European Commission

DIGITAL CITIES CHALLENGE

Assessment report for the city of Kavala

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"City as a Platform"

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Digital Cities Challenge

Assessment report for the city of Kavala

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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 the city of Kavala. 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 25 and July 30. A total of 40 valid replies were collected through the SAT.
- 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 13 to 15 of June 2018.
- A vision an ambition workshop which took place on 25 of September 2018.
- Strategy workshops took place on 7 and 12 December 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

Kavala municipality is the second biggest municipality in the Region of East Macedonia and Thrace (REMTH) with a population of 70,501 in 2011 (the city had 54,027 population). According to 2015 data, the Prefecture of Kavala's Gross National Product (GNP) was 1,8 billion euros, the highest in REMTH, accounting for 27% of regional GNP. Kavala's per capita GNP was 13,241 euros, the highest in REMTH (119% of regional average) and 23rd out of 57 in the country (81% of national average). Regarding the Gross Value Added (GVA) by sector, Kavala is the top regional producer in the sectors of mining and quarrying (31% of total regional GVA), construction (33%), accommodation and food service activities (42%), real estate (29%) and scientific and technical activities (29%). The city of Kavala's economy had according to 2015 data, 7,670 registered businesses, with 19,640 employees and total turnover of 881 million euros.[1] The overall business environment is characterised as not very favourable with low level of ICT skills and usage, limited access to finance, lack of extroversion, brain drain and lack of collaboration among the local enterprises.

The economy of Kavala is predominantly based on the service sector (77%) while the secondary (12,5%) and primary (10,5%) sectors contribute less to the local GDP. More specifically, mining activities (petrol, marble), fisheries and agriculture, alongside a considerable public sector are the main activities for its inhabitants, with tourism being the leading sector of the regional economy. The focus within the context of DCC will be placed on selected sectors namely **tourism & culture, agro-food and logistics**. The latter correspond also to priority sectors of Kavala's Operational Plan 2015-2019 (Municipality of Kavala, 2016) and of the REMTH's Smart Specialisation Strategy (REMTH, 2015) and therefore could leverage significant funding over the current programming period.

Although difficult to estimate in monetary terms due to its broad spectrum, tourism is the most important sector of the city (Municipality of Kavala, 2016) with only the accommodation industry accounting for 10 million euros in 2015. Kavala holds a leading position in the REMTH in all basic tourism indicators (2015) such as arrivals (140,000), overnight stays (275,000) and

[1] Data from Hellenic Statistical Authority.

room-nights sold (43,5%), with however a high level of seasonality and a peak period during the summer. Tourism is seen by most local stakeholders as the driving sector for economic growth and, thus, the aim of the city is to establish a year-round high-quality touristic offering based on its specific identity and territorial characteristics in a way that will create a significant competitive advantage with regards to places nearby. The Culture sector is a supportive field for off-season tourism development, with highly recognisable monuments (Philippi-Unesco, Fortress, Via Egnatia) as well as intangible heritage (Apostle Paul, fishing heritage, etc.).

Kavala's fishing industry is also one of the biggest in Greece. Kavala's fish wharves are 3rd in Greece in terms of tons of fish caught and sold per year. According to 2017 numbers, Kavala produced 16% of national fish stock that was sold through its wharves. What is more important is that Kavala's fishing area (namely Strymonicos Gulf and Gulf of Kavala, coasts of Thasos and Thracian Sea) produce 36% of all national fish stock, one with the highest quality worldwide. During the current programming period a large number of significant projects with regards to maritime and fisheries are underway, among which the regeneration of Kavala's seafront and the privatisation of the commercial pier (Kavala Development Agency, 2016a,b). These programmes are expected to create added value and unlock economic growth prospects of the sector. Despite this potential, further improvements are required with regards to collaboration culture and digital transition, as activities related to the sea are mostly conducted by individual small businesses in an unorganised way, without the ability to establish a clear competitive advantage in the global market and take advantage of that.

Moreover, important opportunities arise by the exploitation of Kavala's commercial port i.e. the creation of the logistics centre, ship maintenance and other related activities. The port is already connected with the Egnatia Road Network, the project for its connection with the existing rail network starts on 2018, while the new Egnatia railway network which is under planning in the Sea2Sea project (4 countries, over €5 bn cost) will connect Kavala with the new European Railway Network alongside Kavala's airport. This will create enormous value for Kavala's port making in a central hub to the Trans-European Transport Network (TEN-T). Kavala is part of the EU's Orient/East-Med Corridor that connects the maritime interfaces of the North, Baltic, Black Sea and Mediterranean.

Finally, in terms of agriculture, although Kavala is only the third producer in terms of tons of agricultural products (20% of total regional production), it still has an opportunity to promote its high end processed and of unique quality agro-products such as olive oil, wine, honey, asparagus, etc. Based on the perception of local stakeholders and the local economic growth

strategy (Municipality of Kavala, 2016), tourism could become the vehicle for the growth of local agro-food industry through the promotion of local products in hotels, local restaurants etc.

Based on the above, the local economy could greatly benefit from a digital technology's strategy adoption in multiple ways such as the following:

- ICT infrastructures (open Wi-Fi public areas, fiber network, sensors) could help in the creation and collection of open data as well as the development of new services.
- The collection and use of open data, like for example athletic events, could enrich and upgrade the touristic offerings (especially during the low-season period), while digital infrastructures (e.g. fiber network) would facilitate in the development of congress tourism, eliminating the problem of seasonality and establishing a year-round touristic season.
- Digital infrastructures, such as open collaborative innovation platforms, could facilitate the development of new business ventures as well as intersectoral links and potential synergies among different sectors of the local economy (e.g. marine and maritime entrepreneurship like maritime tourism with the participation of small boat fishermen).
- Online recruitment and skills-testing platforms could facilitate the absorption of ICT and other graduates to local enterprises and also eliminate the brain drain problem.

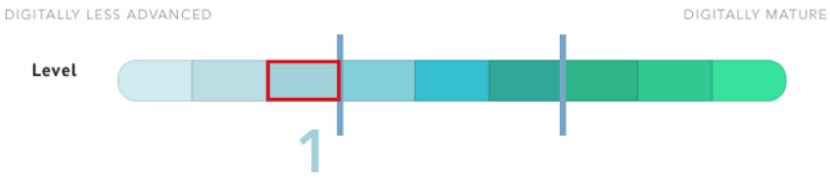
3. Digital maturity level of the city: outcomes of the Self-Assessment Tool and Key Performance Indicators

3.1. Outcomes of the Self Assessment Tool

The City of Kavala is at the very onset of its digital transformation (score of ca. 4) according to the perception of 40 of its stakeholders.

Figure 1 City - overall results

Overall result



Stakeholders

City	Education	Financial	Industry	Utilities
13	7	0	18	2

Industry represented: 1) Chamber of commerce; 2) Telecom sector; 3) ICT sector; 4) Geotechnical Chamber of Greece; 5) Kavala SW development meetup group; 6) Technical Chamber of Greece; 7) Trade association; 8) Agricultural union.

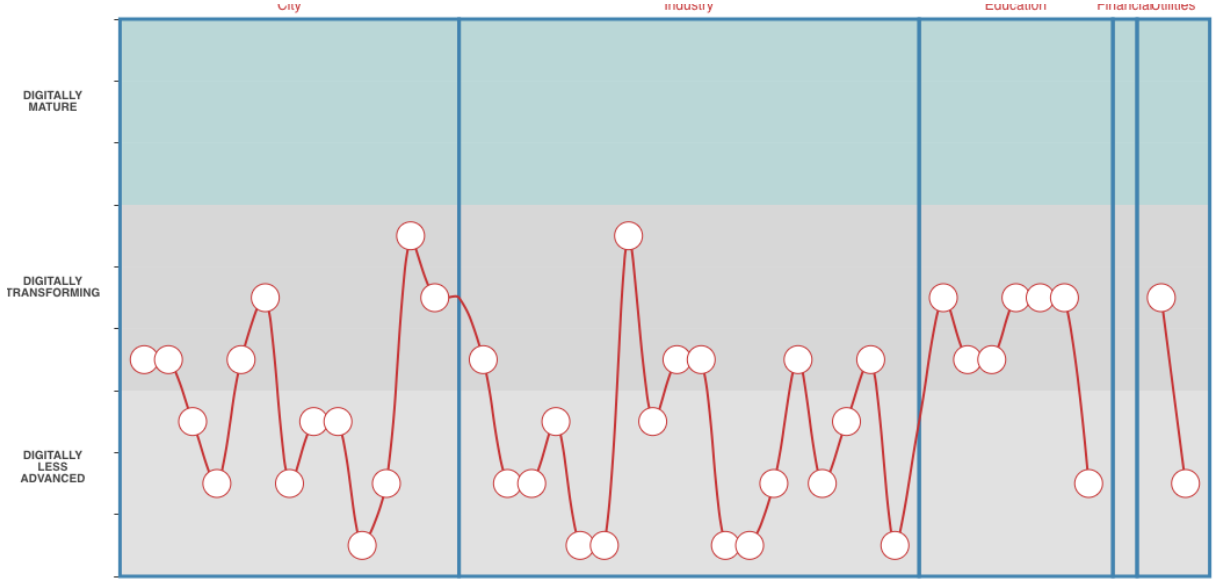
Source: Digital Cities Challenge, Self Assessment Tool (2018)

The perception that the city lies at the threshold between less digitally mature and digitally transforming is reflected in the perception of city representatives, local authorities, industry, education and utilities. No representative of the financial sector contributed to the SAT.

Among the stakeholder groups we observe a less pronounced variability in the educational system with the majority of stakeholders perceiving the city as being digitally transforming which can be explained by the large and active education community particularly Eastern Macedonia and Thrace Institute of Technology (EMaTTech) and the Democritus University of Thrace (DUTH). City stakeholders are also aligned perceiving however Kavala as less digitally advanced. Representatives of utilities include only telecom providers and the two respondents are aligned as to the level of the city as digitally transforming namely due to roll out of the 4G

network and the broadband infrastructure now covering mainly Kavala's city centre. Within the industry which is predominantly represented by the associations and the ICT sector the average perception is one of a city which lies at the threshold between digitally less mature and digitally transforming namely as a result of a realisation of the need to modernise with the help of advanced technologies.

Figure 2 individual city stakeholders rating – overall results



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

According to the stakeholders Kavala is relatively stronger in Digital competencies of companies, Governance and leadership; Digital skillset and Infrastructure in which it is digitally transforming while in Support services; Community; Open data and Finance it is perceived as digitally less mature. More specifically:

- In Digital competencies transformation means that stakeholders acknowledge the importance of digital processes and technologies although this has not yet been translated into an overall rollout in businesses.
- The achieved governance and leadership transformation reflects the ongoing activities from the city of Kavala as embedded in the KOP addressing digital transformation objectives.
- The perception of a transforming infrastructure is driven by digital infrastructure and is validated by the KPIs for the city of Kavala.
- Given the country's economic crisis difficulties in private financing due to unfavourable loan conditions and public financing especially from national funds impact access to finance of all economic sectors.

- Open data do exist but given the none to low utilisation of these databases it is clear that the city requires support in understanding the process and stimulating experimentation leading to business applications.
- Innovation labs / accelerators / fablabs are currently not active in Kavala which also explains why in support services Kavala is assessed as digitally less advanced.
- Finally a digital community per se is not formed in Kavala and there is no culture of collaboration among the stakeholder representing the different groups on digital transformation initiatives.

Figure 3 City stakeholder average assessment by dimension

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

The sub-dimensions in which the city is digitally transforming according to its stakeholders include:

- Digital competencies of companies including building websites for online presence and working with online analytics services to improve marketing campaigns; this is especially used in tourism (e.g. hotels). Other sector such as the one of Argo food the digital competences seem to vary significantly (e.g. restaurants and local suppliers are

not digitally advanced, with little to no online presence, while wine produces are advanced users of digital services including online presence and shops).

- Coordination, implementation and monitoring by the city of Kavala.
- Education as a result of the level of digital training offered in higher education related to non-digital subjects in the city but also in the nurturing of a digital mindset in primary and secondary schools.
- Infrastructure namely digital infrastructure (mobile internet coverage and broadband infrastructure).
- Ecosystem collaboration in terms of the acceptance of the need with however only limited actual collaborative projects in place.
- Open data as regards the involvement of public sector institutions and organisations in Kavala in open data contribution but also in their usage of open data for policy making. Kavala has already opened datasets, such as transport information for the city, but there is limited update of the available open data in terms of service development. This is reflected on the SAT results showing that the open data usage by other digital or business representing other sectors active in Kavala is not occurring.

3.2. Key Performance Indicators

Key Performance Indicators (KPIs) are hard to be collected in city level since, as in most municipalities of Greece, there are neither dedicated offices nor systematic procedures to gather and process statistical data, in the city of Kavala. In addition, some of the indicators, such as average costs of broadband/mobile internet, are the same in national level and could be sought in collaboration with the other two Greek challenge cities and the related national authorities (organisations/commissions).

The perception that the city lies at the threshold between less digitally mature and digitally transforming is confirmed by the KPIs of “Digital infrastructure”. The 43.40% of households has broadband internet at home with an average speed of 13MBps, not adequate for most bandwidth consuming services. Average uploading bandwidth offered is also a KPI that should be collected, since it is an important factor for enterprises that develop and/or offer bandwidth demanding services. The city’s 4G coverage is 80,4% and the average cost of mobile internet is 0,10€/MB at national level, although, as has been already mentioned, such indicators should be collected in a more formal way, i.e. in collaboration with telecom providers and the Hellenic Telecommunications & Post Commission. There are no intelligent sensors in the city while

there are 4100 unique devices connected to wireless internet that is freely available at public spaces, during September 2018.

KPIs show that the city is transforming in “Non-digital infrastructure”, since there is an integrated mobility platform to travel across transport modes, a real-time transport monitoring system and fibre network at the main business park of the city. However, there are neither a one-stop shop nor a system for online permits application and the percentage of public transportation tickets purchased online is low (4.68%). Because of the absence of statistics at city level, the percentage of individuals who used the internet for interaction with public authorities has been retrieved by EUROSTAT, where it is available only for Northern Greece.

There are 16 “Open data” sets offered by the public authorities of the city and 17.07% of them provide real time information through APIs, while the city is at the process of collecting the number of downloads of those datasets. Non-digital companies could make use of open data in 27 cases, mainly for data needed to conduct technical studies and to support their business operation. This indicator is difficult to be collected for digital companies.

In “Digital skillset and education” area, 30% of people bought or ordered goods or services over the internet (EUROSTAT, Northern Greece). According to the statistical data provided by the career office of EMaTTech, 13,17% of its students, studied in digital subjects but only 5,58% of them employed in the city over the last 5 years. In addition, according to the statistics of Hellenic Statistical Authority for 2015, there were 169 employees in 124 active digital companies of the city.

Considering “Digital competencies of companies”, there are 15 mobile applications available in the city on Android smartphone, but the collection of all the other indicators of the area is challenging, although they are considered important by the local team.

KPIs in “Community” confirm the main findings of SAT analysis for the area. There are no ICT clusters organised/formed in the city and only 11 events on digital topics took place in the last five years.

Public “Financing” indicators are all zero, as there are not any grants / tax incentives provided at city level to support entrepreneurship. On the contrary, there are business angels for digital start-ups and the other two, important indicators of Private “Financing” as well as the number of digital start-ups (“Community” area), are under processing by the local team.

There are not any innovation labs / accelerators in the city yet, although the number of 85 participants in events organised within the framework of digital transformation indicates that

the local ecosystem is aware of the important role of digitalisation to the development / growth of local economic sectors.

Considering "Governance and leadership", KPIs confirm the finding of both the SAT analysis and assessment visit, that no digital strategy is available for the city. However, a clear executive responsible for digital development plan / projects exists, dedicating on average 12 man hours per week to coordinate the digital plan.

KPIs			Result/ Assessment
Infrastructure	**Digital infrastructure**	% of households with broadband internet at home [%]	43,40%
		% of enterprises with broadband internet at home [%]	Important indicator but difficult to collect
		Average speed of internet [Mbps]	13 Mbps
		% of people using mobile internet to go online [%]	Important indicator but difficult to collect
		% of city covered by 4G [%]	80,4%
		Average cost of mobile internet [EUR/Mbps]	0,10€/MB
		Availability of (intelligent) sensors in the city (e.g. Low Power Wide Area Networks for the connectivity of devices)	No
		Number of unique devices connected to wireless internet freely available at public spaces in last 12 months [#]	4.100 last month
	Non-digital infrastructure	Availability of integrated mobility platform to travel across transport modes [Y/N]	Yes
		Availability of real-time transport monitoring system [Y/N]	Yes
		# of public transportation tickets purchased online [#]	4,68% 166.452/3.553.006
		Availability of one-stop shop for water, gas, electricity for address changes or new addresses? [Y/N]	No
		Availability of coax or fibre network at main business parks [Y/N]	Yes
		% of permits (e.g., housing construction, house extension) applied for online in last 12 months [%]	0

KPIs			Result/ Assessment
		% of Individuals who used the internet for interaction with public authorities (average for the last three years)	46% (Northern Greece)
Open data	**Data scope and accuracy**	Availability of open datasets [Y/N]	Yes
		# of downloads of open datasets in last 12 months [#]	Processing
		% of datasets offering real time information [%]	17,07%
	Usage of open data	Number of cases of digital companies using open data to develop a new service or to support their business operation [#]	Important indicator but difficult to collect
		Number of cases of non-digital companies using open data to develop a new service or to support their business operation [#]	27
Digital skillset and education	**Digital education**	% of people who bought or ordered goods or services over the internet in past 12 months [%]	30% (Northern Greece)
		% of students in digital subjects over the last 5 years [%]	13,17%
		% of ICT graduates employed in the city over the last 5 years	5,58%
		% of non ICT/digital diplomas at university colleges, universities (e.g., medicine, economics, biology, agriculture) including digital courses	100%
	Attraction of IT talent	# of employees in digital companies [#]	169
		# of vacancies for digital jobs [#]	n/a
		% of foreign students in digital subjects [%]	
		% of vacancies for digital jobs not filled in 6 months [%]	processing
Digital competencies of companies	**Competencies**	% of companies with internet website [%]	Important indicator but difficult to collect*
		% of companies offering online payment option	Important indicator but difficult to collect*
		% of manufacturing companies offering digital services (e.g., company offering remote maintenance)	Important indicator but difficult to collect

KPIs			Result/ Assessment
		# of mobile applications available in the city on smartphone (such as food delivery, peer-to-peer car sharing etc.)	15
		# of users of mobile applications available in the city on smartphone (such as food delivery, peer-to-peer car sharing etc)	Important indicator but difficult to collect
	Training for employees	Share of companies offering training to their employees that are aimed at enhancing their digital skills	Important indicator but difficult to collect
Community	**Ecosystem collaboration**	Number of ICT clusters and number of ICT companies joined as cluster member in any cluster organised/formed in the city	0
		# of digital start-ups	Processing
	Networking and mentoring	Number of events on digital topics and/or for digital companies in the last five years	11
Finance	**Public**	Grants / tax incentives provided at city level to support digital start-ups in last 12 months [EUR]	0
		# of digital start-ups which received grants / tax incentives at city level in last 12 months [#]	0
		Grants / tax incentives provided at city level to support non-digital companies for digital projects in last 12 months [EUR]	0
		# of non-digital companies which received grants / tax incentives for digital projects at city level in last 12 months [#]	0
	Private	Number of digital start-ups receiving a loan in last 12 months [#]	Processing
		Number of digital start-ups received venture capital in last 12 months	Processing
		Availability of business angels for digital start-ups [Y/N]	Yes
Support services	**Innovation lab & accelerators**	# of innovations labs / accelerators [#]	0
		# of start-ups / companies attached to innovation labs / accelerators [#]	Important indicator but difficult to collect
	Awareness raising	Number of participants in awareness raising events organised in the area of digital transformation/Industry 4.0 etc. [#]	85

KPIs			Result/ Assessment
	Other support services	# of support services (other than financial) available for supporting digital transformation in the economy	Processing
Governance and leadership	**Shared vision**	Availability of digital strategy [Y/N]	No
	Coordination	Availability of clear executive responsible for digital development plan [Y/N]	Yes
		# of man hours of executive responsible on weekly basis dedicated to coordination of digital development plan [hours]	12
	Implementation and monitoring	Existence of a monitoring framework for the implementation of the city digital strategy [Y/N]	No

4. The local digital ecosystem: leadership and governance

Kavala does not have a separate digital strategy, but digital transformation objectives are already embedded in its Operational Programme (KOP) 2015-2019 with relevant projects associated with the digital transformation of the city. There is a number of projects related to the digital transformation in tourism, as well as Research, Technology and Innovation projects with applications across all sectors in focus tourism & culture, blue economy, agro-food and beyond. It should be noted that a number of these projects have secured funding through the Regional Operational Program (ROP) of Eastern Macedonia and Thrace (AMT) 2014-2020 as being part of the city's approved Sustainable Urban Development Plan that is currently on the implementation stage. Other priorities of KOP and corresponding projects are predominantly related to smart city objectives.

A large number of the existing projects focuses on the city's infrastructure and access to data (see Table 1).

This will help Kavala building capacity for supporting the development of real time applications and services for its citizens and local businesses. It is envisioned that such projects will lay the groundwork for innovation activities and growth of a 'start up' culture.

Table 1 Existing projects with a potential impact on the digital transformation of the sectors in focus in Infrastructure and Access to data

SAT dimension	Projects
Infrastructure	• Metropolitan Area Optic Fabric Network (MAN). Features: Interconnection of 66 points in city of Kavala and suburbs, including municipality's public buildings/offices, public schools and prefecture's buildings/offices through high speed, fiber network technology • Intelligent Transport System. An integrated information management platform that provides real-time information to drivers about available parking spaces, current traffic conditions, the arrival times of public buses to bus stops and a multimodal routing application. The data produced by the system are openly available and ready to use for applications • Knowledge management and content presentation system for enhanced user experience while collecting valuable user feedback and analytics for later use by the host organisation.

SAT dimension	Projects
	• Cloud GIS mapping of the Ancient Via Egnatia Road. • Wireless Remote Monitoring and Control Solutions ideal for real-time IoT applications. Enables Condition-based monitoring for Predictive Maintenance. (Applications: Building Management, Transportation, Industry, Agriculture, Forests) • Wireless Remote Monitoring & Performance Analysis system based on innovative hardware and sophisticated software. System enhanced analytics allow complete vessel situational awareness and profound analysis of all critical ship's operations in real time.
Access to Data	• Multiannual Union programme for the collection, management and use of biological, environmental, technical and socioeconomic data concerning the fisheries sector. • Monitoring and recording of status (quality, quantity, pressures and uses) of surface waters of N Aegean Sea, Kavala Gulf, Greece. • Monitoring and recording of the status of the North Aegean Sea/Upgrade and functional update of the monitoring network-Sampling and analysis of biotic and abiotic parameters of the marine ecosystem. • Deployment and exploitation of the LHC Computing GRID's big data capacity

A smaller number of the projects is also focusing on the city's digital skillset, community and support services (see Table 2).

During the assessment visit a number of initiatives were discussed, such as open coffee events and the forming of a tech community in Kavala, however it seemed that these initiates are fragmented and rely on individuals to drive them forward. It is believed that Kavala would benefit from a concrete plan at city level around the development and adoption of the digital culture innovation, through the support of local talent and tech community. Initiatives such as hackathons, innovation labs, fab labs, city labs accelerators, incubators were amongst the many ideas that were suggested by the cities stakeholders during the interviews.

Table 2 Existing projects with a potential impact on the digital transformation of the sectors in focus in digital skillset, community and support services

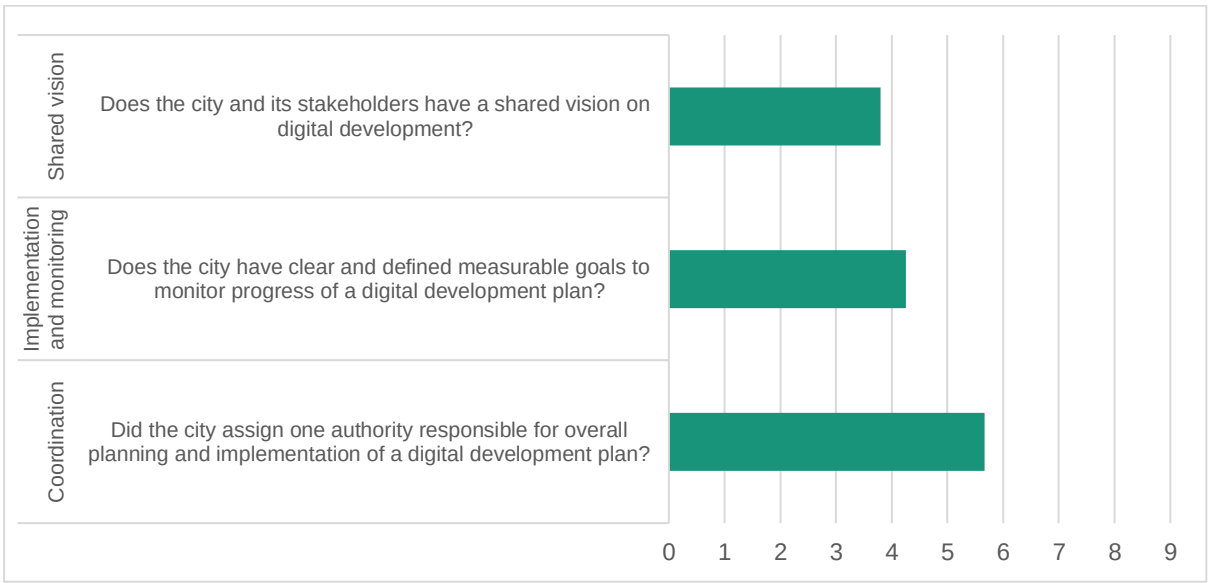
SAT dimension	Projects
Digital skillset	• SNF Fellowships for assisting young scientists in prototyping innovative products by using cutting-edge technology • Student Contest Innovation Ideas
Community	• Hosting CERN's summer schools. • Nationwide Industrial Informatics Festival • TedX Kavala events. Independently organised TedX events that spread innovative ideas.
Support services	• Kavala Start-up weekend events. Events that are set up periodically and are dedicated to strengthen the established network of start-ups and their skills in order to improve their entrepreneurship chances. 4.5 SNF Fellowships for assisting young scientists in prototyping innovative products by using cutting-edge technology.

Kavala has an executive responsible for the overall planning and implementation of the digital development plan, assisted by a tech committee consisting of members of public (task force). In addition, measurable goals for specific projects of the plan have been defined. The strategy reflected by the Operational Programme (KOP) 2015-2019 and the Sustainable Urban Development (SUD) Plan is however fragmented on projects mainly rather than as a part of a structured strategy aiming digital transformation. Should be noted that both KOP and SUD where the result of consultation process which Kavala applied through its innovative and accredited public participation and consultation structure (PPCS), "Kavala Urban Centre" (KUC). Within KUC's context is already organised a thematic Task Force, named "Digital Transformation Task Force" which consists of representatives of each one of the stakeholders that have participated on the procedures of the current project to help formulate and operationalise an upgraded digital strategy. Local stakeholders, during the meetings with the DCC local team and the DCC Experts, discussed and definitely agreed for the need to create an overall digital strategy and roadmap for the city, managed by an independent body comprised by representatives of different stakeholder groups.

In terms of the digital vision, according to the SAT analysis, while the city appears to be more aligned with the educational system, the industry and especially the utilities (as represented

by the telecom providers) do not think stakeholders in Kavala share a common vision on the digital transformation of their city. This finding has been strengthened during assessment visit and workshop events, where objections were raised by some members of ICT industry, tech community and telecom providers, concerning both the strategy followed so far and the proposed digital vision. What they proposed instead, was to include ICT in the strategic sectors of local economy, whose growth will make Kavala a tech hub. However, as was pointed out by the local team, key economic sectors have been determined and included in KOP after an one year consultation process with the participation of stakeholders and citizens of Kavala and the proposed digital vision does not contradict with the vision of ICT industry. After all, has become obvious the need to further continue the consultation process, initiated during the vision/ambition workshop, with all participants in order to discuss in extent the proposed vision and compose/synthesise the different points of view.

Figure 4 Governance



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

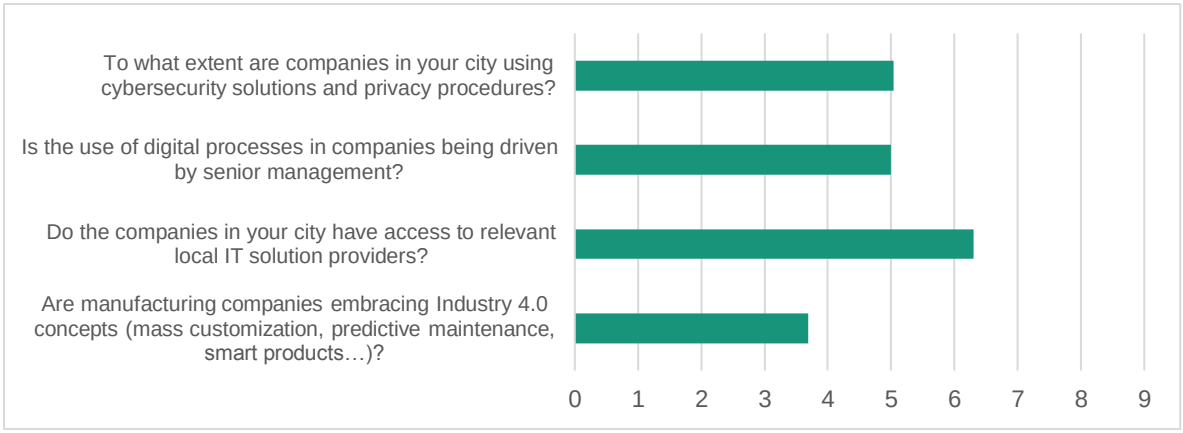
5. The use of digital solutions by local companies

Kavala's optical fiber network connects 66 points such as schools, academic institutes and public buildings, while pipelines are in place waiting for a future fiber to the home roll out. All stakeholders anticipate the extension of the city's optical fiber network, especially to areas such as the Industrial Zone of Kavala that currently lacks internet infrastructure. In addition to the ICT sector, the hospitality industry has been particularly successful in the use of digital solutions, mainly for marketing purposes and are currently also reporting the need of high-speed internet connection, especially when hosting e.g. high-profile events such as national and international conferences.

While the available infrastructure and digital solutions are embraced by the ICT and the Tourism sector, there is very little to no uptake by the Blue Economy. With regards to the finishing industry, this is mainly down to a cultural and educational/skills reasons, although discussions with Kavala Port Authority S.A. (OLK) revealed a big need for digital infrastructure to support the transformation of the city's ports.

In line with the outcomes of the SAT, showing recognition of the need to embrace digital technologies/processes, the assessment visit confirmed the acknowledgement of the importance of industry 4.0 concepts. Stakeholders from all sectors participating to the vision and ambition workshop, also confirmed the commitment of digital leadership of senior management and recognition of the necessity for cybersecurity solutions and privacy procedures.

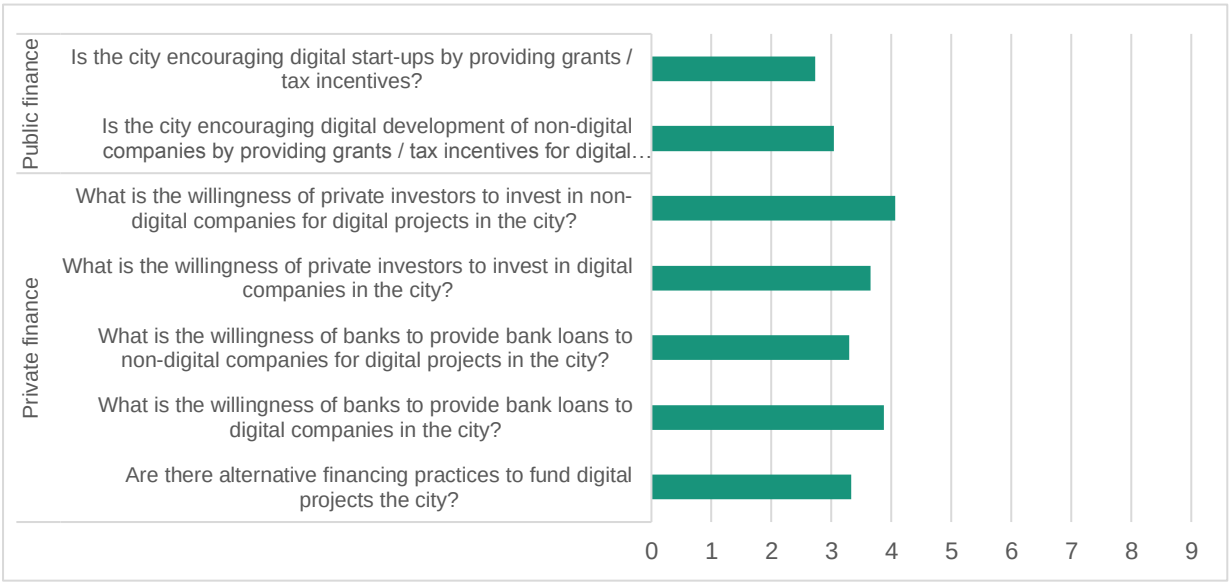
Figure 5 Business competences



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

Access to finance is mainly covered through national and regional grants, however there are complains around the long lifecycle of the projects and associated payments. It was suggested that the city of Kavala could take an active role in initiating B2B meetings with national and international investors (venture capital). Financing as revealed by the SAT replies, either public or private is not available in Kavala. Banks are according to industry representatives reluctant to provide bank loans while utility representatives point out that interest rates are above the market rate. Both industry and utilities note that private investors are willing to invest but instruments connecting investors with such projects are lacking.

Figure 6 Financing



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

6. Community engaged in digital transformation

There is a relatively limited number of local stakeholders that are involved in activities which digitally transform the city. Besides that, they show a low level of interaction among them in order to formulate a clear community. As it is also evident from the SAT the city and educational system acknowledge the limited level of collaboration amongst digital and non-digital stakeholders from various sectors in the city as well as the lack of networking events for digital companies. Stronger collaboration among them would greatly benefit the local economy with the development of online services leveraging Kavala's resources (e.g. developing personalised services on maritime tourism, facilitate the marketing and exports of local products such as sea crabs and mussels). Such a community could also contribute to the development of innovative solutions to specific urban problems.

Most initiatives that have been developed in the city are bottom up, such as the following:

- Open coffee Kavala[2] which, in the same sense as the Open coffee initiatives in Greece for Greek start-ups, it aims at offering a place to network and a platform for exchange that aims to inform and inspire on topics related to technology and entrepreneurship.
- Software development meetups[3] for SW practitioners and citizens of Kavala that are interested in any aspect of software engineering like architecture and design, development, testing and deployment.

Such meetups, however, lack an umbrella organisation or a collaboration culture to orientate efforts and events on local urban problems and the needs of the local enterprises.

Many of the above initiatives in addition to a few more (e.g. industrial informatics festival, Student Contest Innovation Ideas) [4] have been triggered by faculty members or graduates of the Department of Informatics Engineering[5] of the Institute of Technology of East Macedonia

[2] http://opencoffee.gr/2015/02/07/open-coffee-kavala-ii/

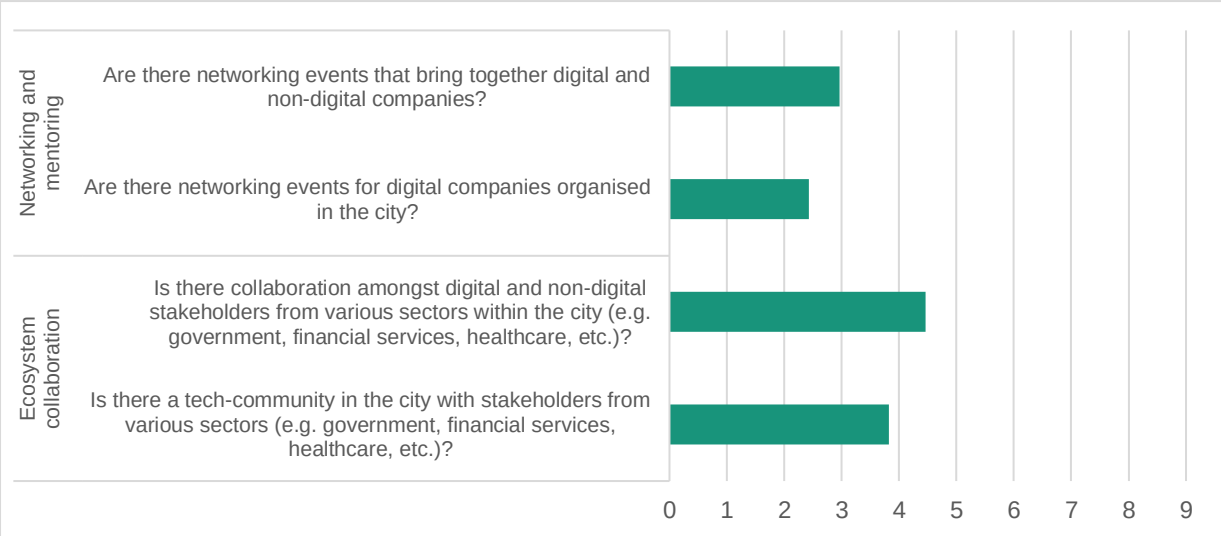
[3] https://www.meetup.com/Kavala-Software-Development-Meetup/

[4] http://www.i2fest.gr/ , http://aetma.teiemt.gr/aetma/wp-content/uploads/2018/02/SCOIN.pdf

[5] http://iiwm.teikav.edu.gr/iinew/

and Thrace (EMaTTech) which is located in Kavala. Despite the 'production' of ICT skilled graduates both from EMaTTech but also from the Demoritus University of Thrace[6] (located in the nearby city of Xanthi), it seems that there is a high level of human capital flows towards Thessaloniki and other larger urban areas. This, in addition to the ICT skills' shortage in other sectors of the local economy, hinders the formulation of an active community that will be engaged in the city's digital transformation process.

Figure 7 Community



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

[6] http://duth.gr/department/ee/

7. The state of local digital and physical infrastructure

According to the SAT the majority of the city is covered by 3G/4G and broadband infrastructure is not hindering the digitalisation of local industry but is somewhat adequate. Stakeholders reveal during the interviews that the connectivity of the industrial zone is poor and the cost of using 4G for their business services (especially in the case of hotels) is particularly high. Kavala's fibre network is available in 66 public areas (HEIs και public services), although it does not connect the Fisheries Research Institute[7], a research institution located in Nea Peramos that is supervised by the Ministry of Rural Development and Food. So far, there is not a strategic framework and management plan for the metropolitan fibre network.

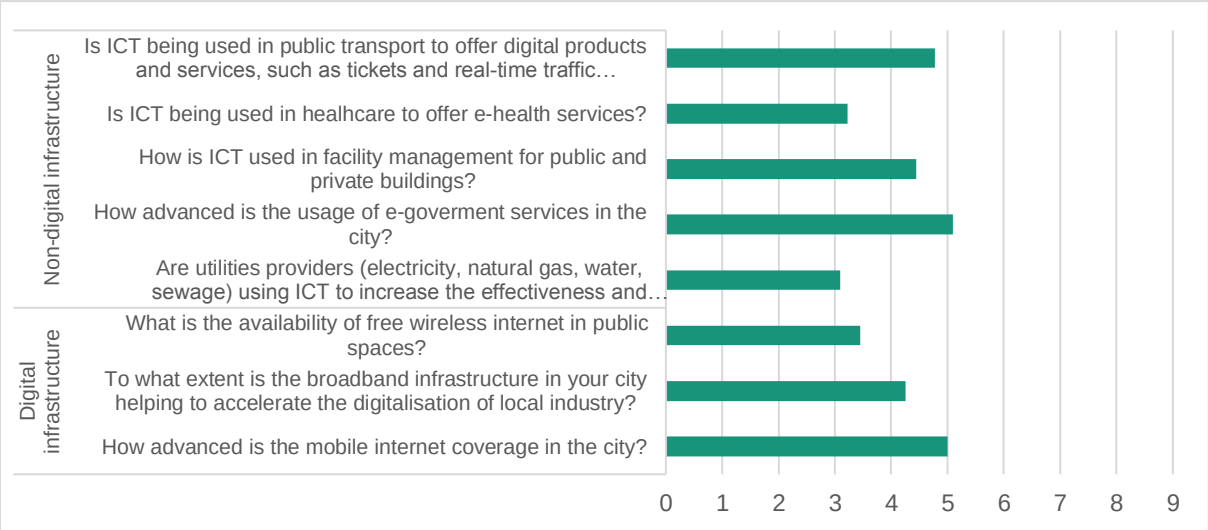
The main topic debated among ICT, Tourism and Blue Economy stakeholders is the type of investments most suitable for the needs of businesses, the public sector and citizens. Currently, there are projects underway to expand the limited wifi coverage in the city centre with the creation of hotspots in areas of regeneration (squares, parks) including prediction for maintenance and management. Upgrading of the digital infrastructure is considered necessary for local business (especially in the tourism sector) and the industry located outside the city centre. A sensors network collecting various data for the development of supportive services is in particular perceived as important for the competitiveness of tourism, sectors within the blue economy, agro-food but also the ICT sector. What was also mentioned as essential by the ICT, Blue economy, National Chambers and Associations is the establishment of digital platforms that will promote collaboration and networking among citizens, businesses and stakeholders facilitating the development of innovative services.

In terms of digital infrastructure and in particular e-government services, these are limited to a few services (information on local transportation and touristic sites and events, electronic payments, public online consultation etc.) in a partially digitised platform. The usage of ICT in facility management for public buildings focuses on costs optimisation and improving working conditions, while there are ideas for combining such services to the offering of innovative touristic products. An example of this is to regenerate abandoned buildings at the dock and

[7] http://www.inale.gr/

offer them to fishermen for use in addition to the development of new services of touristic interest.

Figure 8 Infrastructure digital and non digital (physical infrastructure)



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

8. Digital solutions enabling the modernisation of business environment

There don't seem to be any active policies at city level to support entrepreneurship and new business development in the digital sector. There is clear lack of networking events, acceleration programmes, fablabs, citylabs, innovation labs, start up weeks, although some fragmented initiatives, such as open coffee events have taken place in Kavala. The Kavala tech community has just started forming on voluntary bases aiming at the development of the local university students and digital skillset. The city of Kavala has also initiated a number of meet up groups in order to bring together the local tech community.

The city has no financial means to support local businesses and its procurement budget is not sufficient to enable significant initiatives. As a result, local businesses rely heavily on ESPA or

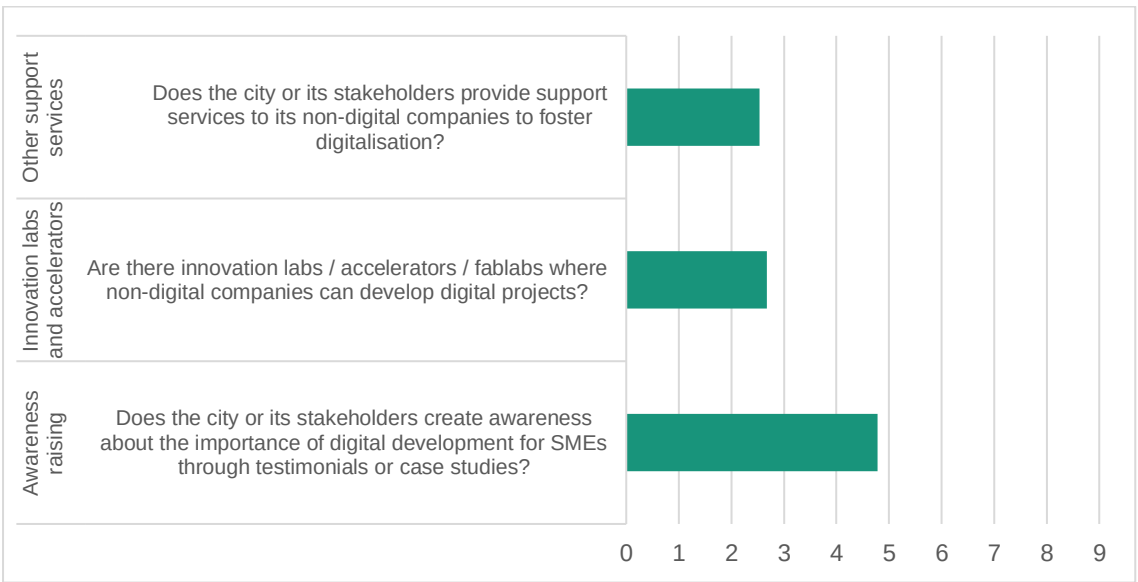
non for profit foundations funding (e.g. NIARCHOS foundation) to fund innovation and technological advancements.

However, it is believed that the city of Kavala could be the vehicle towards business modernisation through other means, such as initiating or becoming the facilitator for B2B meetings with national and international investors. Or even offering digitally advanced space for networking events and workspace for start-ups.

Supporting the interview outcomes, stakeholders completing the SAT point out that there are no innovation labs / accelerators / fablabs where non-digital companies can develop digital projects nor are there support services meant for non-digital companies to foster digitalisation. Also, the city does not provide support services to its non-digital companies to foster digitalisation.

On the other hand there is recognition that Kavala does strive to raise awareness about the importance of digital development for SMEs through testimonials or case studies, although it has limited reach. Utilities appear to be quite positive about the awareness activities of the city and the flagship testimonials and case studies showcased.

Figure 9 Support services



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

9. Data-driven innovation

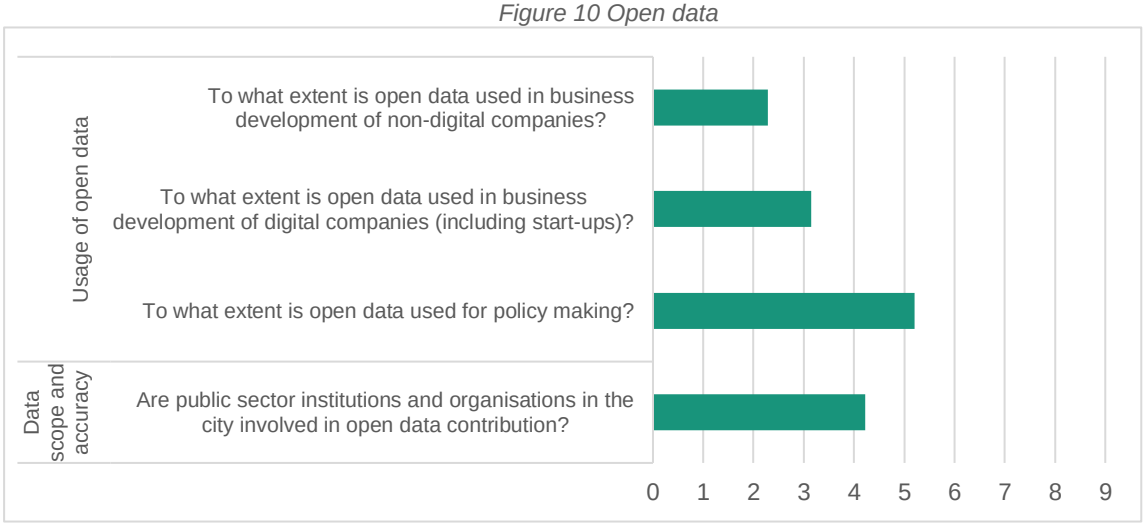
There are no active policies or financial means at city level to support data driven innovation. However, there are local initiatives experimenting with data-driven innovation. The city of Kavala has available data sets on public transport, urban planning, water supply, waste bins, schools, playgrounds etc (http://www.data.gov.gr/).

There are 16 “Open data” sets offered by the public authorities of the city and 17.07% of them provide real time information through APIs, while the city is at the process of collecting the number of downloads of those datasets. Non-digital companies make use of open data in 27 cases as reported by GEOTEE (Geotechnical Chamber of Greece Branch of East Macedonia**)**, mainly for data needed to conduct technical studies and to support their business operation.

Despite the increase of available data for the city of Kavala, there seems to be very little to no data-driven innovation. Stakeholders strongly believe that events such as hackathons could stimulate innovation and the creation of services that could be later offered to the public.

SAT outcomes confirm that the public sector institutions and especially academia are involved in open data contribution but there are no real-time data and no APIs (i.e. Application Programming Interface). Businesses including ICT companies do not make use of open data for business development. The quality of the open data, maintenance of datasets, lack of experience on how to make best use of the data collected and the absence of a coordinating body on all open data partly explain the lack of exploitation.

Figure 10 Open data



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

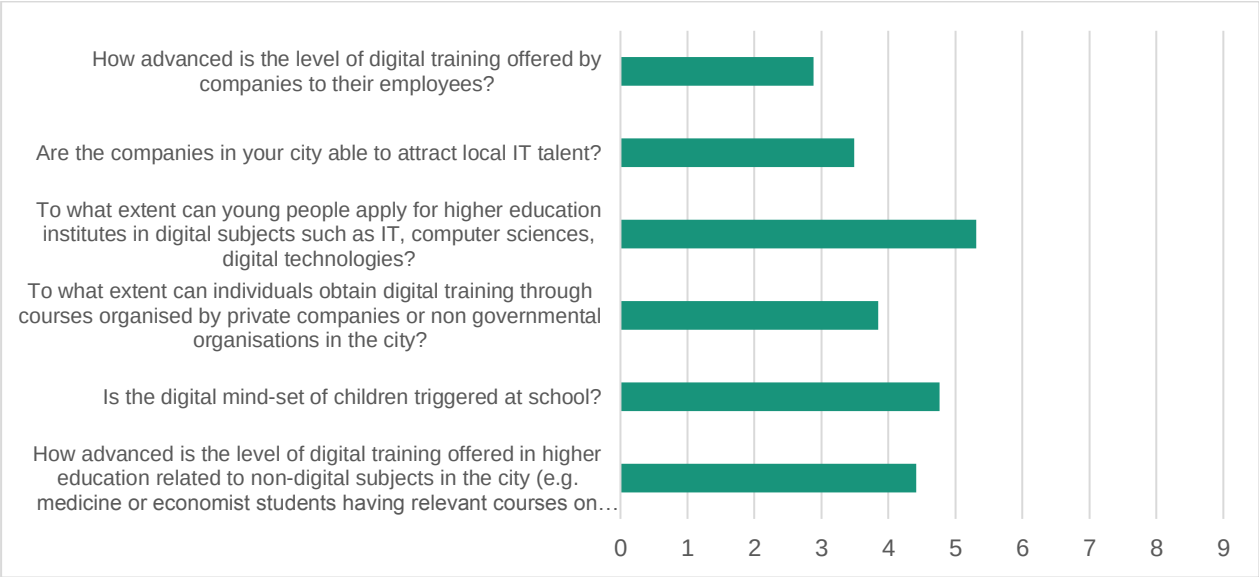
10. Skills and entrepreneurial culture

The city of Kavala has two higher educational institutions, Democritus University of Thrace and Eastern Macedonia & Thrace Institute of Technology, providing high level education and training on digital skills and professions. The city and educational system are more positive concerning the willingness of young people to study digital subjects. At the same time Kavala's stakeholders appear more positive when it comes to education's contribution in either stimulating children's mindset or the offering of digital degrees or training to ICT and non-ICT students.

However, all interviewed ICT stakeholders are sceptical regarding their ability of attracting the needed talents, mainly due to their inability to meet the required salaries, and report difficulties accessing IT talents in the local educational institutions. They are also reporting a gap between the skills that are offered and the skills in need (e.g. programming languages) and would rather outsource projects to other regions/countries than offer digital training (although there were a few exceptions of companies offering inhouse training). As a result of the above, the brain drain trend of young graduates, experienced in the entire country, and the ability of local companies to offer training and subsequently employment, are among the issues businesses are challenged with. Yet, the fact though that local ICT employees remain for many years the same can be considered as a positive asset, as it reduces the need and potential high cost of training new people.

Even though entrepreneurial activity in the city (e.g. digital startups or spin-offs created) is not reported, some TEDEX, open coffee and start up w/e activities as well as the "Student Contest Innovation Ideas", and the "Nationwide Industrial Informatics Festival" organised by the EMaTTech, and have started to take place and some efforts are being made on voluntarily basis to form a local network of digital entrepreneurial culture.

Figure 11 Digital skills



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

11. Digital transformation SWOT analysis

	Strengths	Weaknesses
Infrastructure	> 4G coverage in the city (industry/utilities) > City care, transportation platform, e-participation (e-gov) > ICT facility – public WiFi, optical fiber broadband (public building, GRID)	> Healhcare to offer e-health services > Using ICT to increase the effectiveness and efficiency for utility providers > Broadband accelerates the digitalisation of local industry
Access to data	> Public sector institutions & organisations in the city involved in open data contribution (mainly edu) > Policy making (ELSTAT population, employment)	> Open data used in business development of non-digital companies > Business development of digital companies (including start-ups)
Digital skillset	> Digital training level offered in higher education related to non-digital subjects in the city > digital mind-set of children triggered at school (children's university initiative) > young people apply for higher education institutes in digital subjects	> Companies in city able to attract local IT talent > individuals obtain digital training through courses organised by private companies or non governmental organisations
Companies' digital competencies	> Access to relevant local IT solution providers > Digital processes in companies being driven by senior management > Companies using cybersecurity solutions and privacy procedures	> Digital training offered by companies to their employees > manufacturing companies embracing Industry 4.0 concepts
Community	> Collaboration amongst digital and non-digital stakeholders from various sectors	> Networking events for digital companies organised in the city > Networking events that bring together digital and non-digital companies
Finance	> Private investors are willing to invest in digital companies and in non-digital companies for digital projects > Banks are willing to provide bank loans to digital companies	> City encouraging digital start-ups by providing grants / tax incentives > City encouraging digital development of non-digital companies b providing grants / tax incentives for digital projects
Support services	> Create awareness about the importance of digital development for SMEs through testimonials or case studies (TEDX, open coffee, start up w/e)	> Innovation labs / accelerators / fablabs for non-digital companies (open labs planned) > Support services to its non-digital companies to foster digitalization
Governance & leadership	> Authority responsible for overall planning and implementation of a digital development plan (tech committee consisting of members of public, task force)	> Clear and defined measurable goals to monitor progress of a digital development plan > Shared vision on digital development

	Opportunities	Threats
Infrastructure	> 5G and LoRa networks pilots > Expansion/utilisation of existing infrastructure (e.g. fiber to home) > Increase coverage of free WiFi > Upgrade & Reuse of available empty space (e.g. unused factories) > Promotion of existing ICT facilities and Services	> Decreasing size of the city makes investors skeptical to develop infrastructure > Business value of infrastructure is not appreciated by the local ecosystem
Access to data	> Increase available sets of open data (historical & real time) & awareness for their exploitation > Identify key case studies and turn them into success stories, followed by exploitation of outcomes > Improved decision making in the public and private sector > Develop APIs for access to data sets	> Low exploitation of available open data (limited to certain types/topics) > Open data availability at private/utility company level
Digital skillset	> More adaptation of post-secondary education programs to digital > Increasing digital literacy of citizenship > Improving collaboration with businesses > Completion on innovative ideas	> Brain drain > Unemployment rate > Lack of coordination and training activities
Companies' digital competencies	> Further cooperation with educational organizations > Higher digital competencies of digital companies > Web/e-commerce competencies further adopted among business sectors	> De-industrialization > Limited digital capabilities of non digital SMEs > Limited number of startups
Community	> Promoting entrepreneurship > Build projects involving local actors > Create awareness on the potential of digitalization > Operation of Open Labs	> Limited number of events and attenders > Not all stakeholders participate in networks; silos still remaining
Finance	> Facilitating the development/exploitation of R&D and innovation projects > Utilizing available private grants and new regional funds > Increasing stakeholders ability of attracting funds	> Economic crisis in the country > Public funding In national (not local) level > Insufficient private resources to supplement public funding
Support services	> Creating services to promote importance of digital development for SMEs growth (including startups) > Specialized services targeting growth strategy involved sectors	> Slow pace in startup creation and/or business development and growth
Governance & leadership	> Citizens and companies involvement in digitalization > Strengthening the coordination role of the City > Sustainable urban development as well as urban mobility plans > Sustained cooperation between city, academia-research sector and companies in digital projects	> Lack of digital strategy and its adoption > Lack of shared vision between stakeholders on digital development

Appendix I: Table of abbreviations and definitions

Digital Cities (DC)

Digital Cities are the 15 European cities that have been selected to receive support throughout the duration of the initiative.

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.

Kavala Operational Programme (KOP)

KOP 2015-2019 defines 17 strategic directions for the city of Kavala.

Region of East Macedonia and Thrace (REMTH)

It is one of the thirteen administrative regions of Greece.

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

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