European Commission

DIGITAL CITIES CHALLENGE

Assessment report for the city of Arad

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Digital Cities Challenge

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1. Introduction to the Digital Cities Challenge

According to the recent data, 72% of the EU's population lives in cities, towns and suburbs, making them the engines of the continent's economy. Cities generate 85% of Europe's GDP, they also face multiple, interconnected challenges, including energy and climate change, employment, migration, social inequality, and water, air and soil pollution.

However, through advanced digital technologies, Europe has the opportunity to re-invent the way we manage our cities' development and respond to the big societal challenges, such as efficient health management, cleaner environment, green mobility, and offering great-value jobs. Due to their high density, cities are put in a very good position to create innovative ecosystems made up of a wide array of different stakeholders from government, industry, finance, academia, communitarian organisations, social partners, etc. Cities have the capacity to make policies become reality.

In this context arises the **Digital Cities Challenge**, an initiative of the European Commission with the main purpose to support the cities in their path to digital transformation. DCC offers policy advice and support to 15 cities in Europe, namely **Alcoy, Algeciras** and **Granada** in Spain, **Arad** and **Iasi** in Romania, **L'Aquila** in Italy, **Kavala, Patras** and **Thessaloniki** in Greece, **Sofia** in Bulgaria, **Ventspils** in Latvia, **Grand-Orly Seine Bièvre** in France, **Pori** in Finland, **Rijeka** in Croatia, and **Guimarães** in Portugal. The support to be offered will speed up the digital transformation and the industrial modernisation of cities in order for them to take full advantage of the 4th industrial revolution.

This initiative draws inspiration on the recommendations set out in the "Blueprint for cities as launch pads for digital transformation". In addition, it will reinforce the networking among model

cities, facilitate their participation in on-going European initiatives in similar policy fields, strengthen stakeholder collaboration, cross-regional partnerships and stimulate investments.

The selected Digital Cities receive support in the form of field advisory services to be provided by a group of high level experts and peer reviewers, and offer the possibility for city representatives to participate in a series of capacity building and networking seminars. These activities take place in four Academy seminars during which cities share practices, take advantage of peer to peer learning and work together and in thematic groups on the steps of their transformation trajectory.

This document has been developed in the framework of the field advisory services being delivered in Arad. It represents the main output of the first step of the digital transformation strategy: setting the digital vision and ambition for digital transformation. The assessment report has been developed by the Digital City team on the basis of:

- The results of the Self-Assessment Tool and collection of Key Performance Indicators at the city level which took place between (April – May 2018). A total of 34 valid replies were collected through the SAT from stakeholders representing 7 relevant sectors.
- A literature review of key documents provided by the local leadership team, including reports, policy documents and project plans. (cf. Appendix II for full list of documents consulted).
- An assessment visit which took place from 12th to 14th June 2018.
- A vision an ambition workshop which took place on 30th August 2018.

This document represents the key input to the work to be performed during the forthcoming phases of the digital transformation trajectory (i.e. definition of the city strategy and roadmap).

2. Key sectors of the local economy and DCC focus

Arad is the main gateway to western Romania. Situated on one of the main continental road and railway transport corridors, the Municipality of Arad is one of Romania's most prosperous and dynamic cities. In 2014 Arad achieved the highest rate of economic growth in the country 5.4%, which was almost double the national rate of economic growth.[1] In 2014, with a total GDP of €9.69 thousands Arad county ranked 7th in Romania. Timis county ranked 3rd. In 2014, the GDP per capita in Arad county was €7,185; in 2015 it rose to € 8,391/capita.

INS reported in 2017 (based on 2015 statistics) that 4 counties in Romania had a ratio of more than 5 private jobs to 1 public sector job; Arad, Timis, Brasov, Sibiu. The number of private companies in Arad county (2015) was 15,705, employing 111,401 people.[2]

Employment in Arad county was 31.3% in year 2015. Timis county had an employment rate at 34% (data as a percentage of total population). Unemployment (reported at active population level) was 1.5% in 2017.[3] Similar indicators for Arad city only could not be obtained even by the City Hall.

The key industries and actors per sector (e.g. major industrial players, innovators etc) are the following:

- Automotive: Joyson industries (KSS, Takata), Aptiv (Delphi), BOS, Yazaki;
- Rail carriages and trams: Astra;
- Furniture: Cotta international, Feroneria;
- Clothing and textile: Moda, Aries;
- IT&C: GDS manufacturing, Computer Voice Systems, Baum Engineering, e- Learning software, BB Computers, Icebirdsoftware, Satura computers;

[1] Capital Magazine, September 2015, http://www.capital.ro/arad-campionii-cresterii-economice-impulsionati-de- nemti-si-japonezi.html

[2] See http://www.arq.ro/aradul-bate-cel-mai-mare-jude-al-tarii-la-numarul-de-angajati- la-privati/12943

[3] See https://www.forbes.ro/articles/forbes-best-cities-2018-locul-5-arad-o-pozitie- strategica-119020

It has been difficult to obtain relevant and up-to-date economic data for the city of Arad; the Romanian National Institute for Statistics (INS) only publishes data at county level. The following are comparative numbers on the contribution of the key sectors to the city income:

Table 1 Key economic sectors (% of the city income)

	2004	2017
Services	28%	50 %
Domestic trade	26%	25.7%
Production	20%	12.5%
Construction	6%	8.8%
Import/export	20%	3 %

Source: Romanian National Institute of Statistics

Key business challenges faced by these sectors include:

- Very low unemployment rate 1.5% (Dec. 2017) i.e. challenging for recruiting and retaining;
- Higher salaries in Timisoara and abroad;
- Only few vocational schools and dual-education;
- Permanently changing Romanian legislation;
- Low quality of the infrastructure and non-integrated public transport.

3. Digital maturity level of the city: outcomes of the Self-Assessment Tool and Key Performance Indicators

3.1. Outcomes of the Self Assessment Tool

The digital maturity of the city was assessed over a 2-month period (April – May 2018), based on the answers provided by 34 stakeholders representing 7 selected sectors considered relevant for the expected overview: local administration (9), education (5), finance (1), industry (16), utilities companies (2) and NGOs (1).

The overall results of the SAT show that Arad stands at the boundary between “digitally less advanced” and “digitally transforming”.

The results per dimension of assessment show the existence of good infrastructure, but, on the other hand, poor data availability, poor availability of support services, lack of networking and mentoring, lack of training in the industrial sector. The results also show significant differences in perception between the public sector (city administration) and education institutions, on one hand and the private sector, on the other.

Figure 1: Overview of SAT responses for Arad

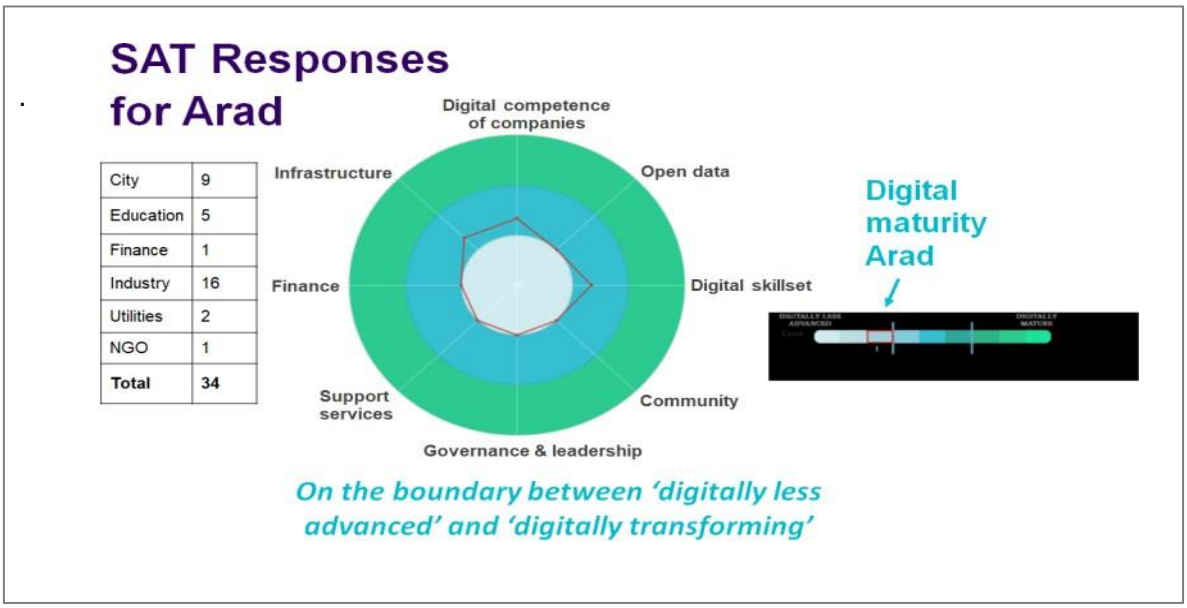
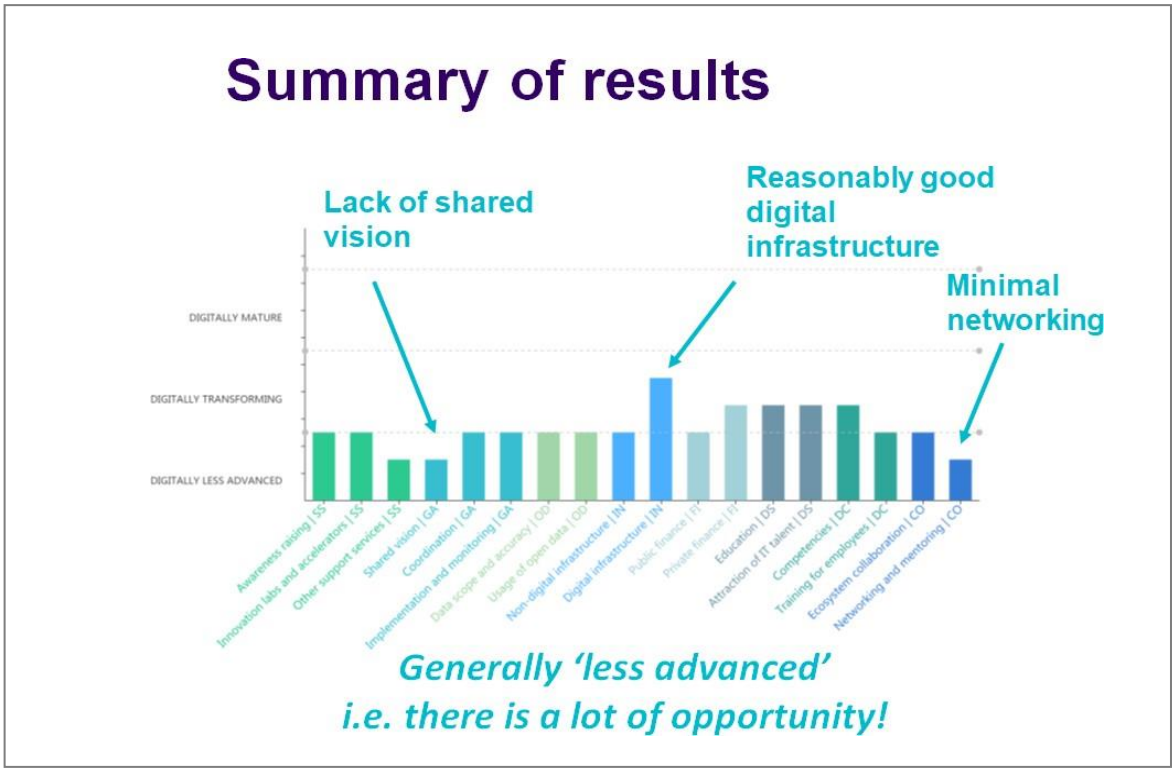


Figure 2 Summary of SAT results by dimension



Source: Digital Cities Challenge, Self Assessment Tool (2018)

SAT – Key findings:

The overall results of the SAT analysis show that Arad stands on the boundary between "digitally less advanced" and "digital transforming". Arad has a relatively good infrastructure and ambition, but there is a lack of shared vision and coordination, as well as networking and mentoring, coupled with poor data availability. Results also reveal significant differences in perception between different stakeholders, from the city administration to the education sector and local businesses.

The main initiatives going on are described in detail in Section 8.

1. **Overall level of digital maturity**

   - On the boundary between "digitally less advanced" and "digitally transforming"

2. **Key strengths and weaknesses**

Strengths: Relatively good infrastructure

Weaknesses: Lack of shared vision and coordination

Lack of networking and mentoring

Poor data availability

3. Key differences in perceptions expressed by different types of stakeholders

- City & Education responses are fairly consistent
- Business responses are significantly different to City & Education

4. Other key findings drawn from the SAT results

- Mixed view of training availability

Figure 3 Summary of SAT results

SAT Summary

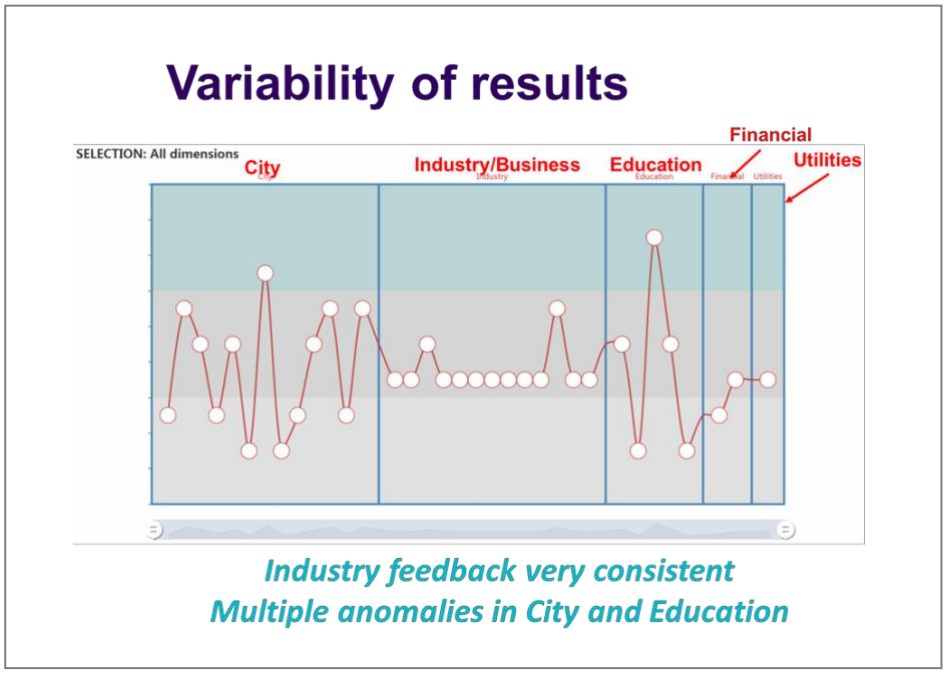
	City	Education	Industry	Total
Community	2.38	3.00	2.63	**2.59**
Ecosystem collaboration	3.17	4.67	3.75	**3.69**
Networking and mentoring	1.71	1.33	1.50	**1.57**
Digital competencies of companies	4.83		4.40	**4.68**
Competencies	5.27		4.63	**5.04**
Training for employees	2.67		3.50	**3.00**
Digital skillset	4.74	4.00	4.25	**4.50**
Education	4.37	4.50	4.17	**4.35**
Finance	3.33		4.14	**3.90**
Private finance	3.33		5.00	**4.62**
Public finance	3.33		2.00	**2.57**
Governance and leadership	2.38	4.00	3.50	**2.73**
Coordination	2.00			**2.00**
Implementation and monitoring	3.00			**3.00**
Shared vision	2.00	4.00	3.50	**2.83**
Infrastructure	4.14	3.50	4.63	**4.20**
Digital infrastructure	5.19	3.50	5.00	**5.00**
Non-digital infrastructure	3.26		3.50	**3.29**
Open data	4.21	2.00	4.67	**3.96**
Data scope and accuracy	2.75	2.00	2.00	**2.43**
Usage of open data	4.80	2.00	6.00	**4.59**
Support services	3.22	4.50	2.67	**3.18**
Awareness raising	4.25	4.50	3.50	**4.13**
Innovation labs and accelerators	2.50		3.00	**2.75**
Other support services	2.33		1.50	**2.00**
Grand Total	**3.96**	**3.36**	**3.95**	**3.90**

Minimal networking

Lack of coordination

Poor data availability

Figure 4 Variability of SAT results per type of stakeholder



Source: Digital Cities Challenge, Self-Assessment Tool (2018)

3.2. Key Performance Indicators

The KPIs were collected over a period of 2 months (July – August 2018) and are detailed in Annex VI, each with individual notes about the source. The KPIs cover infrastructure, open data, digital skills and education, digital competence of companies, community, finance, support services, governance and leadership.

The following key findings were drawn:

KPIs for which the city appears to be a frontrunner:

- Coverage and quality of the Internet, high number of users - both mobile and PC.
- Digital courses offered by companies and within almost all undergraduate and graduate courses.
- High number of vacancies in digital related jobs – opportunity.
- Interest in digitisation (high number of participants to events).

KPIs for which the city appears to be lagging behind:

- Real coordination / collaboration between the key actors: public administration companies, industry associations.
- Support for digitisation both for digital and non-digital companies.

- Availability of open data.
- Integration at least of the existing (private and public) applications.
- Small number of start-ups, in particular digital start-ups.
- High number of vacancies in digital related jobs – weakness.

KPIs for which the city was not able to collect data but which are key to city digitisation ambitions:

- Telco providers – no questionnaire filled-in; the data were obtained from web crawling and/or estimates.
- Banks – financial data were obtained only from one venture capital institution.

Poor availability of data was noted on digital infrastructure, open data, digital competencies of companies and the digital ecosystem. The input values for many of the indicators were web-crawled or estimated by the local expert, by the City and by the Chamber of Commerce.

Some data are available only at national level and some indicators are made available by the DESI Index, but the gap between Arad and the average country level of digitisation make them mostly irrelevant.

4. The local digital ecosystem: leadership and governance

The Digital Economy and Society Index (DESI) 2018 ranks Romania 28th out of the 28 EU Member States, placing it bottom of the group of low performing countries in terms of digitalisation. While Romania's ranking remained unchanged over 2017, its score increased somewhat thanks to an improved performance in four of the five DESI dimensions.

According to the Europe's Digital Progress Report (EDPR) 2017, Romania especially lags behind in integrating digital technology into business. Still, it is mentioned that Romanian Internet users engage in a broad range of online activities, and progress is noted in the connectivity dimension, in digital skills and digital public services. 44% of Romanian homes subscribe to ultrafast broadband (the 2nd highest in the EU). ICT contributes 6-7% to Romania's GDP and the digital sector is growing, with two major hubs in Bucharest and Cluj as well as significant ICT investments in other cities.

Romania adopted its National Strategy for the Romanian Digital Agenda 2020 in February 2015.

At local level, according to the Romanian Association for Smart City and Mobility, Romania counts 24 smart cities and Arad ranks 3rd in the top of the communities promoting smart and digital projects, after Alba Iulia, Cluj-Napoca and before Sibiu, Oradea and Bucharest.

At the current time there is no overall, coherent digital strategy for Arad; this is a parallel activity to the other strategies the City has defined, and the responsibility for the current project is shared with the one dedicated to managing all European Union projects.

There are projects which are digital in nature mainly managed by the City administration and, to some extent, known to the academic and business stakeholders.

There are initiatives from companies as well. However, it has emerged that there is no shared vision on digital development in Arad.

Strategies which are relevant for digital development are primarily listed on the City Hall website www.primariaarad.ro and (Figure 5). Their status of implementation is not visible online *per se*, however, local stakeholders offered answers to specific questions about the status and impact of the already implemented initiatives, where available.

Figure 5 Strategies which promote digital initiatives in Arad

The City has developed a number of important strategies, the most comprehensive being the 'Integrated Urban Development Strategy 2014-2030', which sets out a number of objectives related to digitalisation. Objective 1 of the Integrated Urban Development Strategy is *"Performant city – regional economic driver, with an international vocation and a capacity to maintain, attract and sustain performant economic activities"* and the measures defined for its achievement include digitisation projects in education, culture, infrastructure, public services, mobility, energy efficiency and business, all linked with measures, deadlines and funding sources. The 'Integrated Urban Development Strategy 2014-2030' is coupled with the (2) Sustainable Urban Mobility Plan for Arad (SUMP), 2016, 2017. They include several measures linked to digitisation in various fields, such as developing a platform for the promotion of investment opportunities in the Municipality of Arad and an Investor Catalog, smart parking services, intelligent road traffic management, and the establishment of an integrated platform for promotion, information and tourism services, etc.

The (3) Health Development Plan at the level of Municipality of Arad (2016) also proposes several activities that incorporate digital aspects into health promotion measures and information and awareness measures. This includes measures linked to a healthy environment, anti-smoking campaigns smart water fountains, creating a noise map for urban agglomeration etc.

Last but not least, the Municipality of Arad also developed a (4) Green City Strategy (2017), and a (5) Cultural Strategy 2015-2025, both including digitalisation as means of pursuing environmental or cultural promotion goals.

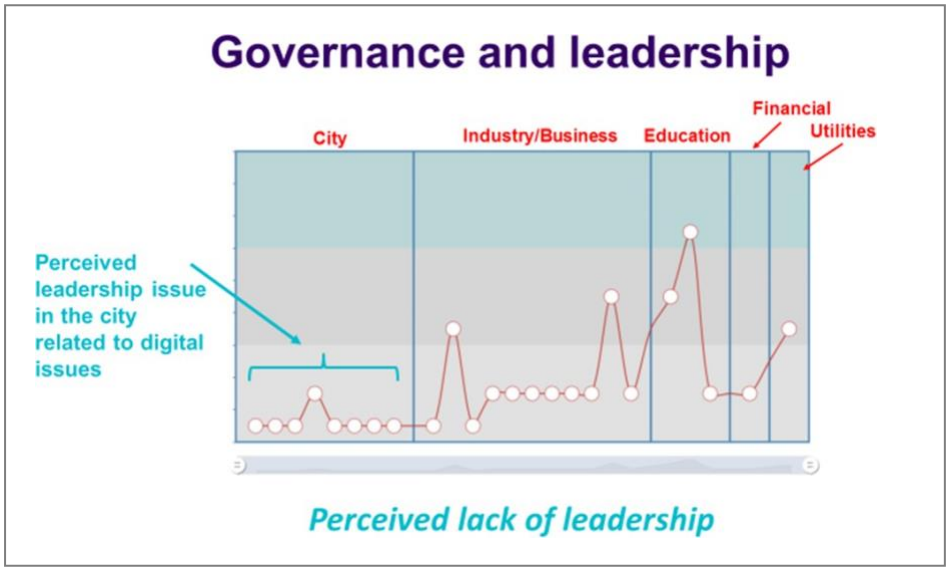
The city's strategies provide a useful framework for introducing digitisation in the city and include good ideas, however, there are significant issues related to their implementation, as there is no overarching framework integrating all the digital initiatives. In addition, while there are structures within the Arad City Hall that have been charged with managing and monitoring the implementation of the Integrated Urban Development Strategy, the majority of the measures included as part of the strategy have not been implemented. The closest projects that relate to digitalisation are rather linked to what is referred to as infrastructure developments (street lights, parking, transport). Also, many of the measures introduced are to digitalise various aspects of the internal functioning of the city hall, or to digitalise the local public services in Arad, also through improving digital infrastructure (Section **Error! Reference source not found.** provides more details on the individual public initiatives). However, there

are perceived problems with their adoptions by the citizens or the businesses in the city, and the monitorisation of their results.

In the meantime, stakeholders (mainly companies) are aware of the importance and need for digital development: some have their own strategies and take steps even without an integrated city plan.

Figure 6 summarises the SAT results for Arad in terms of governance and leadership.

Figure 6 SAT results for governance and leadership



Source: Digital Cities Challenge, Self Assessment Tool (2018)

The **key strengths** of the governance and leadership for digital transformation in Arad are identified as follows:

- There is ambition at both a political and administration level.
- Ambition of IT Arad (hub).

While this is correct, like so many other things, there is little public visibility beyond those involved.

- The existence of digital courses offered by universities and high-schools.
- The existence of private applications available in Google Play.

The **key weaknesses** are as follows:

- Current legislation doesn't allow a business or economic development role at City level so anything with 'Digital' is shared between 'Strategies' functions and 'Managing European' projects.

- The local administration is saturated with strategies, difficult to correlate, monitor and to implement.
- Public procurement legislation is a barrier for local business and collaboration.

Finally, Arad has a golden opportunity to match the (political) ambition with the actual commitment to deliver at least some of the identified potential for transformation for genuine growth looking forward.

The major missing component common to all these activities is that there appears to be nobody having overall responsibility for the economic well-being of the population (private citizens and businesses that provide employment) who is prepared to advocate on their behalf and publicise successes – however modest they may be.

5. The use of digital solutions by local companies

According to DESI 2018, Romania continues to lag in the integration of digital technologies by businesses. Romania scores 17.8, recording a drop of 4% compared to DESI 2017, while the EU average increased by 9%. Also, no significant progress has been registered in e-commerce. Romania does not yet have a clear national strategy for digitising its business sector.

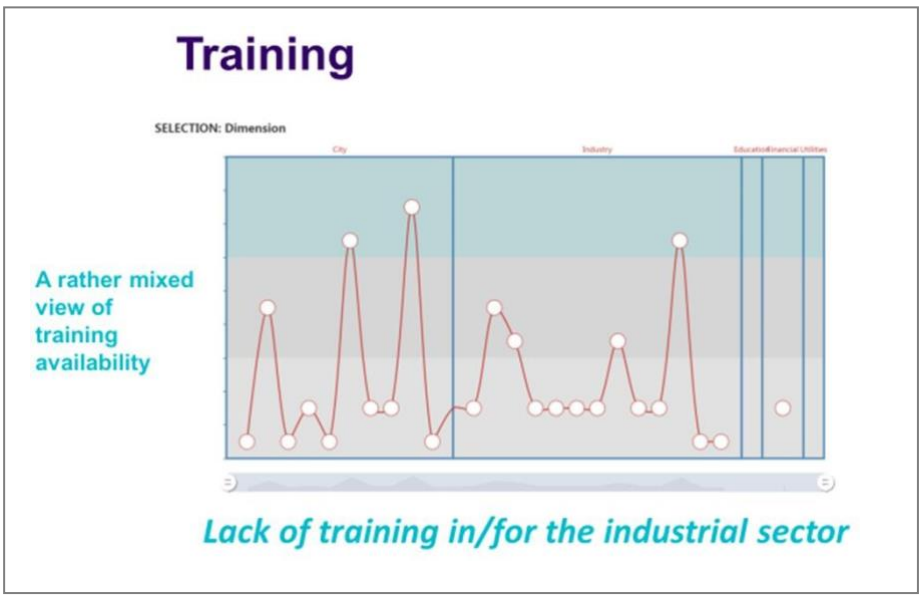
There is a variety of players in Arad and, throughout, the major problem reported by the stakeholders – mainly in the private sector - is the shortage of people with soft skills for the knowledge economy: people who can think, design, problem solve and communicate. This is why only very few projects can be handled by small digital companies. In particular, there is a lack of domain-specific both IT and entrepreneurial skills.

Major employers (who are very niche and outsource local labour for modest skills but mostly in fully digitised manufacturing workflows) report an 'HR desert' in Arad and having to bring labour in from neighbouring counties. These employers are also providing local training in their specific needs; inevitably, most of these skills are not transferrable to other industries or jobs.

While this immediate pressure for employment in outsourcing activities is excellent, it doesn't actually create value for the (digital) future of Arad. Sustainable local growth should also be sourced from innovation and higher value-added products and services; these are usually anchored in higher expectations which start from family, both at an early stage and later in education when confidence, curiosity, an appetite for self-improvement, and higher competencies are developed.

The results of the SAT point at the lack of training (especially reported by industry stakeholders) and a lack of manufacturing companies embracing Industry 4.0 concepts (see Figure 7).

Figure 7 Training availability in Arad



Source: Digital Cities Challenge, Self Assessment Tool (2018)

Romania-Insider reports (10 September 2018) the following:

"Almost 20% of Romanians aged 20 to 64 years old, the main target of the labour market, were residing in another EU country in 2017, according to the recent Report on Inflation for August 2018 of the National Bank of Romania (BNR), quoted by Mediafax.

Romania is second among 43 states in a 2018 Manpower survey on the difficulties of companies in the recruitment process. The percentage is the highest among all 28 EU Member States. Romania is followed by Lithuania, Croatia, Portugal, Latvia and Bulgaria, with shares ranging between 10% and 15%.

The deficiencies in the process of filling the available places are getting more acute, fuelled, on the one hand, by the size of migration […] and, on the other, by the education system's lack of fit to the demands of the labour market".

In our opinion, this situation is self-fulfilling: students are groomed for low value-added (intellectually unsatisfying) jobs within e.g. the IT industry; they migrate to e.g. Timisoara for such jobs; they become dissatisfied; they then contribute to Romania's brain-drain.

Smaller companies which stand out in digital developments (both for themselves and their own customers) such as Baum Engineering and Satura – who are also outsourcing their services - but their owners are more engaged with and willing to influence the strategic dialogue with the wider stakeholders. The same encouraging signs have come from MedLife - a national provider of health services - which is closer to customers and has a legacy of innovative digital approaches.

There are also freelancers in digital but with little visibility and impact at this time.

Local IT solutions, or customised solutions by local providers, are being outsourced to banking and automotive (mainly to foreign players), while, the local agricultural companies (Arad in the middle of highly fertile arable land) are not yet to be motivated to become digital users.

'Digital agriculture' (GPS and remote sensing applications) have become of very significant economic value in western Europe and this is possibly an area where Arad could differentiate itself in the Romanian economy.

Mobile technologies are at a high demand within the private sector (multinationals) and it is predominantly Microsoft technologies what they require. Once again, and although technically advanced, these are low value-added activities required to implement applications and systems as outsourced developments where the IP is owned elsewhere.

The private sector's key development challenges may be overcome by, for example, using such digital solutions to include secured communication. In addition, local companies are interested in the support they can get to ease off / balance outsourcing with building their own products; this would enable them to grow the value-added component and attract more specialised programmers.

In general, there is a poor perception of availability of finance by city stakeholders as the SAT highlighted (see Figure 9). In order to get access to grants &/or tax incentives to promote digitalisation, companies face a series of challenges:

- Small IT companies seldom qualify for public projects and big IT companies charge unrealistic prices for, often, low-quality results.
- Lack of people with the required knowledge and skills.
- Lack of exposure and connections to customers abroad; this requires trust and concerted action which can be built with the support of both the public sector and local universities.

The City Manager has indicated that they need advice on how to integrate various initiatives and new proposals on digital developments; this is an opportunity for direct and very specific problem solving and collaboration with the local companies. However, the online public procurement system SICAP is seen as a barrier (or is over-compliance) for this direct approach and purposeful engagement at a local level.

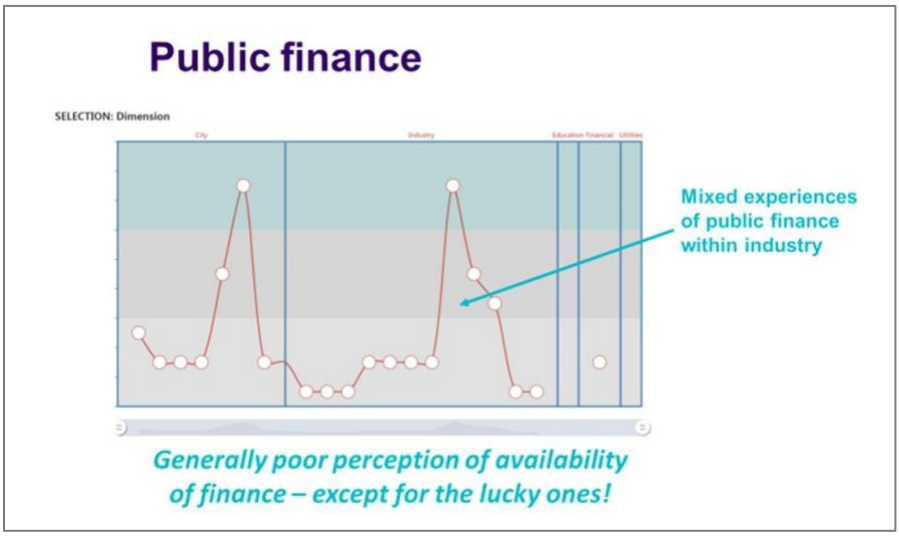
In summary: there is a need for inspiration, mentoring and support for local companies to experiment with new ideas, with data, with understanding and anticipating needs, with pricing

and business models. This is not without challenges in a culture when failure is not seen as 'incremental learning' and financing of new, innovative ideas is generally considered by the banks as being too high risk.

No investigation took place within the context of the project of local training availability for the creation of business plans in support of new ideas. Having emerged while generating the current report, this is not included in the proposed actions but we would recommend that the idea is carried forward to future workshops.

Arad is yet to reach a level of local awareness and appetite for growth from business opportunities in digital developments: this is confirmed also as one of the most significant insights from the SAT results.

Figure 8 Stakeholders' perception of access to public finance



Source: Digital Cities Challenge, Self Assessment Tool (2018)

6. Community engaged in digital transformation

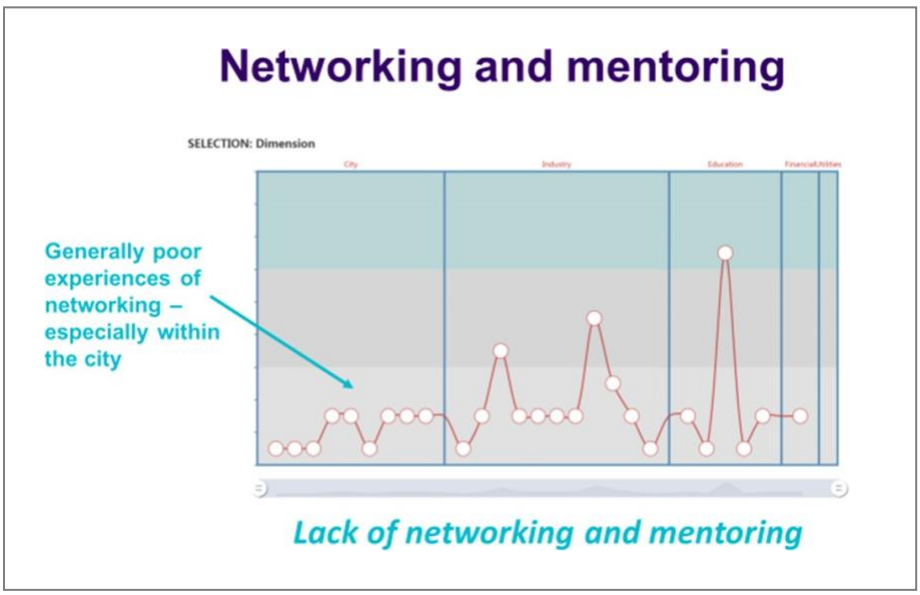
Although both universities in Arad offer IT and technology-based specialisations, digital courses are offered within almost all undergraduate and graduate schools and by some companies. However, those trained in digital specialisations tend to seek careers in cities like Timișoara and Cluj-Napoca: these are 'magnet-cities' offering a wider range of digital job opportunities. The jobs most in demand and publicised are programmers, IT managers, project managers (engineers), network specialists (engineers) and data operators. In every situation companies can only employ using the Classification of Occupations in Romania (COR).

This is one of the reasons why Arad cannot be counted as a city with a strong community of programmers, entrepreneurs, civil and professional associations in the ITC and creative industries. IT is not part of Arad's DNA: however; 'digital' can still be made to – and, indeed - must play a transformational role in the city's future growth.

Both universities in Arad offer, in a complementary way, comprehensive education in IT and related disciplines which respond to the needs of the big employers with big systems and solutions to operate (ERP, CRM etc). Both universities are closer to the private sector than the City Hall, however this is more about placing students in internships and jobs early during school (too early?) to the detriment of students losing the appetite for going beyond / further in both education or the acquisition of more advanced skills. In essence, they may become satisfied with low-ambition jobs and trapped in low-value added activities.

Both universities – including the private university which started as community university - have an opportunity to do more about blended education, in particular to introduce entrepreneurial thinking and behaviour from the outset in the education programme in various ways. This is highly likely to improve the current state of play where there are hardly any start-ups, no accelerators and no visible role models. This is also not helped by the fact that the Regional Development Agency (headquartered in Timisoara) appears to be not interested in anything happening in Arad, apart from the reactive role of monitoring projects which are not connected to a digital vision for Arad's city growth.

Figure 9 Arad stakeholders' views on the digital community in the city



Source: Digital Cities Challenge, Self Assessment Tool (2018)

There is a tech community in Arad organised around IT Arad as (a) Facebook group https://www.facebook.com/groups/165010080947559/ and (b) as a meetup, with ~70 members who meet occasionally (once every two months)loosely connected to the university. There is also a recently set-up YouTube channel https://www.youtube.com/watch?v=xFWPZgf7Sfg.

The event "IT Arad" is organised mainly by three types of people - initiators, organisers and presenters. Other collaborators &/or presenters are involved, depending on the subjects discussed.

The tech community includes several people originated &/or living in Arad and working in neighbouring cities; thus, there is collaboration, at least at the level of information exchange, with other similar communities (e.g. in Timisoara). However, there is virtually no relevant collaboration between various digital and non-digital companies aside from software programs strictly needed for the activity of the non-digital companies (e.g. accounting programs, ERP, MRP, CRM, etc).

The discussions with members of the IT community revealed possible actions to facilitate collaboration. The main idea is to initiate a coherent program, supported by the reputation of one or more relevant institutions, aiming to boost the interaction between the digital and non-digital companies. The program might include:

- Publishing a list and the profile of the digital companies that express their availability to participate in the program and offer support to any interested non-digital company.

- Providing tax incentives for the non-digital companies that implement digital technologies.
- Providing much easier access to public data.

Within the programme, or complementary to it, other specific actions where proposed:

- Create awards such as 'the best digital company of the year', 'the non-digital company that implemented the most digital technology in a year'.
- Start meetings between digital and non-digital companies, and keep the dialogue going even if there is not too much interest in joint activities.
- Implement public digital projects &/or offer them for implementation to local digital companies – at the largest extent permitted by the public acquisition procedures through SICAP (online public procurement).
- Completely digitalise the public administration and make data public.
- Offer incentives to people using digital means to interact with the public administration. (e.g. the local council and the public administration could have a digital document tracking system so that each request could be checked for status and resolution, taxes could be sent by email and paid, the possibility for paying fines and taxes by mobile phone).

Even if there is not much integration between the applications, at a city level, there are several web-based systems solving point-tasks, such as parking tickets, fines and local taxes or the document registration and distribution system.

There are a variety of people and organisations willing to cooperate for the overall benefit of the community, but there is no focus, leadership or coordination of these activities.

7. The state of local digital and physical infrastructure

In terms of digital infrastructure, Arad outperforms the country average. Over 95% of the city is covered 4G, the costs of mobile internet are low and the existing infrastructure is efficient.

Currently, there are 30 active hot spots across Arad (http://www.aradhotspots.ro/ro) put into operation within the framework of an EU funded project, and private wi-fi is offered in almost all public places (schools, universities, cafes, restaurants, hotels etc).

Note: at the current time, neither City administration or other players collect, know how to use or experiment with the use of the data generated by the existing networks to assess patterns of crowding or similar. On the other hand, the mobile phone operator Orange makes use of the data collected via their own mobile broadband network.

The City is aware that there is room for improvement to the current digital transformation and has identified in its Integrated Urban Development Strategy a number of projects and funding sources to improve the digital infrastructure, such as:

- Extension of the access to free secured Internet in public areas;
- Smart Video Surveillance;
- E-ticketing and a video surveillance system;
- Intelligent parking in all public spaces;
- Intelligent solutions for traffic management / integrated public transport monitoring;
- E-administration (integrated platform);
- Digitisation and integration of public services management;
- Improvement /extension of the public administration's Digitax;
- Integrated GIS monitoring system for all the public utilities (water, sewerage, district heating, gas, electricity, internet, cable tv), urbanism and green spaces;
- Digitalisation of the district heating system;
- Digitisation of cultural objectives;

- Air pollution management sensors;
- Smart mobility;
- One stop shop for business – digitisation of services to reduce bureaucracy;

The City has already started to prepare documentations for some of the above projects while other (mainly awareness and educational projects) are already on-going, at different stages of implementation e.g. – "Adaptic" a project implemented by the Chamber of Commerce (CCI) and funded through European Social Fund, POSDRU 2007-2013. CCI worked in partnership with three Romanian and one Spanish institutions. Between 2011-2013, companies and their employees from four Romanian regions (Bucharest-Ilfov, West Region – including Arad, North-East and North-West) benefited from activities focused on digital skills and new technologies. The main objective was to increase the adaptability of employees to IT&C through awareness, short courses for employees and consultancy for the companies. The courses were organised as a 7-hrs practical activity, addressing employees in small groups (7 - 15). At country level, the target group consisted of over 10,000 employees out of **which over 3,000 Arad employees** improved their digital skills (basic level). The courses were on data protection, e-banking, e-commerce, e-business, e-governance and e-tools at very basic practical knowledge. e.g.: how to use Internet banking, how to buy goods on the Internet, how to log-in to sites with secure passwords, how to us ATMs for cash withdrawal or payments, how to keep personal data as safe as possible.

During the assessment visit, some of the entrepreneurs expressed the need for a business incubator or, better, an 'accelerator'. This idea was also discussed in the City Board and business people intended to set-up a company and buy land for building and running an accelerator HQ; however, no adequate funding solutions (either EU or private) were found. A public-funded incubator http://www.uav.ro/ro/cercetare/incubator-afaceri used to exist, but its remote location made it unattractive and inefficient so it was dismantled.

Alternative approaches may be viable and, looking ahead, one of the actions will be to seek ways-and-means of reinvigorating &/or stimulating these activities.

8. Digital solutions enabling the modernisation of business environment

Arad City is aware of the importance of digital solutions for both citizens and the business environment and has initiated a number of projects to improve its public services, such as e-government, Digitax: this is a digital solution for obtaining building permits and urban planning certificates online. Citizens have the option to issue online petitions and their questions are answered in the dedicated section of the City website or via e-mail. Most of the services provided are relevant to companies as well.

In the past years, serious efforts have been made to improve the digital services as well as the dialogue with the business sector. All the local strategies have been developed through public consultations and debates with the stakeholders and, to a great extent, reflect their ideas and proposals.

Arad lacks a specially appointed person in the City Hall with the task to make sure Arad has an enticing environment for the private sector, and to facilitate a coherent and proactive dialogue to promote local business. A Digital strategy is being worked on as part of this current EC facilitation project ('Digital City Arad').

The results are that, in spite of the progress to date (as reported above and in the text to follow), the actual perception by the customer (citizens and businesses in Arad and elsewhere) is that the public services (City Hall +) still have a long way to go to embrace the digital paradigm in an integrated and actionable manner. During the Vision Workshop, stakeholders clearly stated that, as rapidly as possible, public services (a) need help to make sense of what they actually have from point-solutions (digital and non-digital) and (b) to articulate an integrated vision for a pragmatic, customer/business oriented digital Arad.

Again and again, this theme re-occurred i.e. that nobody appears to be responsible for coordinating, reporting and communicating the myriad of independent initiatives currently being undertaken.

As has been reported previously, Arad ranks Nr. 3 in the whole of Romania for digital initiatives – but this is for infrastructure initiatives set in motion. Not so clear, however, is (a) how they are progressing and (b) the impact they are having on the lives of Arad's citizens.

Perhaps more worrying is the fact that stakeholders are not even contemplating external financing to grow new business, explained by the lack of new blood and millennials' lack of interest to develop higher value-added services locally. Of even greater concern during the recent workshop, the local bank was not able to articulate 'customers' as their reason for business in Arad; even more surprising, supporting start-ups was seen to be far too high a risk.

View from the City Hall

The Integrated Urban Development Strategy sets out objectives and measures (including digital solutions) to improve the business environment:

- to make Arad an attractive destination for investment by offering the data, information, infrastructure and support services needed for a competitive local business environment;
- to sustain the dialogue and partnership with the business environment by opening a dedicated office (one-stop-shop) for business and by creating a workgroup for the economic development;
- to facilitate technologic transfer, dialogue and promotion of local products and research results;
- to create a business incubator (resource centre) for prototypes and small production in the North Industrial Zone;
- to open a creation and innovation centre for start-ups, NGOs and artists, dedicated to young people;
- to develop the support infrastructure for business;
- conversion of the former Municipal Hospital building into a business centre: an incubator for entrepreneurs, an information centre and a showroom for local businesses;
- Arad City Hall's document management system has been operational since 2005 (updated 2014);
- Along with the digital solutions previously described, a successful example is the application MyArad (launched in January 2018) for online questions, notifications and

tracking works' status on a digital map. The app has already received 997 complaints in the first semester of operation, which are handled by a team of 3 persons in the city hall;

- Further initiatives included: the online information system to release urban planning documents, as well as the 30 free wifi hot spots in Arad, the SMS payment facility for the parking system or the Library of Applications" project of the Public Library Innovation Program offering media training classes are considered further useful initiatives in the city.

These are encouraging actions and initiatives, demonstrating that public authorities understand the potential for integrated IT solutions, but a coherent digital policy has not yet been developed. This continues to cause waste of time for both citizens and business people and duplicated efforts for them and the public servants who wish to serve them.

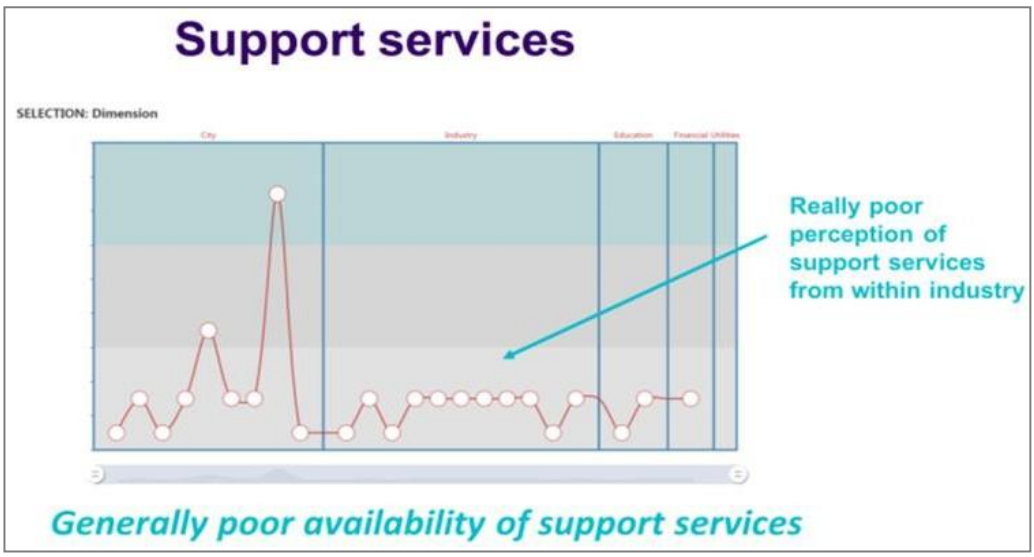
To further create a friendlier business environment, the local authorities should improve communication and problem solving with businesses (via a portal) and improve access to public data (open data). A central portal should be developed to host all the public services.

Great efforts are needed to digitise the archives and create databases to be accessed directly by both citizens and companies.

Last, but not least, the City should promote the use of digital services as they are developed. This aspect is very important as, while steps have already been taken, quite few people are still not aware of, and use the existing applications.

Lack of public support to businesses is a key weakness of the Arad system, as perceived by the local stakeholders involved in the assessment (see Figure below). Moreover, especially the industry voiced the lack of support for digitalisation in non-digital companies, and the need to create awareness of digital transformation.

Figure 10 Arad stakeholders views on extent of digitalisation support services in the city



Source: Digital Cities Challenge, Self Assessment Tool (2018)

How can digital contribute to face business challenges?

- Upskilling current workforce to be relevant and fit for the digital economy (increase value-added skills);
- Developing skills and an appetite for using and analysing data to solve problems collaboratively;
- Develop future-proof skills to forecast and think creatively especially for Arad's millennials and younger groups;
- Use the digital skills and data to make the city attractive to investment;
- Use data to make better and quicker decisions (productivity);
- Increase the quality of services and goods provided by the public administration; aim to operate an integrated 'one-stop-shop' for the public services citizens, businesses and community needs. Reduce/remove citizens and businesses' time spent queuing to pay bills and getting information;
- Set-up a shuttle to connect Timisoara airport to Arad to show Arad is genuinely interested in attracting attention, new competencies and investment;
- Capitalise on the natural economy (DNA) of Arad (trams, trade, logistics) and make them natural targets for digital transformation also via better use of public money and community engagement;

- Capitalise on Arad's strategic location for multi-modal transport; city to collaborate with local competent and successful logistic companies to make this happen;
- Capitalise on Arad's architectural (but decaying) patrimony: integrate and make urban cadastre accessible, rate the issues and establish a joint plan of action for relevant stakeholders (city, owners, developers, financiers);
- Raise the digital profile (branding) of the city through the above;
- Induce a sense of urgency for making things happen; and
- As a result, create opportunities for higher pay and standards of living.

In summary, there is a genuine opportunity for integration and for setting up a 'one-stop shop' &/or 'digital kiosk' for all the services public administration should offer to citizens and businesses as their main purpose.

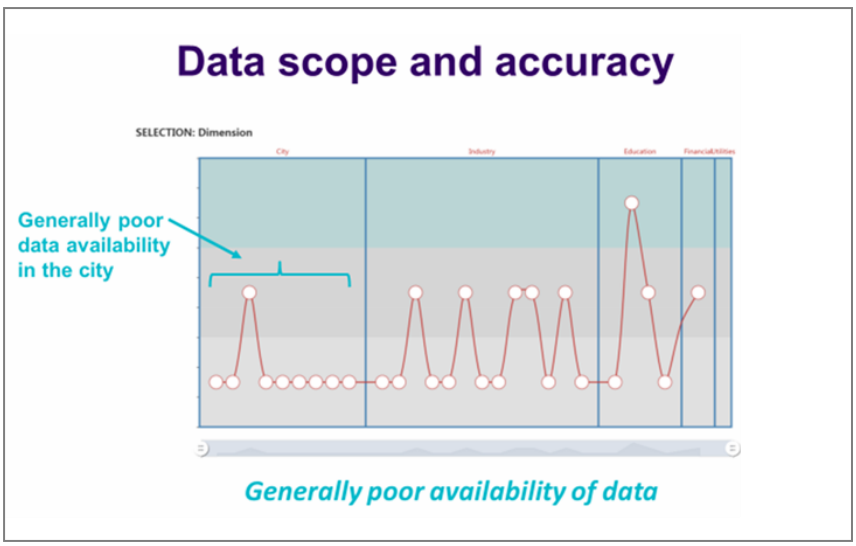
9. Data-driven innovation

Digital transformation in Arad city requires evaluating and, most probably, the pragmatic replacing of strategies which worked in the past with new ways of working in the digital future. Data is the 'fuel' for a modern digital economy - and the only source for competitive differentiation, therefore Arad City **needs to internalise** that the use of data is key to genuine transformation from old to new.

At the current time, public information is made available to the public through the official City website but few are in the form of Open Data. Some government institutions charge fees for the data they provide and, in many cases, they are not in editable formats.

The City provides data related to the city management (mayor, deputy mayors, local councillors, staff, including CV-s and asset declarations), organisational chart and services provided, the activity of the local council (minutes of meetings, decisions, proposals), documents issued, public services, procurement, investments, EU projects, taxes, budget, culture, education, activities and events, local police, agriculture, investors, disaster management, international collaborations, reports, documents and forms etc. The City also has a Facebook page and the Mayor is in constant communication with the citizens on his Facebook – including live periodical meetings.

Figure 11 Open data availability



Source: Digital Cities Challenge, Self-Assessment Tool (2018)

The websites of the public institutions offer a wide range and a vast quantity of information in line with the principles of transparency, but an Open Data policy has not yet been defined. As of now, no relation between the data provided and innovation can be identified.

Some business people who were interviewed during the assessment visit consider that the data on economy, labour, tourism and population statistics are very generic (nothing in-depth or operational). People from both the private and academic sectors comment that, even if there are data sets available at a national level, it is difficult accessing &/or particularising them to a local level.

Some private companies complain that access to public tenders is difficult as a result of data being hidden behind a poorly designed centralised system.

Other business people say they do not require open data, either because they outsource their services to automotive and work on their own data, or because each company has different projects and different needs. This is a surprising feedback and may reflect the fact that a significant number of local companies provide outsourced services to international organisations and so have little-or-no need for local data. The City should ask the business people what is the information that they need and develop the open data sets accordingly.

On the other hand, government policies should be developed to increase economic growth focused on trying to increase aggregate demand (demand side policies) or increase aggregate supply/productivity (supply side policies). Some believe that local IT companies are not designed to use public/open data mainly because they focus on custom products and outsourcing has lowered expectations and appetite for innovation.

The main barrier in fostering innovation activities through the use of open data is the lack of a systematic concern for the availability of open data and the coordination of the existing innovative actions.

A change in perspective (risk taking, appetite for innovation, entrepreneurial, higher value-added) could lead to the creation of own-designed and built IT products which, in turn, will increase the use of open data.

When addressing the City, most businesses want to obtain data related to building permits, land purchase, obtaining approvals, permits and certificates, opening a business, taxes and

fees, local incentives, public procurement, utility services, urban plans, ongoing and planned works.

In their activity, businesses are using the internet to find out what products or services are needed on the market, in order to increase their potential market. Virtually no data other than Google or social media sources are used by local IT companies.

Even so, there are some private innovations developed in Arad on the basis of public data. There are several apps available in Google Play that offer data on public transportation, for taxi ordering based on GIS, information about events and cultural programs, restaurants and stores. Some of these are Arad Official App (Schubert & Franzke), Tpark (Piconet), TaxiVerbita (Probyte), Taxi Europa (Enhanced terminals for telephony), Moovit (the European app configured for Arad), Datz Mobile – artists and events (restricted access).

All discussions with the stakeholders - mainly the companies - revealed the need for an integrated platform that is properly managed, maintained and updated, thus contributing to an operational, growth-conducive digital business environment. The Chamber of Commerce, especially in view of interests in investment, strongly articulated the need to develop trust between public and private organisations so that enquiries and joint problem solving driven by data become a natural within Arad as part of the city's DNA.

In summary:

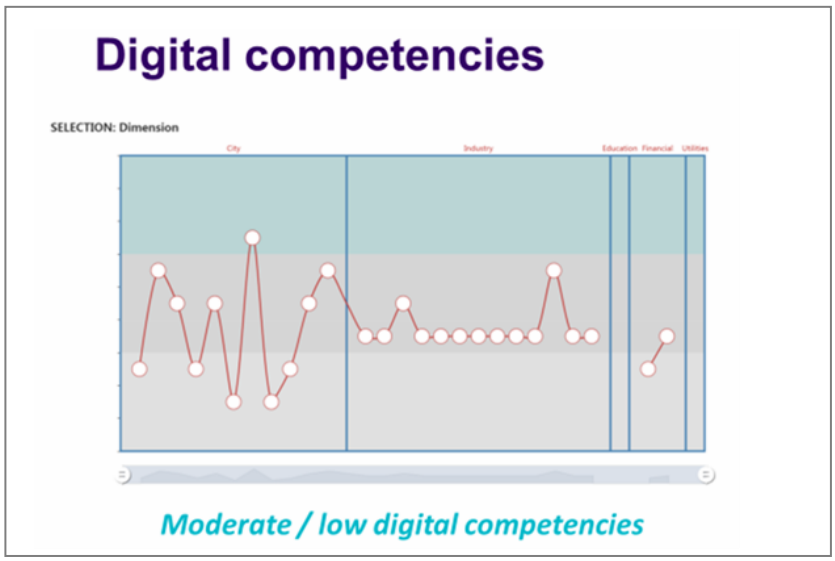
The missing piece in this data puzzle is the (open) data and communication with the business sector. There is little-to-no knowledge of what data is actually available or can be made available. Those datasets available are difficult to access (official requests and delays) and, indeed, even more difficult to use. In a nut-shell, Arad is in very early days for embracing the digital paradigm; this is a huge opportunity and, equally in need of improvement.

One of the most obvious approaches (in terms of visibility and care for the citizen) is a one-stop-shop for integrated digital public services. As for the business environment and growth, the most obvious action is to set up responsibility for genuine engagement and accountability to private business, as they are the key contributors to the local economy - both now and in the future.

10. Skills and entrepreneurial culture

According to local stakeholders, Arad has a modest digital skills capital. There are two universities who offer IT and technology-based courses, however the magnet for higher value digital jobs is Timișoara and Cluj-Napoca (as mentioned earlier in Chapter 7 as well). There are consistent vacancies for digital jobs and students start working from the second year of studies, specialise for a certain job and somehow stop their further development; this makes it more difficult later on to secure a position in the higher value-added labour market (see Figure 12).

Figure 12 Digital skills in Arad



Source: Digital Cities Challenge, Self Assessment Tool (2018)

Digital skills are developed by local high schools and the two universities.

There is a high demand for modest-to-high level skills in engineering, IT (outsourcing services) and IT support for local, multinational and non-digital companies.

Companies try to attract local IT talent by offering internships and work placements with universities (limited by the legislation), participating in job fairs and, at some extent, supporting part of the courses on digital subjects. Still, they face difficulties – especially in engineering (medium level skills, for outsourced manufacturing) and IT companies (higher level skills, for local and mainly outsourced projects), because local IT talent tend to seek better opportunities in other cities.

The universities do their best to enhance cooperation through internships and international programmes (such as Erasmus). Each company develops their particular pool of specialists who then later become competitors in the labour market.

Digitalisation of the entrepreneurial activity in the city is not very visible - except for a very few start-ups (e.g. through Start-up Nation)

In summary:

Arad's millennials appear to cease being curious too early: they appear to lack inspiration and ambition! Even the majority of those who do continue, eventually leave Arad for the magnet cities' opportunities, which are also better paid, but not necessarily higher value-added employment. Outsourcing activities are still the dominant characteristics in technology and IT-related business and this is where the competition for talent thrives.

In some senses, Arad seems to be a city stuck in the past in terms of attractiveness (social environment, employment opportunities, etc.) and young people seek the 'bright-lights' and opportunities elsewhere.

Changing the focus of education towards less information but more inspiration and useful skills at younger age, combined with genuine entrepreneurial learning, mentoring and soft skills are much needed to create an impact in the medium to long term. However, this responsibility cannot just be put on the universities – it requires an integrated approach across the city.

11. Digital transformation SWOT analysis

CITY: ARAD	Strengths	Weaknesses	SAT Feedback
Infrastructure	> Rail and road node, border proximity > Wireless access in most parts > Public transport (most extensive tram) > Cultural and touristic legacy; green; exhibition capacity	> No public transport transfer TM-Arad > Lack of parking areas in city center > Traffic flow > Inter-connected multi-modal transport	> Digital infrastructure adequate for digitization of local industry
Access to data	> Data is available > City Hall is willing to make data available to business > Regular communication with the community	> Data is not fit for purpose (not user-centric) > No real time data provision > Lack of regular data inputs and consistency across sources	> Little or no open data available > Limited use of data for policy making by the city
Digital skillset	> Office and web dev skills in administration > Formal technical / IT education from high school and university > Fair provision in public and private companies	> Lack of incentive for tech skills in administration > Data doesn't flow to feed business > Legacy protocols and procedures > Graduates settle elsewhere (~40%)	> Companies need to catch up > Senior management not convinced about the benefits of digital
Companies' digital competencies	> Some in-house experiments (logistics, IoT) > Entrepreneurial carriages and tram company > Assistive technology (voice recognition sw) > Integrated digital value-chain (productive manufacturing)	> Low pay locally > No collaboration in problem solving > Low value-added activities mainly driven by outsourcing and short term thinking > Low visibility of IT Hub and/or innovation for growth	> A few ICT providers with limited capabilities > Most companies need to catch up on digital training
Community	> Active NGOs > Strong youth presence > Motivated by changes with impact on quality of life > Multi-cultural	> Sharing is not natural > Low appetite for voluntary activities > No business centre or areas for professional networking	> Little or no collaboration between digital and non-digital stakeholders > No visible tech community in Arad
Finance	> There is willingness from finance providers	> No visibility about demand for finance > Minimal information for start-ups	> The city does not offer support to non-digital companies to get access to grants/tax incentives for digital projects
Support services	> Willingness > The two universities are complementary in domains; both offer IT programs	> Difficult to recruit, train and retain > Inefficient administrative processes: HS permits, queues etc > Poor access to data & information	> No promotion/case studies about the importance of digital developments > There are no innovation labs &/or accelerators in the city
Governance & leadership	> Ambitious political leadership	> Ad-hoc, event-driven communication between city hall and business > Saturation of strategies > Legislation doesn't allow a business development role	> No executive assigned for digital development > Stakeholders have no shared vision for digital

Appendix I: Table of abbreviations and definitions

Digital Cities Challenge (DCC)

The Digital Cities Challenge initiative, was launched by the European Commission in November 2017 and scheduled to run until August 2018. It helps cities (The Digital Cities, referred as DC) develop and implement digital policies that can transform day to day life for residents, businesses, workers, and entrepreneurs.

Digital City Teams (DCT)

Each participating Digital City has a Digital City Team which will be in charge of managing and coordinating the involvement of the city in the Challenge. Digital City teams will include a) the core team which consists of one Lead Expert, one Local Expert, one Support Consultant as well as Thematic Experts; and the b) the Digital City leadership team which is made up of representatives of the city (i.e. local elected officials, local public servants, and the designated project management team).

Digital Transformation Trajectory (DTT)

The Digital Transformation Trajectory refers to the evolutionary path a city follows while taking part in the initiative, from the preliminary assessment of the digital potential of the City, to the definition of the City's digital transformation strategy and roadmap.

Field Advisory Services (FAS)

Field Advisory Services are services provided by the Digital Cities Challenge to Cities throughout the duration of the initiative. The Field Advisory Services include the organisation of one assessment visit and a number of local workshops, which will gather local stakeholders involved in defining the digital transformation strategy of the City.

Key Performance Indicators (KPIs)

The objective of the KPIs is to collect data that can diagnose the current status in terms of digital maturity and measure the progress made by cities during and at the end of the Digital Cities Challenge initiative. The KPIs will facilitate the activities of the policy makers and stakeholders of cities when identifying and addressing the bottlenecks and obstacles of the

processes of digital transformation and industrial modernisation. They will also enable the right identification of the key success factors of the different initiatives and actions undertaken.

Self-Assessment Tool (SAT)

The objective of the SAT is to identify the starting points for discussion on how to (further) develop, reshape and improve the digital transformation strategies of European cities. It is an online-tool developed by the project with a set of questions and corresponding response options to be filled in collectively by a set of stakeholders such as industry representation, utility companies, education and research and financial institutions. The SAT covers eight key dimensions: Infrastructure, Open data, Digital skillset, Digital competencies of companies, Community, Finance, Support services, Governance and leadership.

Appendix II: Bibliography

1. Cultural Strategy 2015 - 2025 http://www.primariaarad.ro/html/ron/temp/strategia0820/StrategiaCulturala_2015-2025.pdf
2. Energy Strategy for the 2006-2020 http://www.primariaarad.ro/files/proiecte/p969.pdf

Local Strategy for the Development of the Public Lighting Service

3. Green Strategy - Strategy for the Transformation of the Municipality of Arad into a Green City 2016-2025 http://www.primariaarad.ro/html/ron/temp/strategia0820/Green_Strategy_ARAD_2016_2025_FINAL.pdf
4. Informatisation Strategy for the City Hall of Arad
5. Integrated Revitalisation Plan for the Protected Area http://www.primariaarad.ro/download/PlanRevitalizareaZoneiProtejate.pdf
6. Integrated Urban Development Strategy 2014 – 2030 http://www.primariaarad.ro/html/ron/temp/strategia0820/SIDU_2014-2030.pdf
7. Public Health Strategy /Health Development Plan 2016-2025 http://www.primariaarad.ro/files/proiecte/p948.pdf
8. SEAP - Sustainable Energy Action Plan,2012 – 2020 http://www.primariaarad.ro/html/ron/infoeuropa/RAPORT_STRATEGIC_si_PAED_in_Municipiul_ARAD.pdf
9. SUMP - Sustainable Urban Mobility Plan for the Municipality of Arad 2016-2023 http://www.primariaarad.ro/html/ron/temp/strategia0820/PMUD_Arad-actualizat_20septembrie2017.pdf

Appendix III: KPIs table

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
Infrastructure	**Digital infrastructure**	1	**% of households with broadband internet at home [%]**	X	X	X	Telco provider following DESI definition	Numerator: number of households with broadband internet at home. Data to be inquired to telco provider(s) operating in the city. Broadband connection	33 %	- Denominator: 25,000 source: http://www.primariaarad.ro/arad.php?page=statistica.html - Numerator: 72,000 source: estimate by local expert

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								used by the household includes DSL, wired fixed (cable, fiber, Ethernet, PLC), fixed wireless (satellite, WiFi, WiMax) and mobile wireless (3G/UMTS) (DESI definition). Denominator: Number of households. Data to be		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								collected from Eurostat "Living conditions - functional urban areas [urb_llivcon]" .		
		2	**% of enterprises with broadband internet at home [%]**	X	X		Telco provider following DESI definition	Numerator: number of enterprises with broadband internet. Data to be inquired to telco provider(s) operating in	40 %	- no data available estimate by local expert

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								the city. Broadband connection used by the enterprise includes DSL, wired fixed (cable, fiber, Ethernet, PLC), fixed wireless (satellite, WiFi, WiMax) and mobile wireless (3G/UMTS) (DESI definition). Denominato		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								r: Number of enterprises. Data to be collected from national registers of companies database.		
		3	% of households with internet at home [%]	X	X		Telco provider following DESI definition	Numerator: Number of households with internet. The data to be inquired to telco provider(s) operating in the city. Internet	96 %	- Denominator: 74,960 source: http://www.primariaarad.ro/arad.php?page=statistica.html - Numerator: 72,000 source: M21

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								connection used by the household includes dial up, DSL, wired fixed (cable, fiber, Ethernet, PLC), fixed wireless (satellite, WiFi, WiMax) and mobile wireless (3G/UMTS). Denominator: Number of households. Data to be collected		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								from Eurostat "Living conditions - functional urban areas [urb_llivcon]" .		
		4	**Average speed of internet [Mbps]**	X			Telco infrastructure providers	Data to be inquired to telco infrastructure providers.	75 Mbps	-source (2015) = 75.54: https://specialarad.ro/cea-mai-mare-viteza-de-net-din-romania-este-intr-un-sat-vezi-cum-sta-aradul/ - source (2017, average Ro) = 95 Mbps: https://www.libertatea.ro/utile-si-servicii/utile/p-clasament-european-si-mondial-al-vitezei-de-internet-2017-1897914

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
		5	Average cost of broadband internet [EUR/Mbps]	X			Telco infrastructure providers	Data to be inquired to telco providers.		
		6	% of people using mobile internet to go online [%]	X	X		Telco providers	Numerator: number of people using mobile internet to go online. Denominator: Population Data to be inquired to telco providers	75 %	- estimate by local expert (the most used Internet connection is mobile)
		7	**% of city covered by 4G [%]**	X	X	X	Telco infrastructure providers	Numerator: Number of square	95, 12 %	- source (2018): https://www.orange.ro/acoperire/harta-acoperire-retea/

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								meters covered by 4G or Number of households living in areas covered by advanced fourth generation mobile broadband (LTE protocol) (DESI definition) Denominator: Number of households. Data to be		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								collected from Eurostat "Living conditions - functional urban areas [urb_llivcon]" .		
		8	Average cost of mobile internet [EUR/Mbps]	X			Telco infrastructure providers	EUR monthly charges in EUR by basket with VAT included. The baskets must be defined according to		'- no data available

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								the EU study "Mobile Broadband Prices in Europe 2016". Data to be inquired to telco providers to update/validate the data collected in 2016 for the aforementioned study.		
		9	Availability of (intelligent) sensors in	X			Public administration/educational	This is a yes or no indicator to	Yes	

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			the city (e.g. Low Power Wide Area Networks for the connectivity of devices)				establishment	be inquired to the relevant public administration representatives.		
		10	Number of unique devices connected to wireless internet freely available at public spaces in last 12 months [#]	X			Public administration	The public administration to inquire the data on unique devices connected during the last 12 months to the company(-	381.738	- total number of connections, not unique devices

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								ies) in charge.		
	Non-digital infrastructure	11	**Availability of integrated mobility platform to travel across transport modes [Y/N]**	X			Public administration	This is a yes or no indicator to be inquired to the relevant public administration representatives.	No	- there are applications for different sectors (ex. Tram: https://moovit.com/)
		12	Availability of real-time transport monitoring system [Y/N]	X			Public administration	This is a yes or no indicator to be inquired to the relevant public	No	

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								administration representatives.		
		13	# of public transportation tickets purchased online [#]		X		Public transportation companies	Numerator: # public transportation tickets purchased online in last 12 months Denominator: # public transportation tickets purchased in last 12 months Data to be inquired to	0,1 %	- Numerator: 2,700 - Denominator: 2,876,000 - online tickets are available only recently

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								public transportation companies operating in the city.		
		14	**Availability of one-stop shop for water, gas, electricity for address changes or new addresses? [Y/N]**	X			Public administration	This is a yes or no indicator to be inquired to the relevant public administration representatives.	No	
		15	**Availability of coax or fibre network at**	X			Public administration	This is a yes or no indicator to be inquired	No	- Partly. Works ongoing.

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			main business parks [Y/N]					by the relevant public administration representatives. The information should be provided by main business parks.		
		16	% of permits (e.g., housing construction, house extension) applied for	X	X		Public administration	Numerator: # permits applied online Denominator: # permits The type of	0	- Implementation ongoing

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			online in last 12 months [%]					permits considered will need to be described.		
		17	**% of Individuals who used the internet for interaction with public authorities (average for the last three years)**	X	X		Eurostat Individuals who used the internet for interaction with public authorities (isoc_r_gov_i) NUTS 2 level	This indicator is available in Eurostat: Individuals who used the internet for interaction with public authorities (isoc_r_gov_i) NUTS 2 level (unit of measure=%	388.969	- average session duration: 2.36 min - source: Google Analytics on www.primariaarad.ro

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								of individuals; time=last three years; calculation= average). Note: If the city is not included in the Eurostat database it would need to be explored if such data can be collected by the public administrator. If possible a distinction		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								between households and enterprises to be made.		
Open data	**Data scope and accuracy**	18	**Availability of open datasets [Y/N]**	X			Public administration	This is a yes or no indicator to be inquired to the relevant public administration representatives. This includes an assessment of the relevance of	Yes	- to a certain extent - difficult to obtain - difficult to particularise to local level;

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								national level open data for the city in focus.		
		19	# of downloads of open datasets in last 12 months [#]	X			Public administration	This is a yes or no indicator to be inquired to the relevant public administration representatives.	Yes	
		20	**% of datasets offering real time**	X			Public administration	Numerator: # open databases offering real time		- 9.220 distinct querries and 12,172 payments

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			information [%]					information Denominator: # open databases		
	Usage of open data	21	**Number of cases of digital companies using open data to develop a new service or to support their business operation [#]**	X			Industry associations	Data to be inquired to representatives of industry associations. Open data considers those from both public and private companies.	8.000	- estimate from Chamber of Commerce
		22	**Number of cases of**	X			Industry associations	Data to be inquired to	15.000	- estimate from Chamber of Commerce

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			non-digital companies using open data to develop a new service or to support their business operation [#]					representatives of industry associations. Open data considers those from both public and private companies.		
Digital skillset and education	**Digital education**	23	**% of people who bought or ordered goods or services over the internet in**	X	X		Eurostat (individuals who ordered goods or services over the internet for private use	This indicator is available in Eurostat: Individuals who ordered goods or services	35 %	estimate by local expert

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			past 12 months [%]				(isoc_r_blt12_i) NUTS 2)	over the internet for private use (isoc_r_blt12_i) NUTS 2 (unit of measure=% of individuals; time=last three years; information society indicator= last online purchase in 12 months; calculation= average).		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
		24	**% of students in digital subjects over the last 5 years [%]**	X	X	X	Educational establishment/ SAT	Numerator: # of students in tertiary education (i.e. post secondary education) on a digital subject related diploma (e.g. computer engineering, big data, cybersecurity, web design, artificial intelligence	7%	- Denominator: 11,370 - Numerator: 819

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								etc.) Data to be inquired to all educational establishments in the city. Denominator: # of students in tertiary education (i.e. post secondary education)		
		25	**% of ICT graduates employed in the city**	X	X		Educational establishment (alumni database)	Numerator: # ICT graduates employed in	52,4%	- Denominator:1,040 - Numerator: 545

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			over the last 5 years					the city Denominator: # ICT graduates Data to be inquired at alumni databases of higher education institutes		
		26	% of non ICT/digital diplomas at university colleges, universities (e.g., medicine, economics,	X	X		Educational establishment/ SAT	Numerator: # of non ICT diplomas including digital courses (e.g., medicine, economics,	78,2%	- no. of study programs - almost all have at least one digital related subject - Denominator: 78 - Nominator: 61

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			biology, agriculture) including digital courses					biology, agriculture, etc.) Denominator: # of diplomas		
	Attraction of IT talent	27	**# of employees in digital companies [#]**	X	X	X	National register	# of employees in ICT companies. The definition of ICT companies is based on the NACE rev.2 classification as defined by the	11.000	- estimate by local expert (estimate by Chamber of Commerce: 27,000)

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								OECD and the EU project PREDICT (see Appendix ICT companies definition).		
		28	**# of vacancies for digital jobs [#]**	X	X		web-crawling	To construct this indicator, you need to identify the major online job search engines in your city. You have to web crawl	520	- web-crawling by local expert and job-fair

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								the job advertisements and search for digital related vacancies. For the 15 model demonstrator cities this indicator will be provided by the advisory team.		
		29	% of foreign students in digital subjects [%]	X	X		Educational establishment	Numerator: # of foreign students in tertiary	0,8 %	- Denominator: 1245 - mainly medicine - Numerator: 10

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								education (i.e. post secondary education) on a digital subject related diploma (e.g. computer engineering, big data, cybersecurity, web design, artificial intelligence etc.) Denominator: # of		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								foreign students		
		30	% of vacancies for digital jobs not filled in 6 months [%]	X	X		web crawling	To construct this indicator, you need to identify the major online job search engines in your city. You have to web crawl the job advertisements and search for digital related vacancies.	35 %	- estimate by local expert

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								For the 15 model demonstrator cities this indicator will be provided by the advisory team.		
Digital competencies of companies	**Competencies**	31	**% of companies with internet website [%]**	X	X	X	National register	Numerator: # of companies with internet website Denominator: # of companies Database to be inquired by the	60 %	- estimate by local expert (estimate by Chamber of Commerce: 40%)

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								national register of companies. This assumes that the presence of a website is a compulsory input.		
		32	% of companies offering online payment option	X	X		Web-crawling	To construct this indicator, you need a database of local companies registered in your city	10 %	- no database available - estimate by local expert (based on web-crawling)

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								with their internet homepage address. You need to web crawl the website of these companies and look for keywords (translated into your language) such as • webshop • e-shop • purchase online • online payment		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								If possible, there is a need for manual checks and data cleaning in order to eliminate false positives. For the 15 model demonstrator cities this indicator will be provided by the advisory team.		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
		33	**% of manufacturing companies offering digital services (e.g., company offering remote maintenance)**	X			Web-crawling	To construct this indicator, you need a database of local companies registered in your city with their internet homepage address. You need to web crawl the website of these companies and look for keywords (translated	10 %	- no database available - estimate by local expert (based on web-crawling)

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								into your language) such as • mobile platform, digital platform • online service centre • digital service • digital solution • connected solution • connected digital product and system • online		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								management system • online service management • mobile business system • mobile device connection If possible, there is a need for manual checks and data cleaning in order to eliminate		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								false positives. For the 15 model demonstrator cities this indicator will be provided by the advisory team.		
		34	**# of mobile applications available in the city on smartphone (such as food delivery, peer-to-peer**	X	X		Public administration	#of mobile applications. This indicator includes mobile applications such as food delivery,	23	- My Arad - City Hall - Moovit, Arad Official App, etc - taxi, food, flowers = 18 - electronic catalogue for schools =1 - bike sharing =1

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			car sharing etc.)					peer-to-peer car sharing etc. These include both internationally developed applications and locally developed applications.		
		35	# of users of mobile applications available in the city on smartphone (such as food delivery, peer-to-peer	X	X		Public administration	# of users in the city. Data to be inquired by the administrators of the mobile applications such as food		- no data available

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			car sharing etc)					delivery, peer-to-peer car sharing etc.		
	Training for employees	36	**Share of companies offering training to their employees that are aimed at enhancing their digital skills**	X	X		Industry associations	numerator: # of companies offering training denominator: # of companies By main sector	60 %	- estimate from Chamber of Commerce
Community	**Ecosystem collaboration**	37	**Number of ICT clusters and number of ICT companies**	X			Industry associations	Information to be inquired by the public administratio	1, 18	- there is one strong regional IT&C cluster, in Timisoara (50 km south) - estimate by local expert

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			joined as cluster member in any cluster organised/formed in the city					n and by the existing cluster organisations.		
		38	**# of digital start-ups**	X	X	X	Public administration/ National registers	# of digital start-ups (young firms aged five or less years) to be identified within the national registers of companies database.		- no data available

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
	Networking and mentoring	39	Number of events on digital topics and/or for digital companies in the last five years	X	X	X	Public administration	# of events on digital topics and/or targeting specifically digital companies organised in the city in the last years. Sources include https://www.meetup.com or other local sources of events.	125	- mainly private

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
Finance	**Public**	40	**Grants / tax incentives provided at city level to support digital start-ups in last 12 months [EUR]**	X	X		Public administration	Support to digital start-ups (young firms aged five or less years) in EUR in the form of grants in EUR granted in the last 12 months and tax incentives measured according to the initial revenue loss method of the Frascati	0	- no grants provided by the city. There are companies / start-ups that have applied successfully for EU funds.

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								manual (2015): the amount by which tax revenue is reduced as a consequence of the introduction of tax expenditure, based upon the assumption of unchanged behaviour and unchanged revenues		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								from other taxes.		
		41	# of digital start-ups which received grants / tax incentives at city level in last 12 months [#]	X	X		Public administration	# of digital start-ups (young firms aged five or less years) which received grants / tax incentives at city level in last 12 months.	0	
		42	**Grants / tax incentives provided at city level to support non-digital**	X	X		Public administration	Support to non-digital companies for digital projects in the form of	0	- no grants provided by the city. There are companies / start-ups that have applied successfully for EU funds.

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			companies for digital projects in last 12 months [EUR]					grants in EUR granted in the last 12 months and tax incentives measured according to the initial revenue loss method of the Frascati manual (2015): the amount by which tax revenue is reduced as a consequenc		

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								e of the introduction of tax expenditure, based upon the assumption of unchanged behaviour and unchanged revenues from other taxes.		
		43	# of non-digital companies which received	X	X		Public administration	# of non digital companies which received	0	

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			grants / tax incentives for digital projects at city level in last 12 months [#]					public support in the form of grants or tax incentives for digital projects in the last 12 months.		
	Private	44	**Number of digital start-ups receiving a loan in last 12 months [#]**	X			Financial institution	To be inquired to financial institutions. Digital start-ups are young firms aged five or less years.		- no data available - banks are not responsive

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
		45	Number of digital start-ups received venture capital in last 12 months	X			Venture capital firms	To be inquired to venture capital firms or financial institutions or other entrepreneurship support initiatives in the city. Digital start-ups are young firms aged five or less years.	0	- data are provided by only one (important) venture capital firm
		46	**Availability of business angels for**	X			Financial institution	This is a yes or no indicator to		- Only at national level http://www.finantare.ro/catalog-business-angels

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			digital start-ups [Y/N]					be inquired to financial institutions.		
Support services	**Innovation lab & accelerators**	47	**# of innovations labs / accelerators [#]**	X	X		Public administration	This indicator captures the local presence of innovation labs, accelerator, or incubators.	2	- UVVG - Tehimpuls Timisoara
		48	**# of start-ups / companies attached to innovation labs /**	X	X		Public administration	# of start-ups/companies that have taken their ideas to innovation labs/	24	- UVVG - 7 - Tehimpuls Timisoara - 17 (source: Innomatch)

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			accelerators [#]					accelerators / incubators.		
	Awareness raising	49	**Number of participants in awareness raising events organised in the area of digital transformation/Industry 4.0 etc. [#]**	X			Public administration	# of participants in awareness raising events in the area of digital transformation/ industry 4.0.	3.500	- only events organised by the universities and by private companies
	Other support services	50	**# of support services (other than financial) available for supporting**	X			Public administration	A description of the type of support services should be	0	- no data available

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			digital transformation in the economy					briefly provided.		
Governance and leadership	**Shared vision**	51	**Availability of digital strategy [Y/N]**	X			Public administration	This is a yes or no indicator to be inquired to the relevant public administration representatives.	No	link - to be provided by the City Hall
	Coordination	52	**Availability of clear executive responsible for digital**	X			Public administration	This is a yes or no indicator to be inquired to the	No	who - to be provided by the City Hall

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
			development plan [Y/N]					relevant public administration representatives.		
		53	**# of man hours of executive responsible on weekly basis dedicated to coordination of digital development plan [hours]**	X			Public administration	This indicator assumes the existence of a digital development plan and that the executive responsible is partially dedicated to this task (less than	10	- estimate from City Hall

		ID	KPIs	Diagnose	Monitor	Communicate	Source/definition	Explanation	Value	Comments
								one full time equivalent). The indicator should be provided in hours per week.		
	Implementation and monitoring	54	**Monitoring framework for the implementation of the city digital strategy [Y/N]**	X			Public administration	This is a yes or no indicator to be inquired to the relevant public administration representatives.	No	

Appendix IV: KPIs for Arad's Ambitions

Highest priority KPIs

Vision and ambition statements	Key performance indicator	Baseline	Targets	Means of verification
1. To establish and develop Arad's digital value proposition and branding for growth	Existing of a multidisciplinary Digital Council to implement DCC and enable collaboration of all key actors	N	Y	Constitutive documents, Statute
	# of projects originated from the Digital Council's activity (/year)		5	List of projects
	# of projects implemented with the support of the Digital Council's activity (/year)		3	Project reports
	# of people involved in awareness raising activities related to digital value and branding (/year)	To be collected	300	List of participants
	# of skill developing activities dedicated to the members of the Digital Council		5	List of participants and Subject report
	# of digital oriented study programs, both at pre-university, undergraduate and graduate level	To be collected		Schools' and university registers

Vision and ambition statements	Key performance indicator	Baseline	Targets	Means of verification
2. To create conditions to stimulate and improve Arad's entrepreneurial culture	**#** of sectorial "stories" from other cities in Romania and Europe presented and considered as "lessons learned" (/year)	1	7	List of participants, Presentations
	# of people involved in activities aimed at developing business skills for the young (/year)	To be collected.	100	List of participants
	# of people involved in activities aimed at developing digital skills for citizen with various background (/year)	To be collected	75	List of participants
	# of cases of blending academic education with a business-based experience (/year)	To be collected	8	Case reports
	# digital and innovative start-ups created (/year)	To be collected	2	Registers, registration codes (ONRC)
3. To develop and provide digital services to both business and citizens	Existence of a Compartment for Digital Strategies and Projects in the City Hal (Y/N)	N	Y	The Organisational chart of the City Hall
	Appointment of a Chief Digital Officer in the City Hall, with appropriate responsibilities and authority	N	Y	The Organisational chart of the City Hall
	# of services provided through an extended one-stop-shop for business and citizens (tax, authorizations, cadastre, garbage, fines, education, etc)	2	8	The functioning links on the City Hall webpage

Vision and ambition statements	Key performance indicator	Baseline	Targets	Means of verification
4. To join up thinking and behaviour between Arad's digital and non-digital stakeholders across sectors	# of digital services provided to support citizens' mobility (e-ticketing, parking, real-time bus display, rental of bikes etc)	2	2	List of applications downloaded (AppStore)
	# of companies/ citizens using at least 2 digital services though the one-stop-shop (/year)	To be collected		Service usage reports
	Existing of a new, modern, interactive website for the City Hall, with accessibility for all (Y/N)	Y (primitively)	Y	The URL of the website
	# of users or just visitors of the City Hall website (/year, % of active population)	To be collected		Website monitoring reports
	# of users with special needs of the City Hall website(/year)	To be collected		Website monitoring reports
	Availability of operational open datasets [Y/N]	N	Y	List of the datasets and their location (URL)
	# of downloads of open datasets (/year)	To be collected.		Website monitoring reports
	% of datasets offering real time information [%]	To be collected	5%	Update reports, Website monitoring reports
	# available (published) "stories" related to the use of open data from other cities	To be collected	12	List of available publications

Vision and ambition statements	Key performance indicator	Baseline	Targets	Means of verification
	Existing of a physical space (open lab) set-up to experiment with data, pilot, share knowledge, act entrepreneurially (Y/N)	N	Y	Constitutive documents, Operating rules
	# of people using the open lab (% of active population)		2%	Statistics
	% of young people using the open lab (out of all users)		50%	Statistics
	# of technology events (meetups, digitatlon, gaming, contests, etc) organized (/year)		10	List of events, List of participants
	# of cases of digital organisation (public or private) using open data to develop a new service or to support their business operation	To be collected	5	List of applications and web monitoring
	# of cases of non-digital organisation using open data to develop a new service or to support their business operation[#]	To be collected	3	List of applications and web monitoring
	# services / applications originated from the activities in the open lab		3	List of applications, authorship and web monitoring

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