

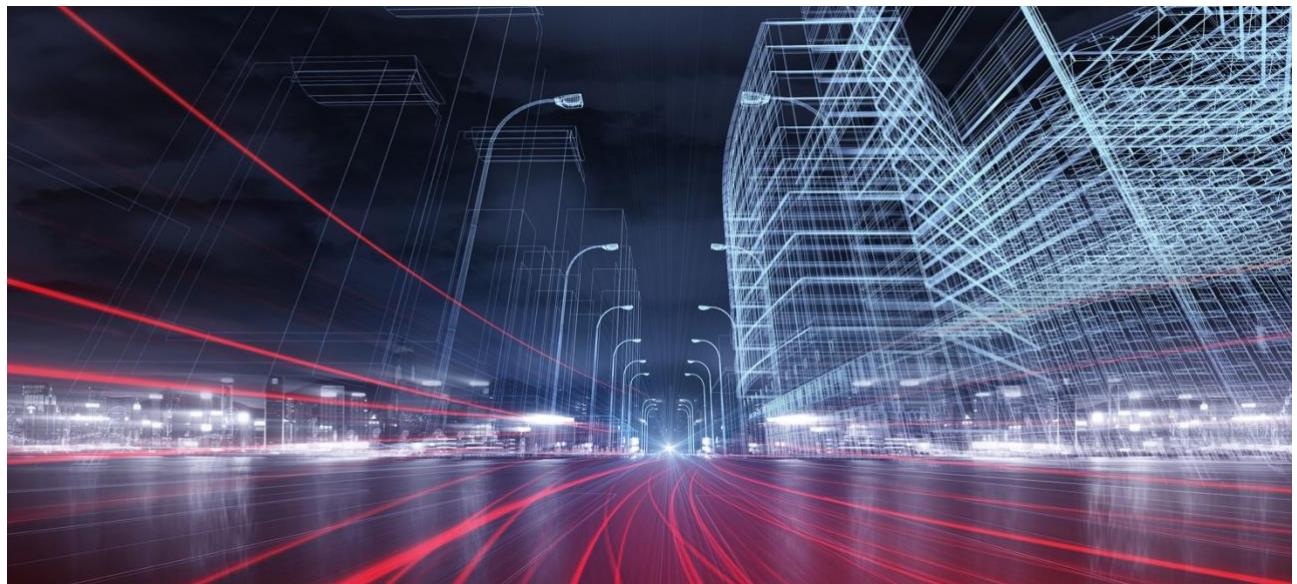


DIGITAL CITIES CHALLENGE

Assessment report for the city of Pori

Artificially Intelligent Pori

July 2019



Digital Cities Challenge

Assessment report for the city of Pori

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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, but they also face multiple, interconnected challenges, including energy and climate change, unemployment, 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 launchpads 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 and 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 Pori. 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 7.5.-31.8.2018. A total of 22 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 the 19th of June to the 20th of June 2018.
- A vision and ambition workshop which took place on the 7th of September 2018.

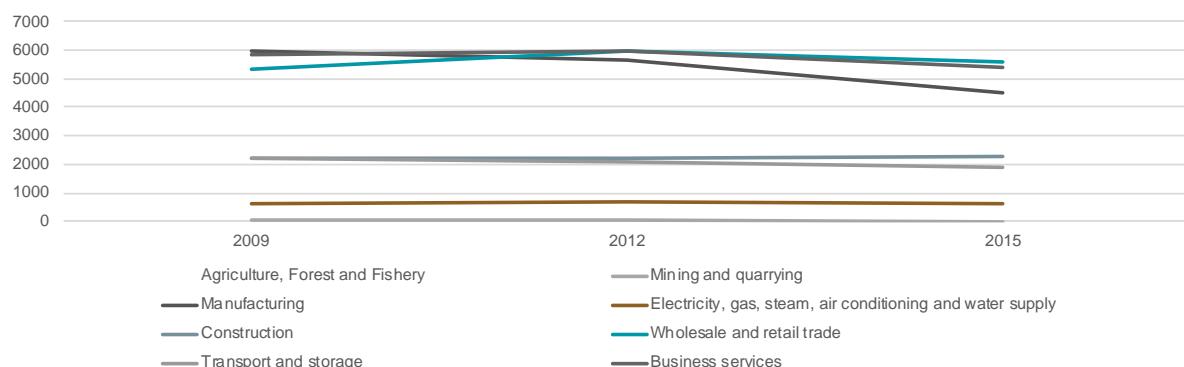
This document represents the key input to the work to be performed during the forthcoming phases of the digital transformation trajectory (i.e. definition of the city strategy and roadmap).

2. Key sectors of the local economy and DCC focus

Pori is the 10th biggest city in Finland with a population of 85 000. Pori is a traditional industrial city which is currently facing a digital transformation. Transformation of the industry has been a big challenge in the Pori area since the 1990's when the globalisation started to change structures of the industry. In early 2000s, Pori managed to diversify the industry areas, develop university education and to maintain the positive development in the area. This has given Pori a better resilience against economic turmoil. However, the competitiveness of the industrial sector is and will be challenged by the low-cost countries and the vitality of the region is in jeopardy. The solutions provided by digitalisation will be essential for the growth and competitiveness of the city as well as of the whole Satakunta region.

Employment in the city is improving. In March 2018 the unemployment rate in the city of Pori was 11,1% while a year before it was 15,5%. The number of people employed in different industry sectors in Pori between 2009 and 2015 is presented in Figure 1. Figure 2 presents the turnover per sector in Pori during 2011-2016.

Figure 1 Number of jobs in different industry sectors in Pori in 2009, 2012 and 2015.



Source: Statistics Finland and Regional Council of Satakunta 2018

Most of the jobs, about 75%, are in the service industry. The rest of the jobs lie in the industrial sector. The main industrial sectors in Pori are **manufacturing, metal processing, marine and offshore, automation and chemical industries**. The key companies in main industrial sectors are presented in the Table 1.

Table 1 The key players per main industrial sectors in Pori.

Sector	Key players
Manufacturing	RKW Finland, Sampo-Rosenlew, Länsihydro, Hydroala, Retco, Eternal, Fiblon, Porin Hydrotekniikka, Porin Teollisuusputki, Brand ID, Purso-Tools, Vertic Zinc Wire, Länsihydro
Metal processing	Outotec, Cupori, Luvata Pori, Upcast, A.Reponen, BE Group, Asteka, Kuusakoski, Valta Works, Aurubis Finland, Porin Levy ja Hitsaus, Syomen Teräsritilä STR, MCW Laakkonen, Scan-Mikael, Porin Metallisorvaamo
Marina and offshore	Tecnic, Subsea Construction, Pori Offshore Constructions
Automation (incl. ICT, robotics)	Advantech, Enmac, Ferob, Festum Software, Ficolo, Fuusio Labs, Cimcor, HeadAI, Hefmec Engineering, Huhtaware, Elinar, Festum, VireLabs, KoivuSolutions, CI Computational Intelligence SWOcean, Timeless Technology, Vire Labs, Power Instruments, Enersense International
Chemical industry	Venator, Eckart Pigments

When comparing the sectoral turnovers during 2013-2016, it is clear that the sectors of ‘Agriculture, Forest and Fishery’, ‘Wholesale and retail trade’ as well as ‘Arts, entertainment and recreation’ have had an upward trend in Pori. Comparably, the sectors with a strong declined trend are ‘Electricity, gas, steam, air conditioning and water supply’, ‘Transport and storage’ and ‘Manufacturing’. Taking into account the turnover volume, the role of the manufacturing sector is relevant. The turnover per sector is presented in Table 2.

Table 2 The turnover per sector (1000 €) in Pori during 2013-2016.

	2013	2014	2015	2016	Variation 2013 - 2016
Agriculture, Forest and Fishery	23 680	24 701	26 412	33 427	+ 41%
Mining and quarrying	11 142	10 907	11 951	11 296	+1%
Manufacturing	1 816 414	1 696 739	1 702 615	1 542 827	-15%
Electricity, gas, steam, air conditioning and water supply	448 916	347 262	353 340	315 586	-30%
Construction	386 417	392 254	388 625	414 738	+7%
Wholesale and retail trade	1 218 951	1 218 463	1 233 854	1 483 790	+22%
Accommodation and food service	102 145	100 166	102 360	105 551	+3%
Transport and storage	278 355	263 641	241 043	228 315	-18%
Business services	480 439	454 386	459 350	517 864	+8%
Human health and social work activities	77 218	77 295	90 218	84 487	+9%
Arts, entertainment and recreation	27 856	35 767	36 725	39 540	+42%

Source: Satamittari¹, Statistics Finland and Regional Council of Satakunta 2018

New emerging industries that are driving innovation and growth in the city, and in the whole Satakunta region, are automation and robotics. In the region there are 52 **companies focused on automation and robotics**. The automation and robotics cluster (including also AI business), Robocoast, consists of over 100 companies, and turnover and employment rates of these companies are higher than in other sectors in the area.

Tentatively, the turnover of the key companies in the automation and robotics sector was 264 million € in 2017. During the period 2010-2017, the growth rate in the Robocoast cluster was 60% while in other companies the average growth rate was only 3,1%. In the industrial sector the growth had even turned into decline by -6,1%, and the number of employees in the sector was also descendent: -9,1%. Correspondingly at the same timeframe, the amount of personnel in the automation and robotics sector grew by 57%. In June 2018 the employment rate in the sector was still expected to grow.² The following Figures represent the comparison between

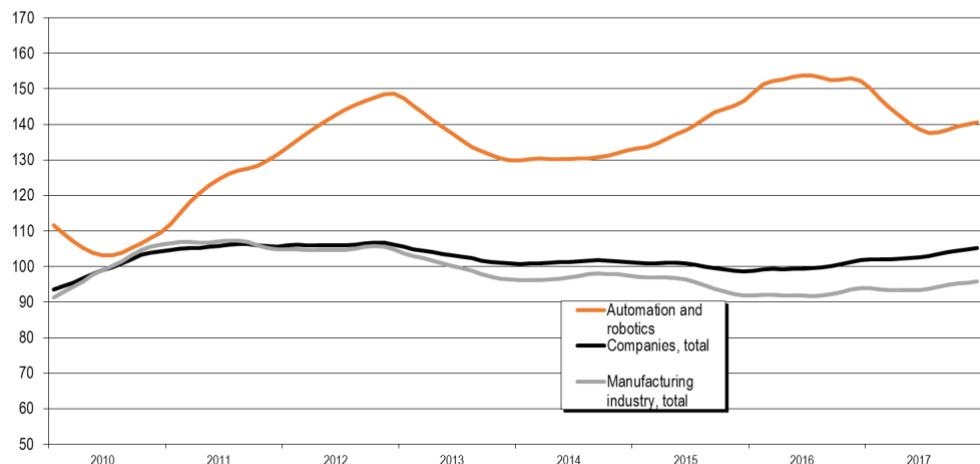
¹ Satamittari http://www.satamittari.fi/Kuntatiedot_Excel-taulukoina

² http://www.satamittari.fi/sites/satamittari.fi/files/asiakaskuvat/Satamittari/Satakunnan_talous/TalouskatsausI2018/Satakunnan%20talous%20-katsaus%2031%202018.pdf

automation and robotics and manufacturing sectors in growth of turnover as well as of personnel.

Figure 2 The growth of turnover in automation and robotics, as well as in companies and in manufacturing industry on the average in the Satakunta region (2010=100).

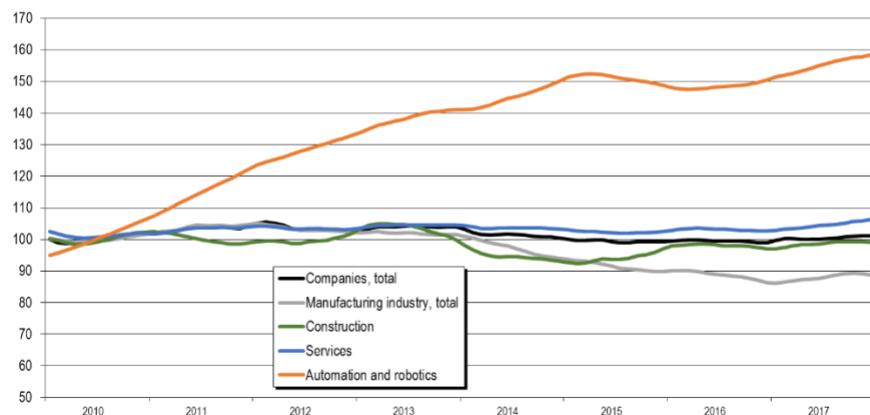
Growth of turnover in automation and robotics, in companies and in manufacturing industry on the average in Satakunta (2010=100)



Source: Statistics Finland and Regional Council of Satakunta 2018

Figure 3 The growth of personnel in the automation and robotics as well as in main industries in the Satakunta (2010=100).

Growth of personnel in automation and robotics and in main industries in Satakunta (2010=100)



Source: Statistics Finland and Regional Council of Satakunta 2018

Automation and robotics are naturally acting as forerunners in digital development, but in other sectors companies are just mainly taking their first steps towards digitalisation. There is a huge variety in baseline, and companies differ a lot related to their interest, objectives and skills towards digitalisation. Also attracting digital talents can be challenging for companies.

One of the main challenges in local economy relates to start-ups. There is no vital and dynamic culture of start-ups, even though there is a growing number of enthusiastic young entrepreneurs and few serial entrepreneurs. However, the current start-ups represent a wide range of industry sectors which enrich the area. In order to gain full potential for the early-stage businesses and their capability of changing traditional business models, the city of Pori needs to boost the start-up culture and to support the attractiveness for building more vital start-up ecosystems.

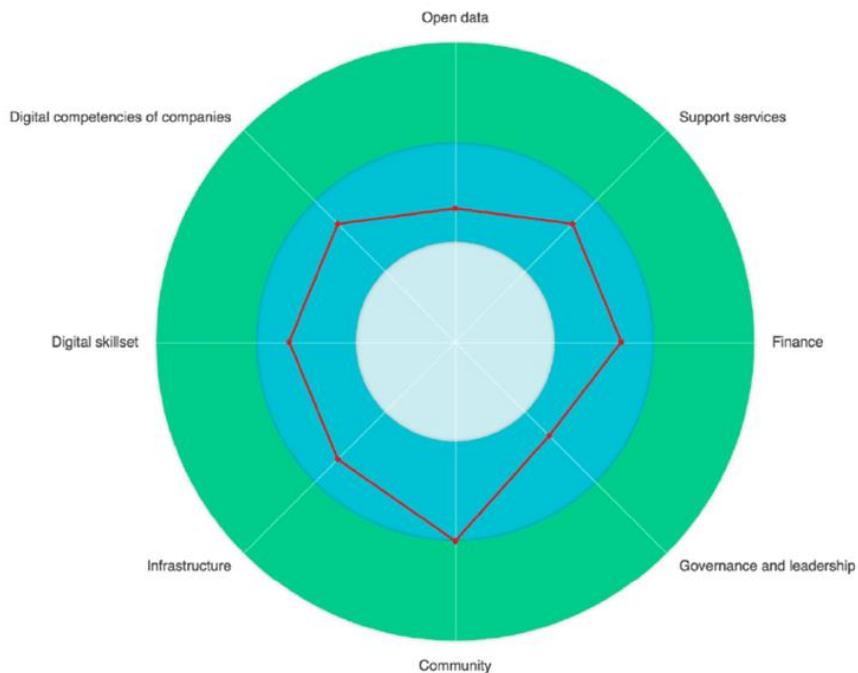
3. Digital maturity level of the city: outcomes of the Self-Assessment Tool and Key Performance Indicators

3.1. Outcomes of the Self Assessment Tool

Based on the Self Assessment Tool, Pori stands at the level 2; the city is well on the way to becoming digitally mature and, continuing on this trajectory, will create innovation ecosystems that will drive job creation and economic growth.

When comparing the results per dimension, Pori is performing quite steadily, and digital transformation is shown in all dimension. The city is performing most strongly in the dimension of ‘Community’, while the weakest level of transformation is in the dimensions of ‘Open data’ and ‘Governance and leadership’ (GA).

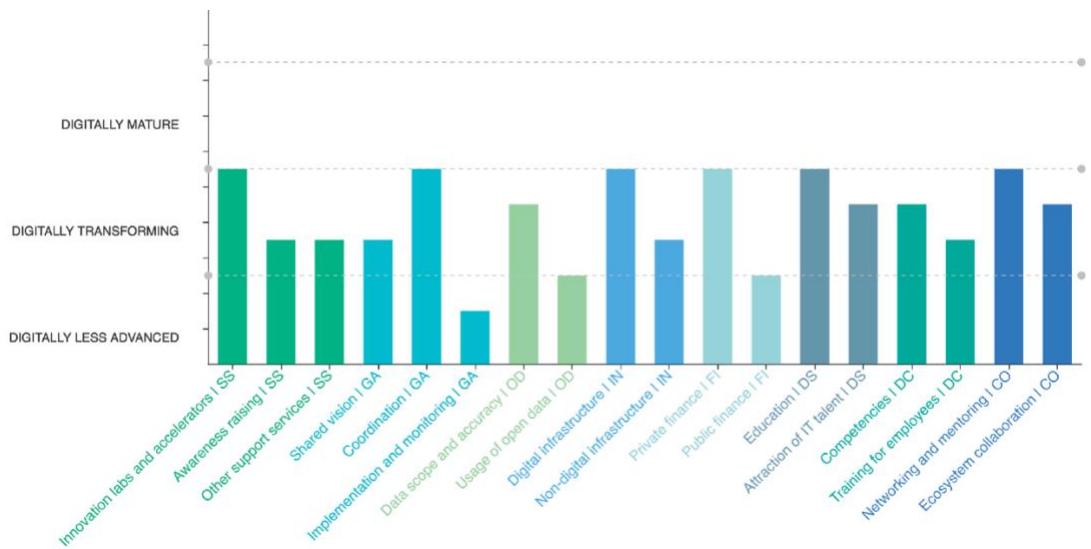
Figure 4 General results of SAT per dimension.



Taking into account the high amount of answers per subdimensions, the results indicate that the city is digitally less advanced in the subdimension of ‘Public finance’ and ‘Usage of Open data’. In turn, there are five subdimensions where the digital maturity is at the top of the level

2. These strong performing subdimensions are ‘Innovation labs and accelerators’ (SS), ‘Digital infrastructure’ (IN), ‘Private finance’ (FI), ‘Education’ (DS), and ‘Networking and mentoring’ (CO).

Figure 5 SAT results per subdimension.



Related to the key differences in perceptions expressed by different types of stakeholders, it should be noticed that the total number of respondents was quite low (22) and the responses per stakeholder type were not divided equally.

Table 3 Number of responses per stakeholder type.

City	Education	Financial	Industry	Utilities	Total
6	3	2	9	2	22

Considering the different stakeholder types, it can be noticed that the representatives of industry has evaluated the city’s digital maturity lower than other respondents. Especially the usage of open data is found weakest by the industry, whereas infrastructure is seen to be in the stronger position than in other stakeholder groups.

The challenges related to city’s efforts to open its data was also confirmed in the background interviews, together with the fact that city has started to invest in opening its data, and the first solutions have been just launched.

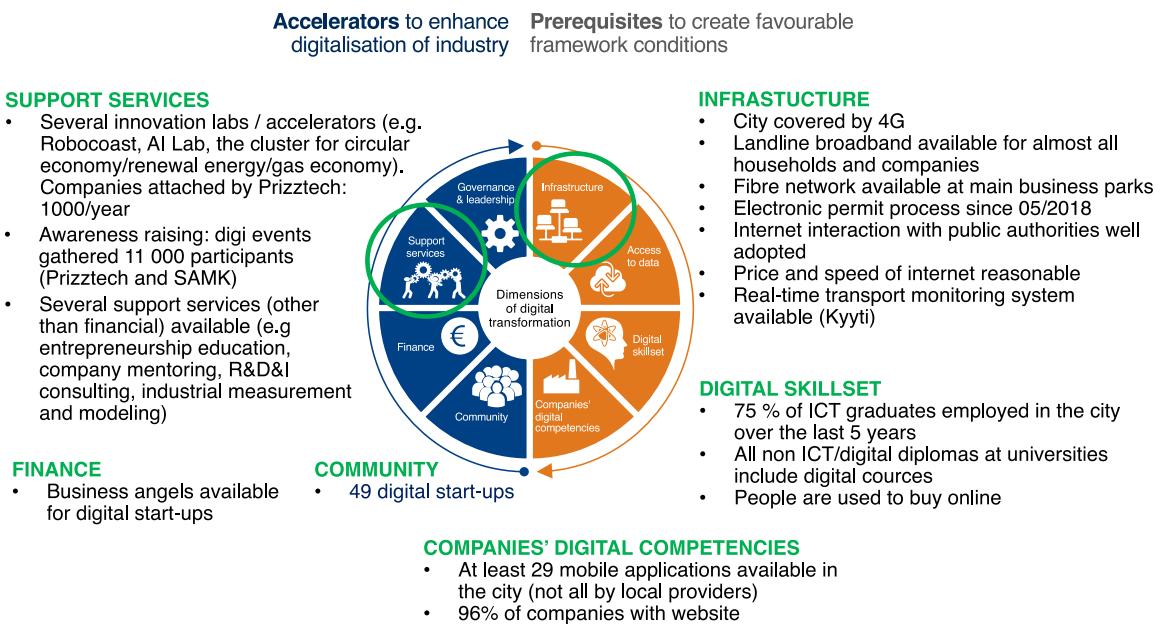
3.2. Key Performance Indicators

The digital infrastructure of Pori set an excellent starting point for the digital transformation development. The city is totally covered by 4G (KPI 7) and e.g. hotels and shopping centers provide their customers with wireless free internet connectivity. In addition, the city of Pori provides access to its own wireless network (KPI 10) and has had totally electronic permit process since May 2018 (KPI 16).

In parallel to infrastructure, Pori is performing well in support services and, at least partly, in digital skills. The considerations on digital skillsets are presented in the chapter 12. Figure 6 presents the KPIs where Pori can be seen as a frontrunner.

Figure 6 The KPI indicators in which Pori is performing at good level.

Areas in which Pori is a frontrunner



During the collection of data for the KPIs, the amount of mobile applications available in the city on smartphone was challenging to collect. However, at least 29 application were found representing solutions related to e.g. parking, tourism, bike rental, food ordering and home delivering (KPI 34).

In parallel to at least eight innovation labs/accelerators (e.g. Robocoast, AI Lab, the cluster for circular economy, the cluster for renewal energy, the cluster for gas economy) (KPI 47), there are several services (other than financial) available in Pori for supporting digital transformation in companies. These support services include for example entrepreneurship education,

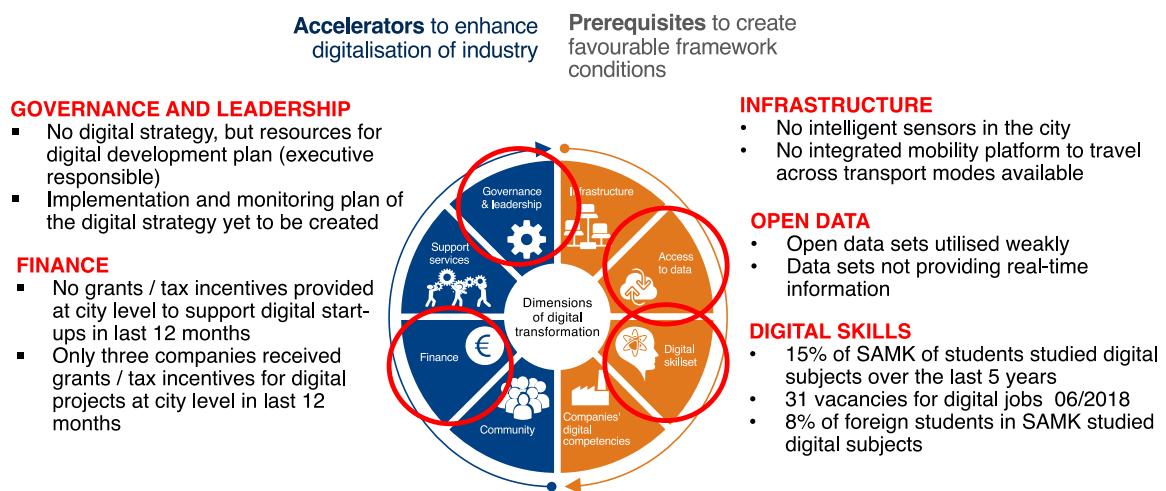
sparring, company mentoring, networking, competence and R&D&I consulting, business development services as well as industrial measurement and modelling services (KPI 50).

The innovation labs/ accelerators gather approximately 50 start-ups (and 1000 companies in total) into their activities per year (KPI 48). In addition, the awareness raising events organised in the area of digital transformation/Industry 4.0 etc. have been fruitful; the events have gathered 11 000 participants in total (KPI 49). However, the data on number of events on digital topics/and or for digital companies in the last five years could not be gathered (KPI 29).

The KPIs related to open data, digital skills, finance as well as government and leaderships reveal that Pori has something to catch up. This performance overview is seen in Figure 7. The city of Pori doesn't have its own digital strategy yet (KPI 51), nor a monitoring framework for the implementation of the strategy (KPI 54). The city has an executive responsible for digital development plan and he spends two man hours, on weekly basis, for coordination of digital development plan (KPI 52 and 53).

Figure 7 The KPI indicators in which Pori is catching up.

Areas in which Pori is **catching up**



The city of Pori provides some open data (KPI 18) but these datasets don't offer real time information (KPI 20). In addition, there is no exact information available about downloads of open datasets in last 12 months (KPI 19).

When it comes to public finance, in last 12 months, there have not been any grants / tax incentives to support digital start-ups at the city level (KPI 40). However, during the past few years, two companies have received development grant of almost 54 000 € in total. There have not been any digital start-ups which have received grants / tax incentives at city level

during the past 12 months (KPI 41). At the same time, a total value of 204 300 € in the forms of development grant was provided at city level to support non-digital companies for digital projects. This sum was allocated between three companies (KPI 42 and 43).

Based on the background interviews as well as the SAT and KPI data collection, private investors are willing to invest in local digital companies. Private funding for digital start-ups is provided by business angels in Pori (KPI 46), but it is impossible to estimate how many digital start-ups received a loan in last 12 months or how many digital start-ups received venture capital in the same time period (KPI 44 and 45).

Overall, it was not possible to collect exact information on the following issues in the KPI data gathering:

- There was no data available at city level on:
 - % of households with broadband internet at home (KPI 1);
 - % of enterprises with broadband internet at home (KPI 2);
 - % of households with internet at home (KPI 3);
 - average speed of internet (KPI 4);
 - average cost of broadband internet (KPI 5);
 - people of using mobile internet to go online (KPI 6);
 - average cost of mobile internet (KPI 8);
 - % of individuals who used the internet for interaction with public authorities (KPI 17);
 - % of people who bought or ordered goods or services over the internet in past 12 months (KPI 23);
 - % of companies with internet website (KPI 31);
 - % of companies offering online payment option (KPI 32);
- (Manufacturing) companies offering digital services (KPI 33).
- Number of both digital and non-digital companies using open data to develop a new service/support their business (KPI 21 and 22).
- Share of companies offering training to their employees (digital skills) (KPI 36).
- Number of ICT clusters and number of ICT companies joined as cluster member in the city (KPI 37).
- Loans received by digital start-ups (KPI 44).
- VC received by start-ups (KPI 45).

- Number of users of mobile applications available in the city on smartphone (KPI 35).
- Number of events on digital topics and/or for digital companies in the last five years (KPI 39).

4. The local digital ecosystem: leadership and governance

The local innovation ecosystem in Pori is based on cooperation between the key innovation players: the local municipality, business development company Prizztech Ltd. (part of the City of Pori corporation), University Consortium of Pori (Tampere University of Technology, Turku University, Tampere University and Aalto University), Satakunta University of Applied Science, and local SME and large technology companies, as well as industrial and commercial associations.

Currently, Pori has several on-going programmes and projects on AI, IoT and robotics. These include e.g. a programme of cyber security analysis in manufacturing industry, a project on Robotic in Health sector and the AI Programme (*Tekoälykäs Pori* in Finnish). In the AI programme the city enhancing digital development within two pillars; by supporting the renewal of traditional industry and providing public services with the help of AI. In related to the pillar for the industry, the city is collecting the needs of industrial companies with the aim to find competitive AI solutions accordingly. The aim of the city is to act as a pioneer in expanding digital solutions as well as focusing on concrete pilots and activities to enlarge the digital ecosystem. These activities and collaboration are also supported by 1,6 million euros public funding received from EU structural funds for structural change.

The emerging role of digitalisation in regional competitiveness is understood by all the players but further elaboration and more concrete steps towards collaboration will be still needed. Referring to the KPI results, a shared vision related to digitalisation seems to be missing -or at least is not communicated clearly. Therefore, the DCC process was highly welcomed by the persons interviewed; there are many players, projects and initiatives in the field, but a shared aim and common understanding of the goals are missing. In spite of several initiatives, the main concern relates to the possibilities to have synergies, collaboration and general coordination between the projects.

In addition, the relevant factor is knowledge and resource-based; do the area have enough participation potential and players interested in all initiatives and actions? Is there sufficient knowledge and understanding to focus on added value driven from digitalisation, not focusing on the technology itself?

Digitalisation is not an aim in itself. It is a beneficial tool to support competitiveness of business, equality and efficiency in public service as well as meeting goals of sustainable development. Digitalisation can be utilised in many sectors in society (culture, health, transportation, etc.) and this versatile approach has to be taken into account also in Pori.

Building local digital ecosystem calls for taking the lead and the risk. The city has to act as a role model enhancing concrete solutions and actions towards digitalisation. In addition, the city has to offer resources in order to reach the goals set as well as strengthen its attractiveness in the eyes of expert workforce. The city government needs also estimate what skills and knowledge will be needed in future ecosystems and what are the main tools to engage different stakeholders to reach common goals.

Based on the analysis done by Digital City Team Experts, pilots and testbed activities are highly recommended instead of long-lasting research and development projects since pilots provide quick feedback whether the actions and interventions are on the right track. There is no need to re-invent the wheel so benchmarking and learning from best practices both from Finland and abroad is advisable. Sometimes ‘the copy with pride’ is very smart approach to proceed.

Beside human resources, the economic possibilities will have a crucial effect on building and strengthening vital digital ecosystem in Pori. Project-based funding, which is commonly used in research and development activities, do not necessarily advance further development and funding for improving and testing operating models created in projects. Therefore, the development done in projects unfortunately ends while a single project comes to its conclusion.

One potential bottleneck for a strong digital ecosystem in Pori can be lack of relevant amount of companies offering digital services and solutions. Are there enough companies offering AI solutions and constituting a vital automation and robotics ecosystem? In case of Pori, the relevant question is whether it is sensible to have these companies in the region or would it be better to expand the connections to relevant companies outside, towards other regions. The increasing collaboration at national and international level will, in turn, boost the local business in Pori.

5. The use of digital solutions by local companies

The digital competencies of Finnish companies in form of internet website are at excellent level; 96% of the Finnish companies have an internet website (KPI 31). However online payment options have been estimated to be offered only by 21% of the companies (KPI 32). Based on the input collected during the interviews and workshops, there is no indication that the city of Pori should follow a different pattern, compared to the national average. However, exact data at city level was not found.

Based on the SAT results, there is some awareness about the importance of digital development for SMEs through testimonials or case studies, but it has limited reach. Digital awareness as well as interest towards digitalisation among the local companies in Pori has been estimated e.g. in two recent studies. According to the digitalisation study (2016) and the automatisation survey (2017), awareness towards digitalisation is quite good among the companies but still many SMEs are lacking skills and knowledge to understand how to comprehensively utilise digitalisation in their own business. Therefore there is a large and unexploited potential for digitalisation.³

Based on the digitalisation study, the companies in Pori region are interested in digitalisation as means of strengthening their business and administrative processes. In turn, the results from automatisation survey revealed that all participating companies representing the manufacturing sector had utilised automatisation at least to some extent. However, in the service sector one third of the companies had not adopted automatisation at any level. Most of the companies that did not have direct plans for automatisation reported that they are aware of the possibilities that automatisation or robotics would bring about, but at the same time they feel that they had no use of it in their businesses. The second most important reason reported for not adopting automatisation was the lack of knowledge and/or skills in the company to exploit these new technologies.⁴

³ <http://www.satamittari.fi/digitalisaatiokyselyn-tulokset-2016>

⁴ <http://www.satamittari.fi/automaatiokyselyn-tulokset-2017>

Based on the previous studies and background interviews conducted, the large local companies have been active in investing in digitalisation, e.g. they have provided digitalisation training with their employees. The role of large key companies can be seen crucial in acting as forerunners in adopting Artificial Intelligence and to boost digital solutions in the ecosystem.

Nevertheless, based on the analysis of SAT and KPI, many companies still need to strengthen their understanding about digitalisation. The degrees from the local education institutes might be too general and therefore the industry needs to educate personnel themselves. Short training periods, extension studies and conversion courses are tools to respond to the need.

The city of Pori is lacking skilled and talented digi/AI-professionals (software engineers, data analysts, automation specialists etc.) both at national and international level. The city's location can be found distant and the size of the city quite small, so competitiveness factors for the city's attractiveness need to be found elsewhere. Training and education as well as highly skilled experts are relevant elements to tackle the potential challenge of underdevelopment of AI solutions provided in the area.

One competition factor is the local education in which Satakunta University of Applied Science (SAMK) is highly valued. Especially collaboration between companies and SAMK is strongly appreciated in the region.

The collaboration between companies should be also emphasised. There already are some driving examples of digitalisation among the local companies (client vs. digital service provider), and these activities should be utilised as a benchmark and an example. Learning by example as well as revealing benefits and added value gained from digitalisation are excellent ways to proceed. The latter point was highly emphasised in the vision and ambition workshop where also the role of the city as a client and an enabler was underlined.

In addition, there are good possibilities for companies to gain public funding towards digitalisation. For example, Business Finland runs the AI Business programme⁵ in 2018-2022 which offers funding, networking and export services for research, development and utilising artificial intelligence and platform economy in business. However the funding possibilities for start-ups and for early stage of business should be enhanced. Based on the interviews and the data collected via SAT and KPIs, especially (pre-)seed funding is highly limited in Pori.

⁵ <https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/verkostot/digitalisaatio/AI/>

When it comes to the funding possibilities for public sector digitalisation, prospects are not that excellent, and they should be improved. For example, EU funding and collaboration could be utilised more widely by the city.

6. Community engaged in digital transformation

According to SAT, many respondents agree that there is acknowledgement of the need of a tech-community with stakeholders from various sectors in Pori but no clear formation of such a community.

Automation and other digital solutions provide leverage to create new business opportunities and to support the current ones. Pori has a well-defined innovation ecosystem around robotics and AI, which is supported e.g. by Pori's AI programme -one example of the city focusing on research, development and innovation activities in the theme. The ecosystem is led by the **Satakunta Chamber of Commerce and Prizztech Ltd** (a regional business development agency specialised in projects and events, and notably in charge of the Robocoast cluster). The city will count on these two partners also in the future in order to coordinate the development of the innovation ecosystem through specific initiatives related to AI, robotics and automation.

One of the main players in the industrial renewal is the **Robocoast cluster**.⁶ The cluster promotes the modernisation of the industry and services by developing new robotics solutions together with a large network of industrial and research partners (e.g. Advantech, Enmac, Ferob, Festum Software, Ficolo, Headai, Hydroala, Koivu solutions, Modultek, Retco, Syncron Tech, Trentec Team, Vire Labs). In addition, Robocoast is a global gateway. For example, the cluster has recently joined the Robocoast DIH, which is a member of the European Digital Innovation Hub Network (robotics) coordinated by the European Commission DG Connect.

In Satakunta region, there is a relevant number of **gaming companies** (20), which, in turn, can have a positive effect on the Pori's vision and ambition statements. The gaming companies in the region are providing e.g. solutions on training for employees as well as on user-centric, product development.⁷

⁶ <https://www.robocoast.fi>

⁷ Satakunnassa valjastetaan pelit hyötykäyttöön. Tekniikka ja Talous. 7.9.2018

In addition, the local industry is highly committed to **responsible and sustainable development**, enhancing smart processes and resource efficiency, which all can be boost with digital solutions, e.g. in terms of life cycle management. The sustainable development is naturally one of the city's main priorities and this greener future is gained via several public initiatives. For example, 'Satahima - Towards Carbon Neutral Pori Region' project helps both municipalities and SMEs develop their products and services towards the carbon neutrality. The Industrial Symbiosis System Programme, in turn, builds an operational model for promoting the utilisation of by-products generated in industry processes. The programme targets to sustainable growth through utilisation of industrial by-products or material and effectiveness.

In addition, a biogas-based economy is strongly supported in the area. The city is planning to increase its low carbon vehicles, both in biogas or electric operated engines - the latter with service-based business model (MaaS – Mobility as a Service). The city downtown bus line vehicles are partly electric (1/3 of the fleet). The digitalisation is helping the passengers; a mobile app exists for easy bus ticketing and bus location tracing.

In order to strengthen the community, more emphasis should be put on networking. Based on the SAT results, the collaboration amongst digital and non-digital stakeholders from various sectors (e.g. government, financial services, healthcare, etc.) could be improved. There are networking events organised where digital companies can meet non-digital companies with the results in visible business development. Most of the SAT respondents agree that there is at least some, or even a good number of, local ICT service providers offering a multitude of services responding to the needs of the local industry. Therefore, these matchmaking activities should be continued in the city.

7. The state of local digital and physical infrastructure

The state of the digital infrastructure at the national level in Finland is excellent. As many as 90% of households in the whole Finland had a broadband connection and in companies this rate was even better, 100% (KPI 1 and 2).

One of the dominant strengths of the city and larger area of Pori is its well-developed digital infrastructure, which allows for quick development of new digital services and platforms as well as provides good preconditions for building successful digital ecosystems. For the digital solutions and transactions of the business and industry, this is particularly important.

The infrastructure is available:

- The city and its surrounding areas are fully covered by 4G and the piloting of 5G is anticipated. The price and speed of internet is very competitive. The average speed of internet is 20,5 Mbps (KPI 4), and the average costs for the broadband internet per month is 25 € (1,25€/Mbps/month) and comparably for mobile internet 15-25 € per month (KPI 5 and 8).
- Landline broadband available for most households and companies.
- Free WIFI is provided by the city to its citizens and visitors in public city offices as well as in libraries.
- The Port of Pori, which is a major logistics hub, is well-advanced in digitalisation of logistics.
- Internet interaction with the City of Pori are well-adopted by the citizens and businesses. For example, the permit processes of the City of Pori are digitalised and there is a platform for Open City Data.

There is neither availability of (intelligent) sensors in the city (KPI 9), nor an integrated mobility platform to travel across transport modes (KPI 11), but there are a number of digital city applications available, for example the ‘Kyyti likel’ logistics platform (KPI 12). For example, 3542 public transportation tickets were purchased online during the last 12 months (KPI 13).

8. Digital solutions enabling the modernisation of business environment

The current strategic framework of Pori (presented in the subchapter 3.1) forms a solid starting point for digital transformation. Behind the strategic targets there is a common understanding that the city's and its citizen's vitality develops through the growth of the city, and the growth, in turn, is based on new innovations launched by companies and public sector.

According to the vitality programme, the city will strengthen the local business with good public business services, tight collaboration between the city and companies, and ensuring quick permitting procedures. City's role as a client and an enabler will also play an essential role where the city can offer e.g. a crucial reference to a start-up based on pilot and demonstration projects. In addition, the activities to raise city's attractiveness are reinforcing the business environment.

Through the AI Programme of Pori public authorities are taking more concrete steps towards embracing the digital paradigm in the private sector development policies. Enhancing online data warehousing and creating public e-services are the tools to create new business opportunities. The city has also many possibilities for supporting modernisation of local business by providing city environment as development and pilot platform for companies. Digital pilots, hackathons and competitions will promote business opportunities as well as the visibility of the city. Since the AI programme is widely communicated by the city, this also supports upcoming digital transformation. Relevant stakeholders have been contacted via several events, e.g. in Suomi-Areena⁸ and the Housing Fair⁹ in Pori 2018.

Digitalisation could be also a well-functional tool in public procurement activities and for shortening city's decision-making processes. Based on the local interviews conducted during the assessment visit, the decision making in Pori is too long-standing which in turn implies that the city resources are too limited. This low-speed can be especially seen in permit granting

⁸ <https://suomiareena.fi/in-english>

⁹ <http://asuntomessut.fi/english/housing-fairs/>

processes. However, the permit processes provided by the city have been totally digital since May 2018. The shift provides an opportunity for more effective case handling. The total number of applications per year has been around 800 in Pori and this level is estimated to remain stable in the future (KPI 16). The starting point for future development is also good because of the high usage of internet. Based on statistics, the usage of the internet for interaction with public authorities is very common in Finland: 81 % used this channel in 2015-2017 (KPI 17). In addition, internet is a common channel for buying. In Finland 71% of people have bought or ordered goods or services over the internet in past 12 month (KPI 23).

9. Data-driven innovation

Based on the interviews of the local players there is not enough information on open data provided by the city of Pori. The city is providing over 140 datasets online (<http://data-pori.opendata.arcgis.com/>), which focus on location data. The datasets give location information e.g. on museums, libraries, schools, sport facilities, bus routes, parking spaces and many other services provided by the city. By opening the data, the objective of the city was to improve public services and information on them as well as to provide private service providers with further business and pilot opportunities.

However, for some reasons, companies have not found these possibilities. Based on the interviews there is neither exact information on the content of the data nor possibilities to utilise it among companies. SME's are also lacking the information on what kind of data the large companies could provide. In addition, based on the SAT results, there is limited usage or no use of open data for policy-making.

However, the starting point is adequate. By providing information on data available and potential collaboration possibilities in more systematic manner, the city can support the local business ecosystem significantly. These activities can be strongly strengthened by Prizztech, which provides open access to pilot and demonstration environments in the city (living labs etc.).

Due to the size of the city, the business opportunities related to open data are, in any case, limited (the number of potential users will act as a bottleneck). In this respect, scalability and repeatability of new services developed are crucial. Thereby open data could be more widely used and utilised for providing better public services for the residents of other cities, even at the international level.

10. Skills and entrepreneurial culture

In order to build successful ecosystem, 4.0. industry, investments in education as well as collaboration between industry and education are crucial. The first seeds can be planted already before the primary school. The local education programme offers science, tech and entrepreneur-related classes both at nursery and at high-school level. In addition, within Finnish science school programme, out-of-school activities related to tech and science are organised for students. Naturally the main educational efforts and inputs are made in professional education and through extension studies.

Higher education institutions in the Satakunta (University Consortium in Pori, Satakunta University of Applied Sciences, Diaconia University of Applied Sciences and University of Turku, Department of Teacher Education, Rauma Unit) play an important role in the area of intelligent specialisation and innovation in the region. These players provide trained workforce and contribute heavily in research, development & innovation activities. The local digital skills and knowledge is strongly supported especially by SAMK where one of the three focus areas is Robotics and Artificial Intelligence. For example, SAMK coordinates The Robotics Academy which is an educational platform for the Robocoast cluster. The goal of the Academy is to strengthen the positive image of automation and robotics as well as support the ecosystem by providing state-of-the art study and research environment. In addition, the Academy boosts internalisation. This is also supported by SAMK via attracting students from abroad. In order to foster collaboration between students and companies, SAMK has created ‘Apparaatti’ concept. The Apparaatti strengthens the collaboration and helps to find the most skilled students matching the company need in question. The future also depends on how local education players will success in attracting both Finnish and foreign students in the region. One relevant tool for building international contact is the collaboration with Edu-Nation.¹⁰

Over the last five years (2013-2017), 15% of all students in Satakunta University of Applied Science (SAMK), were focused on digital subjects (KPI 24). Related to foreign students in SAMK, 8% of them were studying digital subjects (KPI 29). All non-ICT/digital diplomas at

¹⁰ <https://www.edu-nation.net/>

university colleges, universities (e.g., medicine, economics, biology, agriculture) include digital courses both in SAMK and in University Consortium of Pori (UCPori) (KPI 26).

The objectives of UCPori, in turn, are to increase the level of education, to enhance know-how and to support the region's development and internationalisation. The umbrella organisation of four universities provides relevant skills and knowledge related to digital transformation. For example, the Pori Unit of Turku School of Economics offers bachelor's and master's degrees in Economics and Business Administration. The main areas of expertise and research are business competence of knowledge-intensive organisations, and renewal and competitiveness of industries. The research projects join both academic and business approaches; for example, the TEUVO project carried by the UCPori investigates the key success factors needed for growth and modernisation in smart specialisation with the help of networking and collaboration.¹¹

In addition to higher education provided, WinNova Lansirannikon Koulutus Oy Ltd and SataEdu provide vocational education and training, as well as robotics development projects with SMEs.

Positively most of the students graduated are employed in the region. For example, 75% of ICT graduates were employed in the city over the last five years (while the average in Finland is 52%) (KPI 25). However, new and additional recruitment channels are needed both in private and public sector. The companies face challenges to recruit skilled and experienced workforce, especially in the field of AI, automation and ICT.

Digital skills have been on the focus in the DigiBusiness¹² project 2016-2017, coordinated by Prizztech. The project improved the digital capabilities of local entrepreneurs and, consequently, developed their business. The target groups of the project were small and micro-entrepreneurs/small businesses, and the project focused on digital solutions on financial operations, sales and marketing communications.

The growth of automation and robotics has been very significant, and it has contributed to the vigour of the whole Satakunta region. As already mentioned in the chapter 4, the increase in personnel in automation and robotics sector has been 57% during 2010-2017. In 2017 automation and robotics industries employed in Satakunta region 1142 specialists.¹³ At the

¹¹ <http://www.hanketusokortti.fi/hanketusokortti/teuvo/#>

¹² http://www.prizz.fi/en/digibusiness#.W31MfC0gk_U

¹³ Source: Statistics Finland and Regional Council of Satakunta 2018

same time there were 800 open vacancies for automation and electrical engineers in the Satakunta region. The unemployment rate among these experts was non-existent. In order to improve the situation, the pilot project ‘Robocoast recruitment’ was launched with the aim to find 200 new high-educated experts to the field of automation, robotics and programming during 2018-2019.

In summer 2018 there were approximately 355 employees in digital companies in Pori (KPI 27), and simultaneously there were 31 vacancies for digital jobs (KPI 28). During the past six months there were no vacancies for digital jobs to be filled in Pori (KPI 30).

Based the interviews and other data collecting as well as the workshop organised in the first phase of Digital City Challenge Project, skills and entrepreneurial culture in Pori can be further supported with more holistic ecosystem approach. Matching relevant stakeholders and utilising different interfaces, the city can bring players together to meet and solve current and future digital needs. One relevant tool could be services and support for local start-ups where long-lasting visions and attractive factors are crucial. In Pori there are around 50 digital start-ups (KPI 38) but the main sectors in these early stage businesses are related to health care and wellbeing. More focus should be put on building vital start-up culture and cluster among ICT companies which in turn, will support the aims of digital transformation.

11. Digital transformation SWOT analysis

	Strengths	Weaknesses
 Infrastructure	<ul style="list-style-type: none"> > Basic digital infrastructure at good level (access, availability, 4G coverage) > Electronic permit process / eGovernment 	<ul style="list-style-type: none"> > No intelligent sensors in the city
 Access to data	<ul style="list-style-type: none"> > Traffic, events, location, energy data opened, available > Procurement data opened 	<ul style="list-style-type: none"> > Information on open data has not reached companies > Real-time information not available > Access to planning processes
 Digital skillset	<ul style="list-style-type: none"> > Strong input on education on automation and robotics > Robocoast Academy > SME digibusiness training 	<ul style="list-style-type: none"> > Lack of skilled professionals > Lack of companies offering digital expert services
 Companies' digital competencies	<ul style="list-style-type: none"> > Large companies lead the way > Utilisation of automation by manufacturing > Supply chain management & logistics > Digital utility & maintenance 	<ul style="list-style-type: none"> > Differences between companies vary greatly > SMEs' digital skills > SMEs' IT level not ready for next digi step
 Community	<ul style="list-style-type: none"> > Strong Robocoast cluster + startups > Digital events (regular & thematic) > Thematic networks & meetings (health, etc) > CoC Digitalisation Committee 	<ul style="list-style-type: none"> > Lack of growth ambition of SMEs / startup culture > Lack of expertise locally > Business ability to carry risk
 Finance	<ul style="list-style-type: none"> > Local Business Angel Network > National Business funding available 	<ul style="list-style-type: none"> > Utilisation of public funding in city development > Funding possibilities for startups and for early stage of businesses
 Support services	<ul style="list-style-type: none"> > Innovation labs/accelerators > Wide range of support services > Match Industry Lab 	<ul style="list-style-type: none"> > Participation of start-ups remains at quite low level
 Governance & leadership	<ul style="list-style-type: none"> > Digitalisation ambitions > Authority responsible for digital development plan 	<ul style="list-style-type: none"> > Digital strategy missing > Lack of shared vision

	Opportunities	Threats
 Infrastructure	<ul style="list-style-type: none"> > Upcoming 5G infra > gGov system being updated > public eHealth system > Free access internet to be increased 	<ul style="list-style-type: none"> > Vulnerability of IT infrastructure (information security)
 Access to data	<ul style="list-style-type: none"> > Open data could be utilised more widely > Access to planning permission processes 	<ul style="list-style-type: none"> > Limited market size > Lack of commercial interests to improve public services
 Digital skillset	<ul style="list-style-type: none"> > Enhancing collaboration between students and companies (incl. foreign students) > Dissemination of good examples e.g. from health care sector (open data solutions) 	<ul style="list-style-type: none"> > Graduated students move elsewhere-> lack of skilled workforce as a bottleneck > Adaptability of education
 Companies' digital competencies	<ul style="list-style-type: none"> > AI utilisation in manufacturing companies > Supporting training by public funding > Education provided by industry associations > AI Program identifies the gaps in skills 	<ul style="list-style-type: none"> > Value of investment in digitalisation not clear to all companies > SMEs' IT level not ready for next digi step
 Community	<ul style="list-style-type: none"> > Systematic knowledge on local ecosystem to be collected and utilized > Digital community building > Tighter collaboration between city and education 	<ul style="list-style-type: none"> > Start-up culture missing > Lack of international mindset
 Finance	<ul style="list-style-type: none"> > Public funding possibilities for city development (national and EU level) > Business angels / local Growth Fund 	<ul style="list-style-type: none"> > Venture capital and private funding is insufficient > No funding for digital start-ups
 Support services	<ul style="list-style-type: none"> > Prizztech as an engine in awareness raising > Variety of accelerators and support services for companies > Accelerator plan 	<ul style="list-style-type: none"> > Public funding for support services not available any more > Increased administrative burden
 Governance & leadership	<ul style="list-style-type: none"> > Strong strategic background & synergies > Digital monitoring plan > Digital branding and communication > Innovative public procurement as a tool 	<ul style="list-style-type: none"> > No systematic coordination among initiatives > Lack of transparency and speed in public services > Resources allocated not sufficient

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.

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