacks as well as its consequences for labor markets and working conditions) has been debated for many years in media, the politics and research last for more than two decades, the literature has been intensified in recent years.

At the same time, the literature addressed many aspects of the digitalisation process in many countries, including the way that digitalisation accelerates now job loss and change of work procedures [5-8].

Consequently, the number of papers, articles and books published have addressed many aspects of the digitization and digitalisation process, therefore the increasing interest for the subject is obvious, according to the results in Google

Scholar [9], Web of Science Core Collection [10], Scopus [11] and IEEE Xplore [12] presented in Table 1.

Table 1. The number of papers, articles and books published in Online Databases

Online Database	Google Scholar		SCOPUS		Web of Science Core Collection		IEEE Xplore	
Period of time/ Term searched	Anytime	2022	1950-2022	2022	1975-2022	2022	1967-2022	2022
Digitization	1340000	20200	28260	3225	20538	3088	4597	419
Digitisation	309000	14000	28260	3225	17524	2084	4597	419
Digitalization	758000	39200	28736	6072	18933	4379	3139	583
Digitalisation	154000	12500	28736	6072	3174	842	3139	583

The term "digital transformation" refers to a modern perspective over the organisational activity, model, and competencies in order to make use of newly accessible technology. Digital transformation demands a much wider use of digital technologies as well as a better understanding of the new paradigm of cultural, social, political and economical shift, worldwide.

While people must be more important than technology, when it comes to digital change, a customer-centric organizational reforms must be applied by leaders, driven by radical organisational culture challenges, and the use of technology that empowers and enables people [13]. According to Brennen and Kreiss [14] the process of digital transformation is how many domains of life are restructured around digital communication and infrastructure. Digital transformation brings new freedoms and rights, and give citizens the opportunity to reach out various services beyond physical communities, geographical locations, and social positions. Many areas, such as public services [15,16], healthcare [17-20], education [21-26], justice [27], environmental protection [28], e-business [29-32], industry (manufacturing) [33,34], economy [35, 36], culture [37] and so on, can only benefit from the many advantages of digital transformation.

However, there are still many challenges in front of a secure and citizens-centered digital transformation that need to be addressed during the digital era that has already began. There must be better defined the strategic autonomy in technology and development, and novel rules must be imposed (regarding cybersecurity, online platforms and media freedom) in order to protect citizens from cybertheft, counterfeit products, and disinformation [38]. The pandemic period because of COVID-19 (that came as a black swan event [39]) forced most of the world population to change their daily habits dramatically and slow down (if not even cancel) most of their daily activities.

However, there is a saying in Romania: "Any event that brings a bad situation comes along with a good one". Although the pandemic period has been problematic from many points of view, the limited physical access to public institutions, forced Romanian authorities to rush the digitalisation process, authorizing remote access to information allowing procedures that have been considered at least unacceptable, if not forbidden, previously to the 2020 year. At the same time, the companies' owners realized how important is to invest in the IT technologies, not only to increase their business but to keep making business in the new economic era because of the paradigm change during and after Covid-19.

1.2. Benefits and Drawback

There are two main directions enhanced by digitalization. First, the automatization of work that changes job functions and in some cases erases jobs that become useless and second, the creation of work without jobs via digital platforms.

The main focus is on services, which is under the highest pressure from automatization and the trend of work without jobs [40].

These main concepts related to digital transformation must be first and foremost human-centered to enhance the human digital welfare. The digital welfare state concept refers to a state in which public authorities deploy technologies to perform a broad range of public services (easy access to public services as social protection and assistance systems, public education, and healthcare, and so on) [41], while they maintain fair policies with a broad vision to create advanced digital society that empowers both citizens and businesses.

However, there are many concerns regarding digitalisation, one of them being is on how the government's use of data about its citizens. All the changes that digitalisation brings, reconfigure human rights and increase the governs' power and how data about people impact the citizens' digital welfare state [42]. There are arguments that the logic of data analytics and predictions go well in hand with digitalisation policies focused on public sector efficiency but risk to undermine individual rights [43].

Some major drawback of digital transformation for citizens consists of the spread of disinformation, addiction to social media, compromised personal privacy, increase in the crime rate, breaches in data security, loss of traditional lifestyle and values, development of more deadly weapons of war, loss of jobs and information overload.

2. Digital Transformation Landscape

2.1. The United Nations' Survey

Significant information regarding evolution and current status of digitalisation across all 193 states member of the United Nations (UN) have been concluded in 28 September 2022. The 12th edition survey about the UN' assessment of the digital government landscape has been presented in November 2022 at the UN e-Government Event [44].

The survey contains more than two decades of research with relevant data, based on a ranking of countries, according to UN EGDI (E-Government Development Index).

The EGDI integrates features, such as the infrastructure and educational levels, reflecting the way a country is using information technologies to allow access and inclusion of its people. The EGDI is a composite measure of three important dimensions of e-government, namely: provision of online services, telecommunication connectivity and human capacity [44].

The EGDI is based on a two decades of United Nations experience resulted in comprehensive Survey of the online presence of all 193 United Nations Member States. It evaluates national websites and how e-government strategies and policies are implemented in general and in specific areas for delivery of vital services. The evaluation aims to rate the e-government performance of countries relative to one another. The results are tabulated and combined with a set of indicators.

Even though the initial model has been kept, the specific connotation of these values differs from one edition of the Survey to the next one, according to changes and novel technologies on the market.

Mathematically, the EGDI is a weighted average of three normalized indices as the most important dimensions of e-government:

- scope and quality of online services - OSI (Online Service Index);
- inherent human capital – HCI (Human Capital Index);

- development status of telecommunication infrastructure – TII (Telecommunication Infrastructure Index).

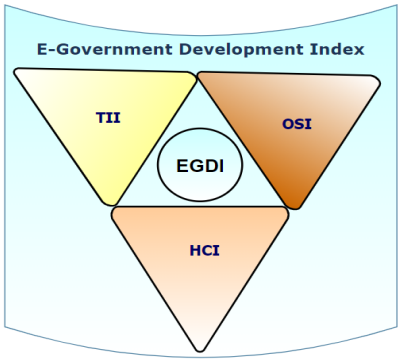

Fig. 1. The tree components of EGDI

Each of these indices is a complex indicator that can be analyzed distinct from the other two.

$$\text{EGDI} = \frac{OSI_{norm}+HCI_{norm}+TII_{norm}}{3} \quad (1)$$

Prior to the normalization of the three component indicators, the Z-score standardization procedure is implemented for each component indicator to ensure that the overall EGDI is equally decided by the three component indexes, i.e., each component index presents comparable variance subsequent to the Z-score standardization.

In the absence of the Z-score standardization treatment, the EGDI would mainly depend on the component index with the greatest dispersion.

After the Z-score standardization, the arithmetic average sum becomes a good statistical indicator, where "equal weights" depicts "equal importance."

For standard Z-score calculation of each component indicator:

$$x_{new} = \frac{x-\mu}{\sigma} \quad (2)$$

X - is a raw score to be standardized;

μ - is the mean of the population;

σ - is the standard deviation of the population.

Within 0 to 1 range of EGDI values the countries are then grouped into four levels as presented in Table 2.

Table 1. Range of EGDI values

No.	EGDI classification	Quartiles (descending order)	EGDI values from… to inclusive
1	VERY HIGH	VH, V3, V2 and V1	0.75 ÷ 1.0000
2	HIGH	HV, H3, H2 and H1	0.50 ÷ 0.7499
3	MIDDLE	MH, M3, M2 and M1	0.25 ÷ 0.4999
4	LOW	LM, L3, L2 and L1	0.00 ÷ 0.2499

In all references to these ranges in text and graphic elements, the respective values are rounded for clarity and are expressed as follows: 0.75 to 1.00, 0.50 to 0.75, 0.25 to 0.50, and 0.00 to 0.25.

In order to have better view of the situation, in case of subgroups of countries with similar levels of performance, each EGDI group is further divided into four equally defined intervals, named quartiles as seen in Fig. 2.

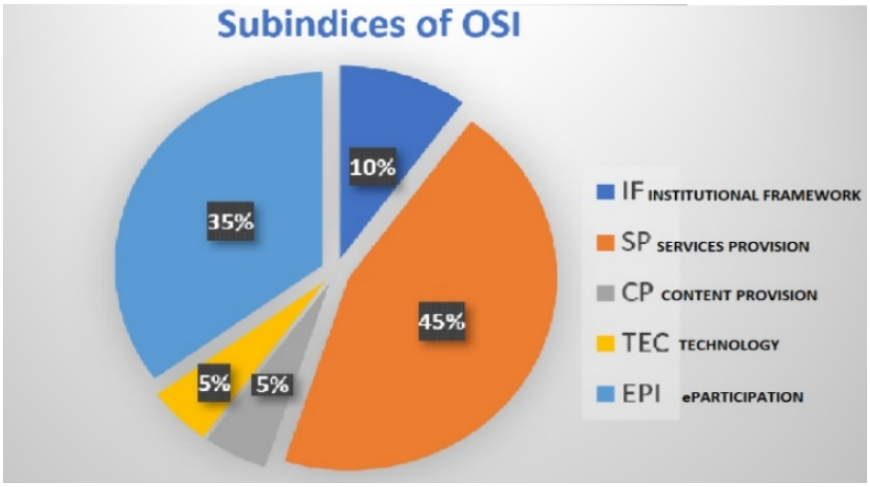

Fig. 1. The five subindices of OSI.

The evaluation criteria have evolved continuously since 2003, being kept up-to-date according to novel technologies, new concepts and paradigms, therefore, in 2022, the UN Survey comes as a refined formula for generating the Online Service Index.

This new approach presents a standardization and normalization division to further align the OSI with LOSI (Local Online Service Index) by splitting the assessment questions into five discrete particular areas forming five subindices: Institutional Framework (IF), Services Provision (SP), Content Provision (CP), Technology (TEC) e-Participation (EPI) with the OSI as a whole calculated based on the normalized values for each subindex as presented in Fig. 2.

Each of the five subindices of OSI are assigned a weight based on the relative proportion of questions that fit in to the associated category in the OSI evaluation feedback form.

This 2022 edition includes data analysis in both global and regional contexts, and a study of local e-government development based on the UN LOSI (United Nations Local Online Service Index). It also contains consideration of inclusion in the hybrid digital society, and a concluding chapter that outlines the trends and developments related to the future of digital government. As all previous editions, it provides data acquired during study, the methodology used and related pilot study initiatives [44]. In this study, Denmark, Finland, and South Korea are at the top of the 2022 UN e-government ranking. Although Romania is one of the countries with a very high EGDI level that largely derives from high or very high HCI and TII, more attention should be directed towards transforming services for citizens and shifting them online, as well as providing support for humans to acquire more advanced digital skills.

2.2. European Union Digital Transformation' Perspectives

As part of the EU (European Union) effort to shape the Europe's digital future, the Digital Decade policy program is based on the "*digital compass*" that sets out digital perspective for the next decade. It consists of clear, concrete targets based on four general main areas - skills, infrastructure, business and public services, presented in Fig. 3 [45].

The first target refers to digitally skilled population and highly skilled digital professionals with over 20 million ICT specialists and gender convergence covering at least 80% of European population with digital skills.

As for infrastructure, the perspective is to develop a secure and sustainable digital one with Gigabit for everyone and 5G connectivity everywhere, double EU share in global production for cutting-edge semiconductors, 10,000 climate neutral highly secure edge nodes, and the first computer with quantum accelerator.

The third area refers to digital transformation of businesses of EU companies, particularly SMEs - Small and medium-sized enterprises that should reach at least basic level of digital intensity (at least 90% of them), use novel concepts and technologies as AI (Artificial Intelligence), big data and cloud computing to increase their revenues (about 75% of them), and to support and increase innovation and innovators managing start-ups.

Last, but not least, digitalisation of public services targets all the public services, medical records (to be digitalized and become available remote), as well as, digital IDs for all EU citizens. As part of the digital market strategy, the European Commission has launched a number of digital programs [46].

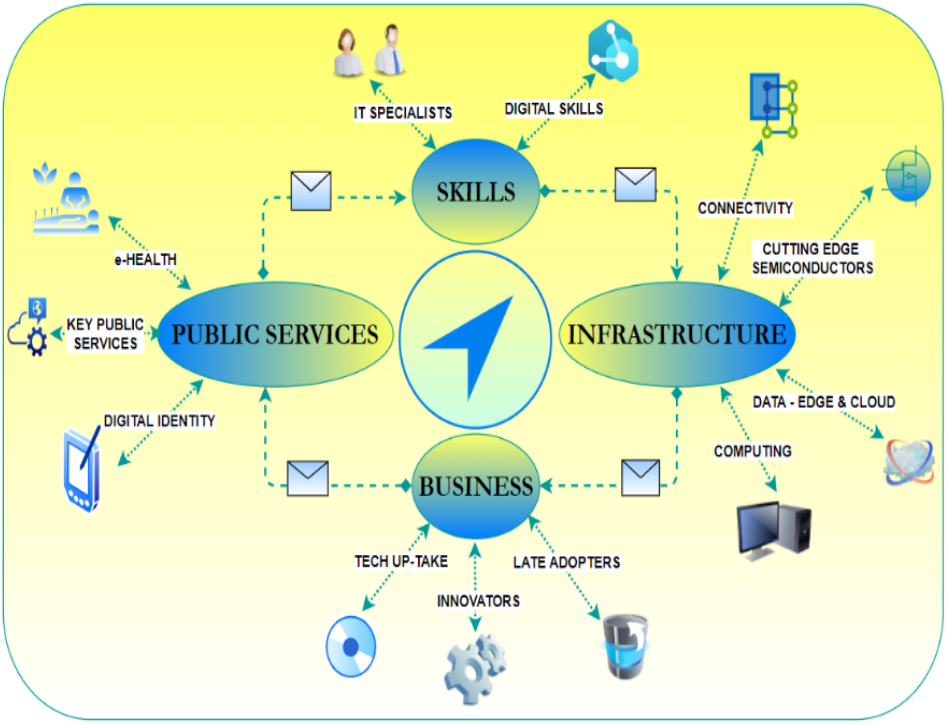

Fig. 2. Digitalization areas and targets for next decade in EU countries

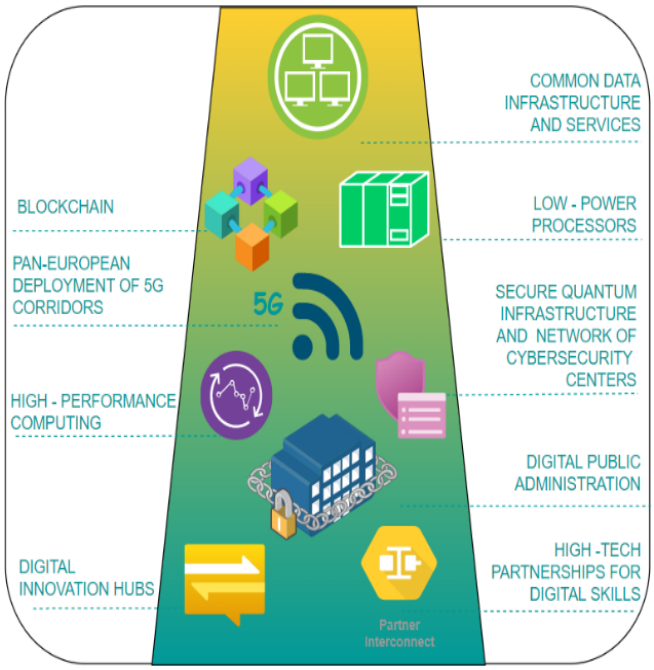

Fig. 3. Areas for EU multi-country digitalisation projects

Although the list is not final, being under process of improvement, the EU Commission identified some major areas for the multi-country digitalisation projects as seen in Fig. 4.

3. Digital Transformation in Romania. Efforts and Results

The Authority for the Digitization of Romania (ADR) is a structure with legal personality within the Ministry of Research, Innovation and Digitization that has the role of realizing and coordinating the implementation of strategies and public policies in the field of digital transformation and the information society [47].

Global e-government policies, strategies and project applied in practice aim to improve the quality, efficiency and control of interactions between public administration, on the one hand, and citizens and private organizations, on the other hand in order to provide as many as possible services online.

E-government refers to digital interactions between citizens and administration (G2C – Government to Citizen), between administration and others government agencies (G2G – Government to Government), as well as to those between the administration and the private economic environment (G2B - Government to Business).

One of the working concepts that drive the development of these projects is that of the life event. An event of life covers public services that are related to a certain situation that the citizen (or the company) encounter in the lifetime. According to EU policy, there is a set of 20 life events (12 for citizens and 8 for companies) aiming to increase the quality of the services provided, increasing the number of users and the degree of coverage for different categories. The evaluation method of these

life events is conducted according to five degrees of digital transformation services that take into consideration how advanced is the digital interaction between citizens/companies and public administration (as presented in Fig. 5).

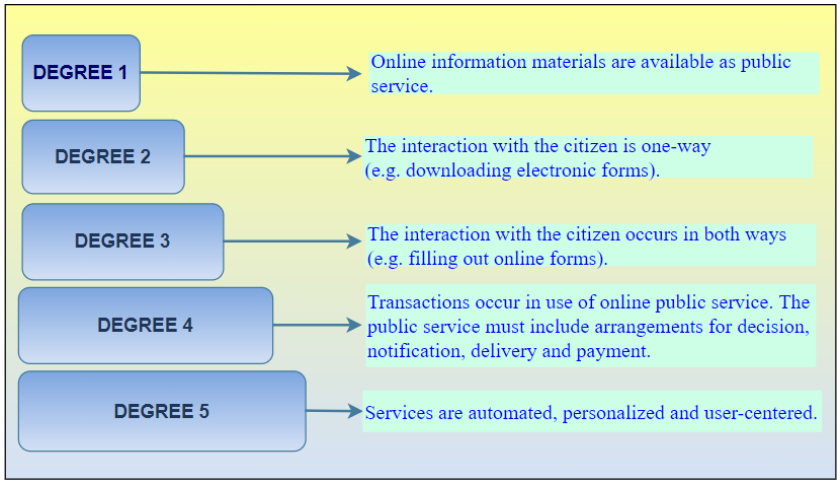

Fig. 4. Degrees of availability in digital transformation services to citizens

With the aim to objectively measure the evolution of different countries in the field of e-government, one of the most relevant indices is given by EGDI, evaluated by the United Nations Organization.

The EU Member States are above the global average, and the European countries are more developed than all other geographical areas of the world, from the perspective of e-participation measured by:

- the availability of information about public services without being requested;
- citizens' online participation in the public policy debate;
- citizen participation through online forms in the development of public policies or the design of certain service components public.

Another relevant measurement of progress in the field of e-government is given by DESI (The Digital Economy and Society Index) base on about 30 indicators relevant to the EU's digital performance. DESI consists of indicators on Europe's digital performance and evaluate the progress of EU countries.

The National Strategy regarding the Digital Agenda for Romania 2020 (NSDAR 2020), adopted by Government Decision no. 245/2015 SNADR 2020 was prepared in order to align Romania with the strategic directions established in the framework of the Europe 2020 Digital Agenda.

Since investments in information technology and communication (ITC) have a direct influence on progress of the Romanian economy, NSDAR 2020 deals with four key areas (including the one dedicated to e-government), as in Fig. 6.

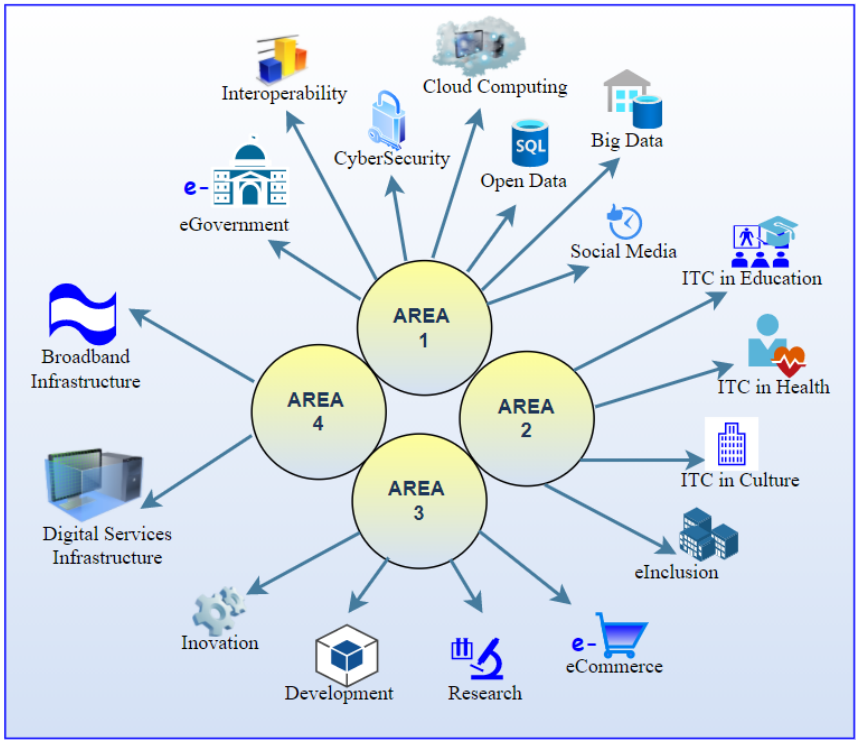

Fig. 5. Development ITC areas

In the field of e-government, NSDAR targets services that provide at least life events of the 4th degree of performance/sophistication (see Fig. 5).

For example, for the life event "scheduling a medical consultation" (as part of the Area 2, sub-field ITC in Health), aims, to create a platform integrated for all services with easy access or e-accessibility as part of a medical system patient-centered, as well as the efficient management of information generated by the IT system that can be better used in order to manage the resources of the medical system.

For life events related to enrollment in various forms of education and the library, national aptitude/baccalaureate exams, the ICT in Education sub-field aims to provide relevant equipment and infrastructure in schools, as well as ongoing training ITC specialist skills of public administration staff.

The main objectives with the regard of Area 1 are:

- increase the transparency of public administration acts through computerization of public services;
- develop and improve security networks and systems cybernetics;
- increase access to digitized public services;
- make more efficient the public administrations and reduce the public administration's costs;
- improve the business environment;
- improve governance at the time of implementation of computerized public services.

All the objectives above, to be fulfilled, must be supported by a legal framework in Romania, therefore, the relevant legislation to the field of e-government consists of two regulatory levels, namely legislation with a rather horizontal character (which covers large topics of e-government) and legislation specific to various fields of activities with the aim to support the development of electronic public services, such as: Law no. 119/1996 regarding civil status documents, Law no. 455/2001 on electronic signature, Government Decision no. 922/2010 regarding the organization and operation of the Contact Point unique electronic, Government Decision no. 908/2017 for the approval of the National Framework of Interoperability or Government Decision no. 89/2020 on organization and operation Authority for Digitization of Romania.

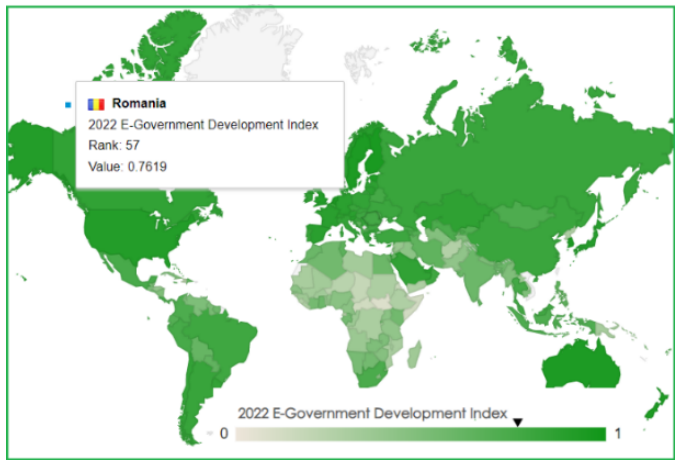

Fig. 6. EGDI Romanian rank and value in 2022

As the result of the effort made in all directions to implement digital transformation in Romania, the UN Survey made public this November (2022) show that Romania is classified on the place 57th (among all 193 countries evaluated), according to EGDI index (Fig. 7).

The evolution of Romania (since 2003 to date) regarding EGDI, according to UN Organization Survey (Nov. 2022) is presented in Fig. 8.

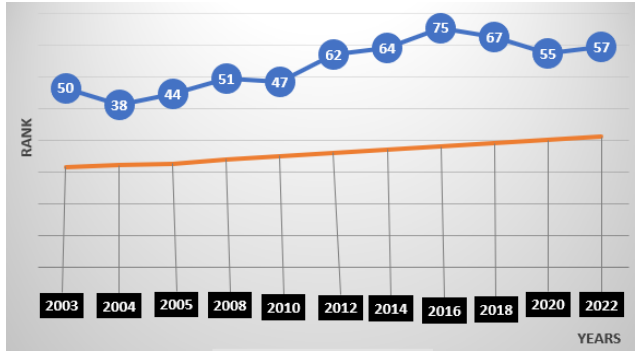

Fig. 7. EGDI Romanian rank evolution from 2003 to 2022

The EGDI index for Romania in 2022, according to the UN Survey is shown in Table 3.

Table 2. EGDI index for Romania in 2022

Country	Region	Sub-region	EGDI Group	Rating Class	Rank	EGDI 2022	OSI 2022	TII 2022	HCI 2022	"Level of Income"
Romania	Europe	Eastern Europe	Very High EGDI	V1	57	0.7619	0.6814	0.7954	0.809	UMC

Romania profile for 2016 is shown in Table 4.

Table 3. EGDI - Romania profile for 2016

Rank	Country	Region	Sub-Region	EGDI 2016	OSI	TII	HCI	Level of Income
75	Romania	Europe	Eastern Europe	0.5611	0.4565	0.4533	0.7736	Upper Middle Income

Romania is among countries in Europe with the highest EGDI value as seen in Table 5. Also, EGDI in 2020 is compared with the one in 2022.

Table 4. EGDI value for Romania

Country	Rating class	EGDI rank	Subregion	EU	OSI value	HCI value	TII value	EGDI (2022)	EGDI (2020)
Romania	V1	57	Eastern Europe	Yes	0.6814	0.8090	0.7954	0.7619	0.7605

According to TII and HCI subcomponent convergence and divergence for the high OSI group, 2022 Romania is classified as with Very high TII + Very high HCI.

The human capital index (HCI) (in 2011, 2012 and 2015) for Romania and its components are presented in Table 6.

Table 5. 2011, 1012, 2015 HCI for Romania

Country	HCI	Adult Literacy (%)			Gross enrolment ratio (%)			Expected years of schooling			Mean years of schooling		
		Index value	Year	Source	Index value	Year	Source	Index value	Year	Source	Index value	Year	Source
Romania	0.7736	98.77	2015	UNESCO	80.56	2011	UNESCO	14.21	2011	UNESCO	10.78	2012	UNESCO

The Romanian e-Participation Index and its utilization by stages is shown in Table 7.

Table 6. Romanian e-Participation Index

Rank	Country	EPI	Total %	Stage 1 %	Stage 2%	Stage 3%
60	Romania	0.6271	63.3%	70.6%	57.9%	42.9%

The Telecommunication infrastructure index (TII) in Romania and its components are presented in Table 8.

Table 7. TII in Romania

Country	TII	Percentage of Individuals using the Internet	Fixed-telephone subscriptions per 100 inhabitants	Mobile-cellular telephone subscriptions per 100 inhabitants	Fixed (wired)-broadband subscriptions per 100 inhabitants	Wireless broadband subscriptions per 100 inhabitants
Romania	0.4533	54.08	21.26	105.91	18.52	37.70

One of the OSI subindex, the e-participation index (EPI) for Romania in 2022 is 0,625 as can be seen in Table 9.

Table 8. The e-participation index (EPI) for Romania

Country	EPI Group	EPI 2022	Rank	E-information	E-consultation	E-decisionmaking
Romania	High EPI	0.625	54	0.8	0.5	0.2

Regarding the European Commission's, Digital Economy and Society Index (DESI) measurement, Romania is in 27th place out of 27 EU member states. Although the digital communication infrastructure in Romania has a high rate, the lowest ratings are received for the use of internet services and digital public services.

In the field of integration of digital technology by businesses, Romania has the lowest rates of SME digitalization. As for the Digital Economy and Society Index, Romania, Bulgaria, and Greece have the lowest DESI scores.

However, Romania is far ahead better at the connectivity criteria; the Country Report for Romania regarding the Index economy and digital society, for the year 2020, remarks the strong competition based on registered infrastructure in Romania, especially in urban areas, which is reflected in the indicators in which the country performs very well, namely very high network coverage fixed capacity and the use of broadband services of at least 100 Mbps (over 75% and, respectively, 55%).

More than 60% of homes in Romania are subscribed to services of very high-speed broadband (fourth fastest in the EU), and in terms of graduates in the field of ITC, Romania is well placed in the ranking, being the fifth. Optical Fiber to the Premises (FTTP) coverage doubled in the last 5 years and reached 50% in the mid-2021 in the EU. Romania, among other countries, is leading with 85% FTTP coverage and the lowest broadband prices among Lithuania, Poland, and Bulgaria.

On the other hand, regarding the human capital – digital skills, Romania is at the end of the list with less than 30% of people (aged 16-74) having at least basic digital skills (less than 10% are above basic). Here, the Finland and Netherlands are the frontrunners in the EU.

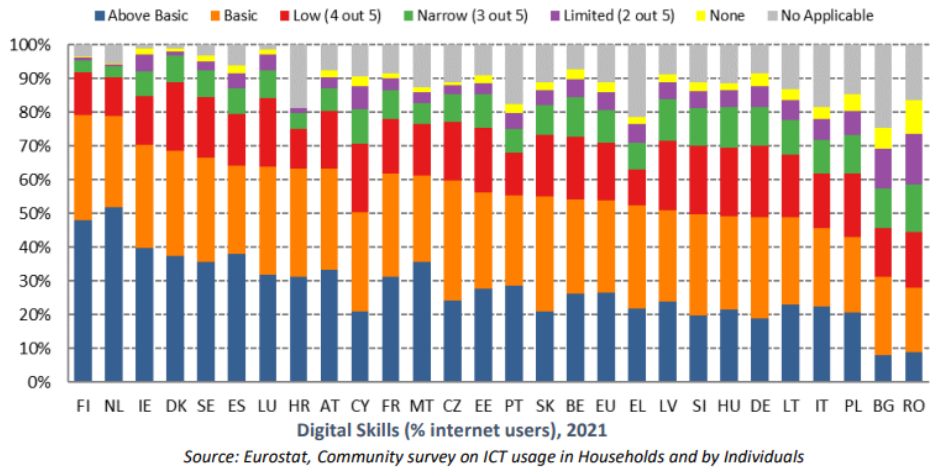

Fig. 8. EU countries – internet users / digital skills (2021 survey) [45]

Romania is at the end of the list regarding the smallest investment in digital technologies in the business sector (less than 10%).

Regarding the Cloud computing services of sophisticated or intermediate level, Romania is situated at the lowest level with less than 10%. As for AI and Big Data adoption (collecting, storing, and analyzing data) the evaluation shows that only 5-6% of enterprises in Romania use it.

Regarding the DESI 2022, referring to Digital public services, unfortunately, Romania is at the end of the table with the lowest score (20 for citizens and 42 for business) while Estonia and Finland are the top performers with scores above 85.

Two members states that do not have an eID scheme in place are Cyprus and Romania. The eID (Electronic Identification) refers to the process of using person

identification data in an electronic form uniquely representing either a natural or legal person or a natural person representing a legal person. While Cyprus is planning to start issuing an eID as a pilot in the third quarter of 2022, Romania is expected to deliver 8.5 million eIDs by June 2026.

The top performers in the integration of digital technologies are Finland, Denmark, and Sweden. Romania, along with Bulgaria and Hungary show the weakest performance.

Although Romania registers delays in many areas reflected in many DESI dimensions, some of them quite substantial, is on an upward tendency in line with the general trend at the level of the European Union.

4. Examples of good practice at the national level regarding the use of e-government tools

A number of calls for projects have been launched lately by the national authorities with the aim to improve the digital transformation process and speeding up the implementation procedures of digitalization in Romania [48].

The funding is directed to:

- ITC hardware purchases;
- procurement of equipment for automation and robotics intended for technological flows, integrated with digital solutions;
- development and/or adaptation of software applications/licenses, including RPA software automation solutions, respectively Robotic Process Automation;
- procurement of blockchain technologies;
- purchases of artificial intelligence systems, machine learning, augmented reality, virtual reality;
- purchase of presentation website;
- procurement of cloud and IoT services;
- training the staff who will use ICT equipment;
- consultancy/analysis to identify technical solutions needed by SMEs, etc.

At the national level, there are some successful projects available for citizens and businesses.

4.1. G2C – Government to Citizen

One of the most useful and used flatform as public service is the platform "ghiseul.ro". This is a project developed by the Authority for the Digitization of Romania and supported by the Romanian Electronic Payments Association, which offers taxpayers the opportunity to view existing payment obligations and/or to pay online by card, (partially or fully), the local taxes, local services, traffic fines, and fees for a number of documents (passport, ID, car registration, driving license, and so on) [49].

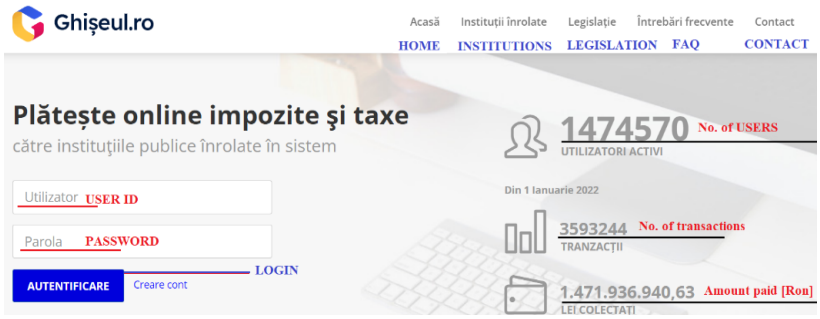

Fig. 9. Ghiseul.ro, the LOGIN page

Citizens have the possibility to enroll on the National Tax Administration Agency platform (ANAF) (which is clear and well structured) and get (online) from the authority, a Personal Virtual Space (SPV).

Through SPV, the citizen has remote access to its dedicated platform space to send documents and declarations, buy shares emitted by the state, and so forth.

The answer from authority comes back quickly, in a professional manner, and the citizen personal archive is easy to reach [50].

The National Road Infrastructure Administration Company (CNAIR) [51] has also a professional platform allows to check the validity of the Vignette and also buy a new one online or by SMS.

On the General Direction of Driving Licenses and Auto-Registrations platform, there is detailed information regarding procedures and documents necessary to get (extend) a driving license and obtain certificates for new (or newly bought) vehicles, and also fill forms for online programming at institutional headquarters, as well as an online simulation for examination in order to get a driving license [52].

The National Cadaster and Real Estate Advertising Agency has, also, a professional platform, (the 4th grade of digital transformation - figure 5) that allows citizens and organizations to fill out forms, pay online by card, and receive (by e-mail) information about Romanian real estate properties and owners [53].

The InfoCert online service (developed by the National Trade Register Office) provides certificates, allows registration for new organizations, and sends information to citizens in an automatic flow manner [54].

On the portal of the Ministry of Justice/courts in Romania, it is possible to quickly view pending cases or those that are being resolved in court. The search options are multiple with many filters to reach out quickly to the desired information [55].

Local Authorities/Halls have various online services (as part of digital transformation) classified from class 1 to class 4. It is notable, however, that in the last two years, in Romania, more and more integrated platforms have begun to be developed to make available to citizens local and regional services, online.

A good example is the CityManager platform [56], (part of the B2G Business to Government model) which is developed with the intention to be used by urban/rural Halls in the service of the communities (G2C model) The platform has been launched in 2017 and already implemented in several Transylvanian localities situated in Alba, Sibiu, Mureș, Brașov, and Hunedoara counties and makes available to citizens a number of specialized online services such as:

- allows the visualization of concentrated information about a citizen related to Taxes and Fees, Agricultural Register, Urbanism, Social Assistance, and Electronic Registry, in one place;
- allows submitting documents/applications online and receiving their solution automatically;
- allows citizens to report any community problems online 24/7, even from their mobile phone (abandoned cars, potholes in the asphalt, disturbing public order, obstacles on the road, garbage thrown in unauthorized places, lighting system malfunctions, stray dogs, etc.);
- paying taxes, fees, and fines online on the institution's website;
- online verification of the status of the documents submitted to the institution;
- real-time information on the status of submitted documents;
- quick access to information of public interest, automatically published on the website;
- citizens can automatically issue their Certificates from the Agricultural Register and Tax Certificates;

- citizens can consult their land, buildings, declared cars, taxes, fines and other charges directly on the institution's website.

CityManager is an integrated software solution (Fig. 11) for digitizing the interaction between public administration and citizens through online public services, reducing bureaucracy and simplifying the work of civil servants.

Fig. 10. City Manager Platform.

4.2. G2B – Government to Business

Business organizations have a number of services online (including RO e-Factura or RO e-Transport) on the National Tax Administration Agency (ANAF) platform that is developed so far to the 3rd degree of digital transformation, according to figure 5 [57].

SEAP, the Electronic Public Procurement System (available in both Romanian and English languages) is probably the first online public service for business companies. It allows an organization to publish, sell, and bid services for governmental institutions. (Fig. 12.) [58].

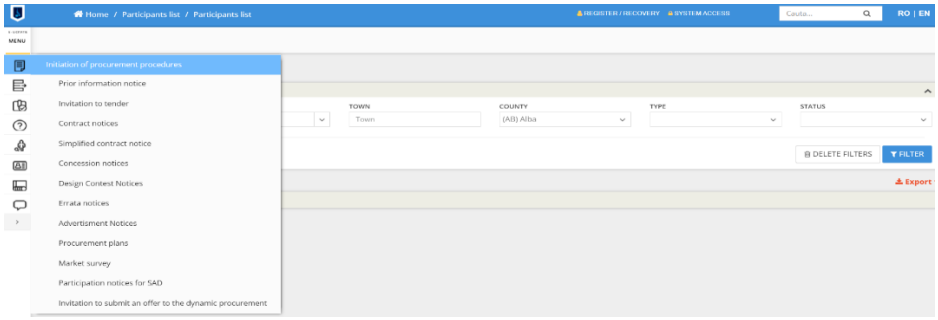

Fig. 11. The e-licitatie.ro platform.

There is a huge gap between public institutions and private ones in the medical domain. Although some public hospitals (as part of G2C model) allow online programming for clinical consultation, most of these online services are not working in real situations. Private medical institutions, on the other hand, have far more advanced online services, that are developed most of them up to the 4th grade and 5th grade of complexity. A good example is the Regina Maria Company, one successful Romanian business in the medical area [59]. Besides its platform that is developed up to the 5th grade of complexity (figure 13), there is also available an application for mobile devices that incorporates lots of medical information (about medical staff, future and former visits to doctors, hospitalizations, medical investigations' results,

the patient's medical history, virtual clinical service, virtual medical assistant, offers, and medical subscriptions, invoices, online payment by card, and so on) and allow real-time interaction with medical personnel and doctors.

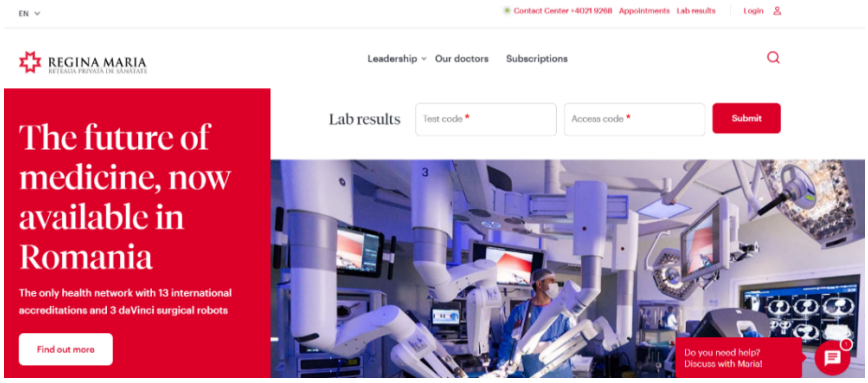

Fig. 12. Regina Maria – Private Medical Network.

Education is another area where digital transformation is in progress in Romania. However, the differences between public and private institutions regarding digital transformation are less distinguishable here, than in medical system.

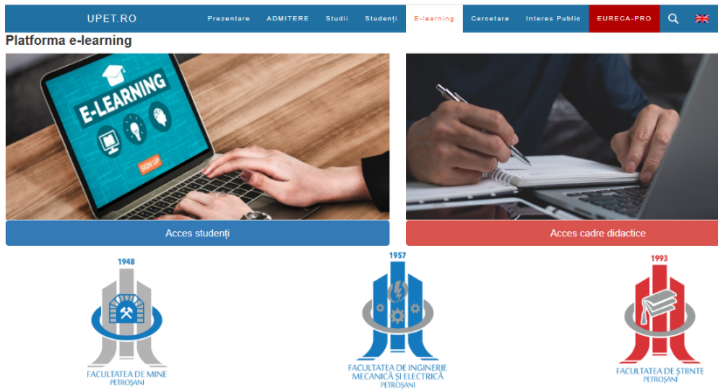

Fig. 13. University of Petrosani e-learning platform [60].

Most schools allow parents to check online (on the institutions' platforms) their children's scholar situation and be up-to-date regarding the current curricular and extra-curricular activities organized by teachers.

Universities have today more advanced digital transformation instruments as part of their own web platforms, because of the pandemic situation that forced professors, for two years, to teach and evaluate students online.

E-learning platforms, with advanced tools incorporated, allow efficient teaching, online interaction in real-time, and tools for a fair evaluation (figure 14). Students can read online, information relevant to them, pay their taxes, and can also check their own grades [60].

4.3. B2C and B2B – Business to Customers and Business to Business

Private telephone services (fixed and mobile), media (television, internet), electricity, gas, running water, heating, household water, meteoric water, and garbage collection have advanced platforms with varying degrees of sophistication, but no less than level 3. Besides lots of information available online, their platforms allow to make new contracts, choose different services, see their own consumptions, own invoices, pay online, and compare consumptions (quantity and financial) in previous years with the current one. Most of these companies have applications for mobile phones, that make it easy to access information online, allow one to send own meter readings (some by taking photos of meter index), and pay invoices online by card.

When comes to digital transformation, of all the online services, the banking ones have the highest dynamics. One of the most famous banks, Banca Transilvania, another successful Romanian business, is often in first place in terms of digital transformation and the variety of services included in the online platform and mobile phone applications [61]. The BTPay mobile phone application (figure 15) is a good example of an online banking service, complex, easy to access, and used even by users who are less trained or they feel less comfortable with mobile applications.

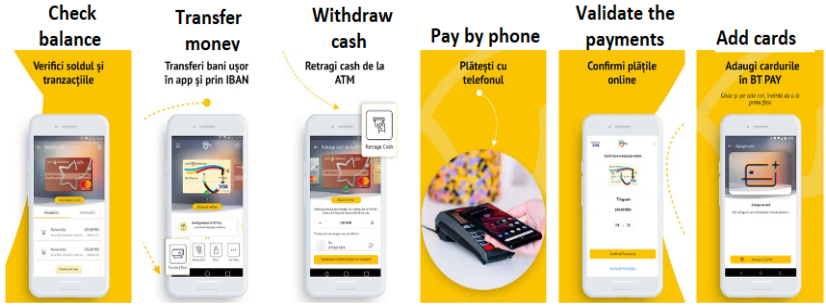

Fig. 14. BTPay app

Courier companies, during the pandemic time, grew in number and services "like mushrooms after the rain". A relevant example is Fan Courier (Fig. 15).

It is a successful Romanian courier business company that offers several online services such as AWB tracking, self AWB and cost estimate [62].

Fig. 15. Fan Courier Services online

BeeFast is a super-fast courier system based on a locally developed IT platform and its integration with e-commerce solutions. It is a service for fast delivery in an average time of 55 minutes in the Romanian capital, Bucharest and Ilfov county [63]. BeeFast is based on an IT platform that has several features: orders are received by both businesses and individuals, either by integrating with business e-commerce solutions or by placing the order directly. Couriers are assigned automatically based on proximity. If the client business does not already have an online shop, BeeFast builds such a shop for free within 24 hours and integrates it with the delivery solution. In this way, businesses can be online in 24 hours. For the next period, BeeFast aims to continue the development direction of the digital infrastructure, pursuing the implementation of new applications, both in the B2B area for the integration of more complex businesses in terms of the products and services offered, as well as for couriers and final requests [64].

And the number of examples, covering many other areas of business in Romania, is much more, and keeps growing.

5. Conclusions

Most e-business and e-government models in Romania, as part of digital transformation processes, are under development, though some of them are rather at the beginning of the development process and the steps made are few and reluctant, and others are quite advanced, even up to the 4th of 5th grade of sophistication. Unfortunately, in Romania, the lack of a general vision of the political ac-tors regarding digital transformation and its benefits, obstructs its implementation and possibility of growth in public institutions, especially in infrastructure, skills, and public services, therefore delaying the deployment of new projects.

Although this has been the case in the past, we can notice many positive changes during the past three years and the dynamic of development and implementation of digital transformation projects keep growing in Romania.

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