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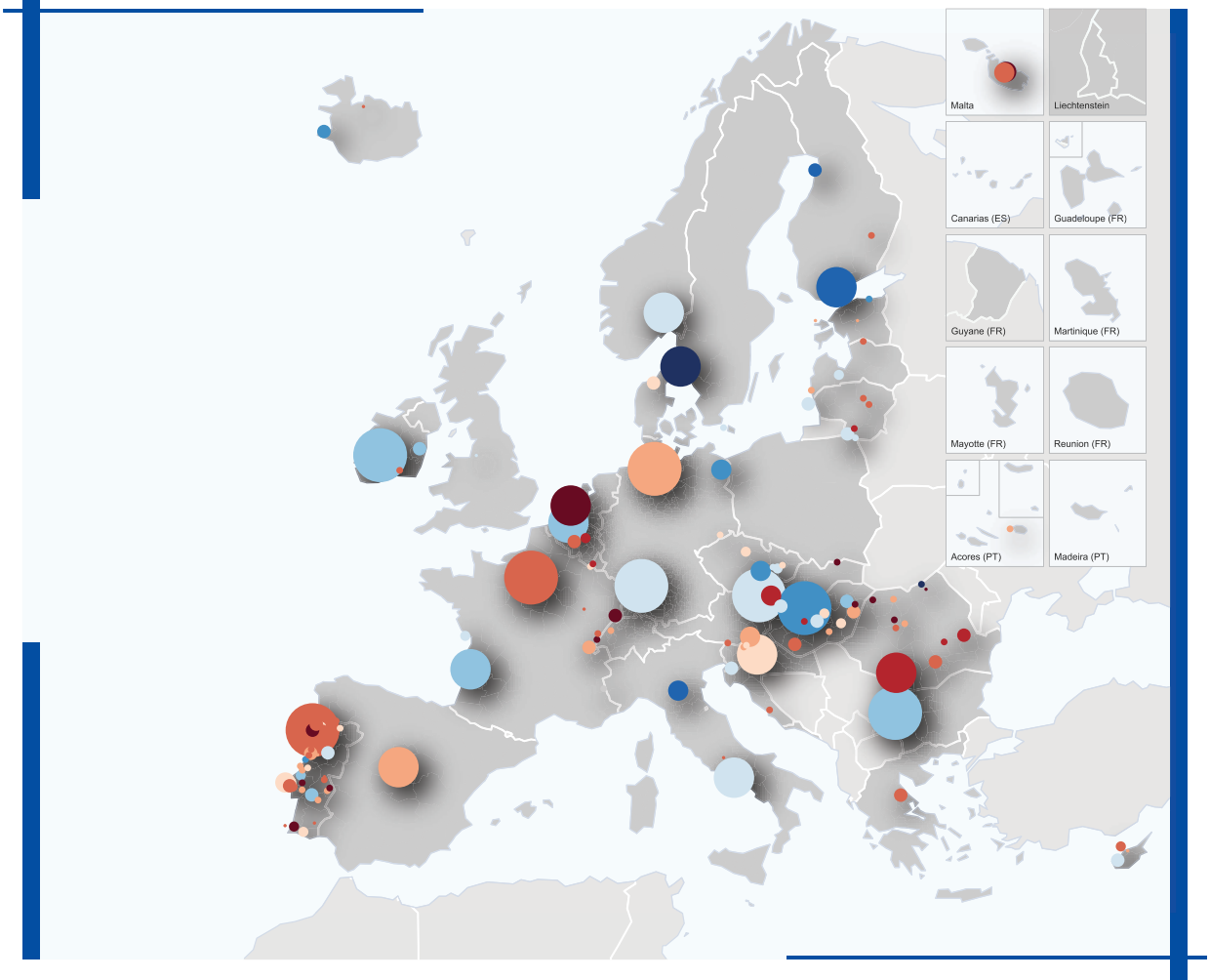
Territorial and urban dimensions of digital transition in Europe



This applied research activity is conducted within the framework of the ESPON 2020 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.

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Territorial and urban dimensions of digital transition in Europe

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Abbreviations

BB	Broandband Access
BG	Bulgaria
CEMR	Council of European Municipalities and Regions
CZ	Czech Republic
DS	Digital Score
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
EE	Estonia
EGTC	European Grouping of Territorial Cooperation
ERDF	European Regional Development Fund
ESF	European Social Fund
ESPON	European Territorial Observatory Network
EU	European Union
EUR	Euro
FI	Finland
GDP	Gross Domestic Product
GDC	Green Digital Charter
HRI	Helsinki Region Infoshare
HU	Hungary
ICT	Information Communications Technology
IS	Iceland
ISA	Interoperability solutions and common frameworks for European public administrations, businesses and citizens
IT	Italy
LDS	Local Digital Score
MT	Malta
NGOs	Non Governmental Organisations
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
PPPs	Public Private Partnerships
R&D	Research and Development
SE	Sweden
UDG	Urban Development Group
UK	United Kingdom
UN	United Nations

Executive summary

Digital transition is a high priority in the European policy context. It is supported by a range of strategies, policy initiatives and programmes which cover the digital economy and growth, governance and digitalisation of public services. Digital transformation of public administrations has received considerable attention over the last years. However, despite the large volume of knowledge available, insights into the digital transformation at city level are scarce as there is a lack of systematic information Europe-wide.

The objective of the report therefore is to provide an overview of digital transition of EU regions and cities (i.e. the take-up of the digitalisation of services), and to investigate the linkages with, and the potential impacts for socio-economic development. In order to capture the urban dimension of digital transition and since data at sub-national level are scarce, a survey was carried out aimed at collecting the views of city officials. The survey received in total 136 responses from all the EU Member States as well as from Iceland, Norway and Switzerland. Half of the responses came from small and medium-sized towns (fewer than 50,000 inhabitants), 30% from small and medium-sized cities (between 50,000 and 250,000 inhabitants) and 20% from large cities (more than 250,000 inhabitants). The analysis was further supplemented by the examination of four case studies on cities that are considered digitally advanced or are in the process of digital transition.

As regards the cities' level of digitalisation, the report found that there are differences in the range of services between cities of different size across Europe. For the 57 public services examined through the survey, the results showed that larger cities provide more digitalised services than small and medium-sized cities and towns. Northern European cities are more digitally advanced in terms of services provided to their citizens irrespective of size compared to other European cities.

Cities digitalise their services in a drive to modernise, increase their internal efficiency, improve citizen experience and facilitate access to information. The main factors that constrain digital transition are insufficient funding, absence of overall strategy and lack of skills, which affect smaller cities and towns in particular. While only some cities have already implemented their digital strategy, the majority of them are working on it. Besides, more than half of the cities have a budget reserved for the digitalisation of services. Cooperation is also an important factor that can foster digital transition; however, only a small number of cities in Europe participate in EU/international networks related to digital transition and in PPPs.

Western and Southern European cities are more advanced related to the factors such as digital strategy implemention and participation in PPPs and networks compared to other European regions but it should be taken into consideration that the majority of cities that participated in the survey are from Southern Europe. Large cities are more actively involved in the digitalisation efforts and are more likely to perform well in the those factors than smaller

cities and towns. Small and medium-sized cities and towns seem to face more challenges in keeping up with digital developments as in some cases they lack technological competences and budgetary resources to digitalise their services.

Digitalisation has a positive impact on cities' services. The services have improved for more than 90% of cities as a result of digitalisation and almost 40% of the cities have noticed a significant uptake of specific services due to digitalisation. In addition, approximately 70% of the cities use the data gathered from the use of digitalised services to improve their services or to facilitate the decision making processes. The digitalisation of services also reduces the operating and staffing costs and therefore can improve the effectiveness and efficiency of public administrations at local level. Furthermore, 1 in 3 cities has seen a substantial reduction of operating costs as a result of digitalisation and for 3 out of 5 cities it has resulted in reduction of staffing.

As for the level of digitalisation at regional level, there are still considerable differences, with Northern Europe being more digitally developed, especially in comparison with the countries in Southern and Eastern Europe. The most digitally advanced region in terms of services provided to the citizens at local level as well as at regional and national is Northern Europe. On the contrary, the least developed region is Southern Europe. In addition, Northern regions invest more in R&D activities, employ more people in science and technology sectors, have higher levels of broadband access, interact by digital means with public authorities and order more goods and services online than other regions in the EU.

The models of digital transition analysed in the case studies present common elements, which provide relevant insights into approaches that have proven to be successful. It is evident that the design, definition and implementation of a successful strategy needs broad support from within the city´s governmental structures, the private sector and the citizens at large. Coordination and collaboration with the private sector is key, and public-private partnerships have proven to be a useful means for engaging the private sector and ensuring the success of initiatives where their involvement is vital. Involving citizens in the process while ensuring the active involvement of relevant stakeholders is served well by implementing a broad range of smaller activities and initiatives from the local companies and communities, facilitating citizens' involvement. Implementing the strategy requires considerable funding and the studied cities use a wide array of different sources, from own funds to other public and private funds.

The report puts forward a number of recommendations to enhance the digitalisation of cities. In particular, national and regional levels need to support the development of cooperation among cities and the digital transition of smaller cities and towns. Medium-sized and large cities are recommended to make use of the data and to open up to support the development, testing and roll-out of advanced digital solution; to promote digital awareness and support; and to develop digital talent. Small cities and towns are also recommended to make digital

strategy a core part of their cities' policy; to benefit more from the available EU and national programmes; and to start the digitalisation efforts with small-scale experiments (Proof-of-Concepts).

1 Introduction

Digital technologies and tools are transforming the internal operations of governments and the way they interact with the citizens. Many cities have been digitalising their services and modernising their government processes, simplifying their governance and increasing efficiency and effectiveness.

Digital transition is crucial for public administrations as it shortens the time and lowers the cost of obtaining information and carrying out administrative procedures. Citizens expect that public administrations offer digitalised solutions for facilitating the exchange of information and improving their transparency and efficiency. Digital transition contributes to the competitiveness, growth and sustainable development of cities and regions.

Digital transition is currently very high on the political agenda. Since taking office in November 2014, the current European Commission has given greater recognition to digital transition by making it one of its key priorities. Furthermore, as one of the most digitally advanced countries in the world, Estonia, was holding the presidency of the Council of the EU in the second half of 2017, this theme was chosen as one of the priority themes for the current policy debates.

Digital transition is supported by a range of strategies, policy initiatives and programmes at EU level. Those particularly relevant to the context of this study are the Europe 2020 strategy, the Digital Agenda for Europe, the EU Cohesion Policy during 2014-2020, the Digital Single Market Strategy, the European eGovernment Action Plan and the ISA Programme. Digital transition is also one of the key priority themes in the Urban Agenda for the EU, which has been adopted by the Pact of Amsterdam in 2016.

A great deal of knowledge exists in terms of what is going on in Europe as a whole and at national level. However, there are significant knowledge gaps on the progress of digital transition in different European regions and cities.

The purpose of the study is to provide an overview of digital transition (i.e. concerning the digitalisation of governance and services) in EU regions and cities. The methodology that was used to carry out this study is presented in Section 4. The study started in May 2017 and completed in September 2017.

1.1 The objectives and scope of the study

The main outcomes of the study are to provide a comparative picture of digital transition in the EU and a series of policy recommendations based on best practices and innovative ideas aimed at further promoting digital transition, taking into account the diverse territorial and urban context within Europe.

Specifically, the study aims to: analyse the ways in which regions and cities differ in terms of the level of digital transition; explore the linkages and potential impacts of digital transition for socio-economic development in European regions and cities; investigate the main territorial preconditions, driving forces and bottlenecks for the advancement in digital transition; explore how different models of government interventions (regarding infrastructure, funding, skills, etc.) generate favorable impacts; and examine the need for cooperation and common platforms.

1.2 Purpose, scope and structure of the report

The purpose of this report is to provide an overview of digital transition of the EU regions and cities (i.e. the take-up of the digitalisation of services), and to investigate the linkages with, and the potential impacts for socio-economic development.

1.2.1 Scope of the study

- **Intended audience**: the study allows urban level policy makers to better understand the level of digitalisation of public services, for whom the study should provide recommendations on digital transition;

- **Geographical scope:** the study covers all the countries participating in the ESPON 2020 Cooperation Programme, i.e., EU 28 Member States and the 4 Partner States of Iceland, Liechtenstein, Norway and Switzerland. Where possible the comparative analysis was made across NUTS III regions (or NUTS II depending on data availability) with a focus on urban areas and cities. Where the data was available only at NUTS II level we used the survey results to supplement the analysis;

- **Services focused on citizens**: the study captured the services focused on citizens, examining how urban areas and cities deliver public services and which of them are digitalised.

1.2.2 The structure of the report

The report is divided into the following sections:

- **Policy context**: This section provides the policy context of the study;

- **Recent studies on digital transition**: This section provides an overview of the different studies related to digital transition in the EU;

- **Methodology:** This section presents the methodology of the study, the type of data used for the analysis and the method of data analysis;

- **Cities' level of digitalisation and factors that facilitate or constrain digital transition:** This section is focused on understanding digital transition at city level. It also presents the different factors in the digital context and their effect on digital

transition. Besides, it analyses how urban and regional authorities differ in Europe; how different models of government interventions (regarding, funding, skills, etc.) generate favorable impacts; the role of public private partnerships in digital transition; and where is the need for more cooperation and common platforms;

- **Impacts of digital transition on cities' services**: This section presents the impacts of digital transition on city services;
- **Capital cities' and regions' level of digitalisation:** This section presents the digitalisation of services at supra-local level, i.e., regional. It also analyses the linkages and potential impacts of digital transition on the socio-economic development in European regions;
- **Models of digital transition:** This section presents the case studies conducted in four cities that are considered digitally advanced or in the process of transitioning digitally;
- **Recommendations:** This section presents the policy recommendations;
- **Annexes:** The study includes two annexes; the first presents the results of the survey carried out for the purposes of the study, and the second contains the four case studies.

2 Policy context

Digital transition is recognised as a vital topic in socio-economic development and is receiving more and more support from EU policies. It has been high of the EU agenda as one of its key priorities since the current European Commission took office in November 2014. Furthermore, this theme has been selected as one of the priority themes for the Estonian presidency of the Council of the European Union for the second half of 2017.

The current EU digital transition should enable “our societies and economies going digital” as pointed by the Commissioner for the Digital Economy and Society, Günther H. Oettinger, on the launch of the Digital Single Market Strategy on 6 May 2015. Such a transition is intended to “prepare for a modern society and will table proposals balancing the interests of consumers and industry”.

Digital transition impacts all aspects of our lives. Although, private sector is taking the lead, governments and public sector agencies are also investing heavily in digitalisation. Digital tools and solutions are transforming public services and how governments interact with their citizens. A large number of countries, regions and cities have been actively engaging in the modernisation and re-engineering of government processes and services and have seen high returns through simplified governance and increased efficiency, effectiveness and outreach. However, public authorities face many challenges in the process of digital transformation including re-thinking governance, allocating resources for re-skilling and adopting new technologies, as well as legislative and policy issues.

There are a range of EU policies, some directly relevant and devoted to digital issues, some more general but of major relevance to digital transition. Below are presented some of the key policies considered relevant in the context of this study.

2.1 Europe 2020 Strategy

The Europe 2020 Strategy is the EU's growth strategy running from 2010 to 2020. The focus is on smart, sustainable and inclusive growth to help deliver high levels of employment, productivity and social cohesion. At EU level, and within each Member State, concrete objectives and targets have been set for 2020.

Enhancing the spending on R&D, the use of ICT and the high-speed internet are key objectives of the strategy. R&D spending in Europe is below 2%, compared to 2.6% in the US and 3.4% in Japan. In addition, the demand for ICT is EUR 2 000 billion globally, with only one quarter of this coming from the EU. Europe is also lagging behind in high-speed internet access.

For progressing in each of the priorities and achieving targets set by the strategy, e.g. bringing expenditure on R&D to 3 per cent of GDP by 2020, the strategy includes flagship

initiatives like the Digital Agenda for Europe in order to reach the goals by 2020 (European Commission 2010a)[1].

2.2 Digital Agenda for Europe

The Digital Agenda for Europe is one of seven flagship initiatives under the Europe 2020 strategy. It focuses on the role of ICT to foster innovation, economic growth and progress. The objective of the Digital Agenda for Europe is to maximise the social and economic potential of ICT, most notably the internet, to promote innovation and economic growth, and to improve the everyday life of citizens and businesses.

Specifically, the Digital Agenda Europe sets three goals related to fast and ultra-fast internet access for the year 2020: first, the entire EU should be covered by broadband access (over 30Mbps); second, at least half of the population should use Internet with a speed of at least 100Mbps or more; third, investments in ICT and R&D should be promoted.

After consultation with stakeholders, the European Commission identified some obstacles related to digital economy, namely lack of investment in networks, lack of interoperability, lack of skills, fragmented answers to societal challenges, insufficient R&D investments, fragmented digital markets, rising cybercrime and low trust. These obstacles undermine ICT development and show that action is needed at EU level (European Commission, 2010b)[2].

2.3 EU Cohesion Policy during 2014-2020

The Cohesion Policy has 11 thematic objectives to help deliver the Europe 2020 goals. One of its objectives includes enhancing access to, and use and quality of ICT. In particular, this thematic objective relates to extending broadband deployment and the roll-out of high-speed networks; developing ICT products and services and e-commerce; and strengthening ICT applications for e-government, e-learning, e-inclusion, e-culture and e-health (European Commission, 2015a)[3].

ICT is important for Europe's sustainability and economic competitiveness, as well as social inclusion (European Commission, 2015b)[4]. The ICT sector is responsible for 5% of EU GDP, with a market value of EUR 660 billion annually (European Commission, 2010b). European Structural and Investment Funds available for ICT investments in the period 2014-2020 can generate up to EUR 250 billion growth for the EU and support the creation of a Digital Single Market (European Commission, 2015a).

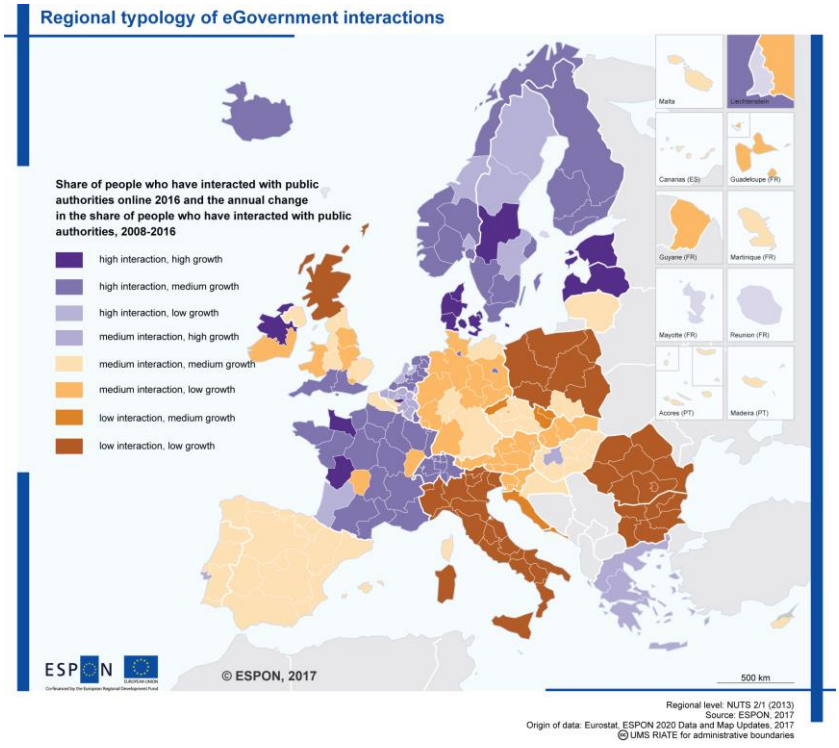
The European Regional Development Fund (ERDF) has a specific focus on sustainable urban development for cities have an important role to play in achieving overall European objectives. At least 5% of ERDF support will be dedicated to cities, which will need to have an integrated urban strategy and decide on project selection. Through Integrated Territorial Investments joint use of different funds to implement such a strategy should be easier and Community-led Local Development stimulates local engagement.

Smart Specialisation Strategies help regions to shift from a conventional ICT sector approach to a comprehensive local, regional or national “digital agenda”, so that municipalities, regions and countries can identify ICT investment priorities relevant for them. European Structural and Investment Funds support public authorities in achieving their policy objectives, implementing their strategy and moving towards a Digital Single Market (European Commission, 2015a).

2.4 Digital Single Market Strategy

The Digital Single Market Strategy was launched in May 2015 as one of the 10 political priorities of European Commission. Digital Single Market aims to maximise the growth potential of the digital economy by ensuring the free movement of persons, goods and services and capital. Besides digitalising the industries and production, the Digital Single Market can benefit EU citizens and businesses by enabling modernised digital services such as e-government, e-health, e-energy, e-transport,etc. (European Commission, 2017)[5].

Map 2.1: Share of individuals who used the internet for interaction with public authorities (2016)



One of the objectives of Digital Single Market is the modernisation of public services through digital technologies that will allow public authorities to deliver services more effectively (European Commission, 2017a). Digital interactions with public services include services such as obtaining information to manage administrative procedure or voting online. The interaction with public authorities has increased in Europe since 2004. As can be seen in Map 2.1, parts of the Northern and Western Europe have much higher levels of digital interaction with public authorities compared with parts of Eastern and Southern Europe. For implementing this

objective several actions have been taken at EU level, such as the European eGovernment Action Plan.

2.5 European eGovernment Action Plan

The digital transformation of the public sector is an important goal in the EU and a key element to the success of the Single Market. The current European eGovernment Action Plan for 2016-2020 launched in the context of the Digital Single Market Strategy for Europe aims to remove existing digital barriers to the Digital Single Market and to prevent further fragmentation arising in the context of the modernisation of public administrations. More specifically, it serves as a catalyst for coordinating public sector modernisation efforts and resources in the field of eGovernment.

The vision guiding the Action Plan feeds into the implementation of Europe 2020: "By 2020, public administrations and public institutions in the European Union should be open, efficient and inclusive, providing borderless, personalised, user-friendly, end-to-end digital public services to all citizens and businesses in the EU" (European Commission, 2016)[6].

2.6 ISA programme

The interoperability solutions and common frameworks for European public administrations, businesses and citizens (ISA programme) is running from 2016 to 2020 and supports the development of tools, services and frameworks in the area of e-Government (European Commission, 2017b)[7].

The digitisation of public administrations and the services they offer is one of the key goals of the programme. Although Member States are in the process of digitalisation, the Digital Economy and Society Index for eGovernment demonstrates that digital public services are not yet a reality throughout the EU[8].

Public service providers in the Member States thus need more precise guidance on improving the governance of their interoperability activities, establishing cross-organisational relationships, and streamlining the delivery of end-to-end user-centric public services.

2.7 Urban Agenda for the EU

The Urban Agenda for the EU was adopted on 30 May 2016 by the Pact of Amsterdam. Today, more than 70% of EU citizens live in urban areas, while 85% of the EU GDP is generated in cities. The Urban Agenda for the EU aims at involving urban authorities to achieve better regulation, better funding and better knowledge.

The cornerstone of the Urban Agenda is a set of priority themes on 12 identified urban challenges, including "Digital Transition", allowing cities, Member States, EU institutions and other stakeholders (NGOs, business partners…) to work together on an equal basis to find common ways to improve urban areas in the EU. "Digital Transition" aims at providing better

public services to citizens and create business opportunities. More specifically, the focus is on data collection, better use of open data, data management and digital services (EU Ministers of Urban Matters, 2016)[9].

2.8 UN Sustainable Development Goals

The Sustainable Development Goals set by the UN are aiming at ending poverty, protecting the planet and ensuring peace and prosperity. One of the specific aims of Goal 16 ("peace, justice and strong institutions") is to ensure responsive and accountable institutions that deliver fair public services and inclusive development at central and local levels with a focus on improving government functions and local governance and local development. Specifically, it seeks to help countries establish structures and systems for multilevel governance through policy, institutional and capacity development and the development of systems for the delivery of services (United Nations, 2016)[10].

Digital technologies play an important part in enhancing knowledge, economic growth, transparency of institutions and, moreover, create new opportunities for innovation. Digital technologies can contribute to the fulfilment of Goal 16, as they are a cross-sectoral and cross-cutting issue, that can modernise government processes, improve institutions functions and enhance their effectiveness.

2.9 Smart Cities

There are several definitions of smart cities that exist, and it appears that there is a degree of confusion as to what exactly is understood by "smart city". The definition of smart city used in this study is the following: "A smart city is a place where through the use of digital and telecommunication technologies, traditional networks and services are made more efficient, for the benefit of the citizens" (European Commission, 2017d)[11].

Smart city means smarter urban transport networks, upgraded water supply and waste disposal facilities, and more efficient ways to light and heat buildings. It also contains a more interactive and responsive city administration, safer public spaces and meets the needs of an ageing population (European Commission, 2017d).

For cities to be smart, ICT technologies need to be part of a city's strategy, and be able to improve the provision of public services. In smart cities, users need to understand the applications of ICT by becoming "smart citizens", to exploit the contribution to productivity, economic growth, carbon emission reduction, and to ensure that the benefits are experienced across the city and its citizens (European Investment Bank, 2012)[12].

3 Recent studies on digital transition

Digital transformation of public administrations has received considerable attention over the last years. Various studies and reports, as well as case studies and analyses have been published. However, despite the knowledge available, pan European insights into the digital transformation at city level are scarce.

Much of the published research provides relevant insights into the digital transformation of Europe as a region, at country level or at most on regional (NUTS II) level. For instance, McKinsey´s report on Digital Europe compares the digitalisation efforts and impact in Europe with the status in the United States (McKinsey, 2016)[13].

Studies which do analyse the situation at country level, tend to focus on specific sectors or areas of services, such as Accenture´s report on the digital readiness of European financial services (Accenture, 2016)[14], or the activities within the framework of the EU digital strategy focusing on the issue of skills and IT professionals (European Commission, 2017e)[15].

The research and studies available on the situation of digital transformation in cities are scarce and relatively outdated. For example, the Committee of Digital and Knowledge-based Cities published a report on the digitalisation and situation of smart cities in Europe, including examples of different cities (Committee of Digital and Knowledge-based Cities, 2012)[16], or the report from the UK Department for Business (Department for Business, Innovation and Skills, 2013)[17]. Those that are more recent tend to focus on a specific service area, e.g. the report of the Strategic Policy Forum on Digital Entrepreneurship on the transformation of European Industry and Enterprises addresses services related to entrepreneurship for Europe.

An example of the few studies available which are recent and focus on city level is the report “State of the digital region: cities connecting the digital economy in the Baltic Sea region” (Wernberg and Andersson, 2016)[18]. However, it only addresses cities located in countries in a specific part of Europe.

An assessment of the available studies and research shows that solid and comparable data on the digitalisation of municipal services represent a void in this field, and real insights on how cities approached the digitalisation of their services is key for successful smart strategies for all cities in Europe, irrespective of size or geographical location. The present study aims to contribute to the knowledge concerning digital transformation at sub-national levels by providing recent and relevant insights on the strategies implemented by different cities across Europe.

4 Methodology

4.1 Methodological approach

4.1.1 Desk research

The initial step of the study included desk research to identify existing data and information on digital transition in regions and cities in Europe. The quantitative part of this work involved the identification of datasets (taken from EUROSTAT) for the use as indicators to capture the digital transition at regional and city level within the socio-economic and digital environment contexts. Examples of indicators used to represent the socio-economic context include the total intramural R&D expenditure, while indicators such as households' access to broadband and online interaction by citizens with public authorities were used to understand the digital environment.

4.1.2 Survey

In order to examine the urban dimension of digital transition and since the data at sub-national level are scarce, a survey was carried out aimed at obtaining the views of city officials. The survey collected data on the level of digital transition of cities based on opinions and perceptions of city officials from local government authorities and organisations providing public services. It provided information on the digital strategies in place and the level of digitalisation of the services provided to citizens.

The survey was sent to city officials in the EU 28 Member States as well as to Iceland, Liechtenstein, Norway and Switzerland asking them to fill in an online questionnaire. It was disseminated through the following city networks: Eurocities, Urban Development Group (UDG), Council of European Municipalities and Regions (CEMR), METREX, URBACT and ESPON. The platform used for disseminating the survey was the EU Survey platform, the European Commission's tool used to create surveys of public interest.

In total 147 responses were received from 136 cities from all the countries examined under the scope of the study except for Liechtenstein. The largest group of cities that participated in the survey were from Portugal, while for some of the countries we received only one response.

A limitation of the survey data relates to the respondents' knowledge and/or awareness of the digitalisation efforts and services in their cities. For some cities, for which we received more than one response, it was noticed that the respondents' answers differed significantly on certain questions. In such cases responses were prioritised based on the perceived knowledge and responsibility of the respondent by considering the organisation that the respondent is a part of and his/her functional level.

As part of the survey, city officials were given the opportunity to respond to questions grouped into the following sections:

- **Digital strategy and leadership** – to understand whether the city has a digital strategy, what are the main drivers behind the strategy and whether there is a single person responsible to oversee or manage the city's digital strategy;

- **Digitalisation of city services** – in total 57 services falling into 9 service themes were chosen as indicators for the study based on expert opinions. These services were deemed to be the most common and the most representative to capture the different stages of digital transition in the provision of public services. Respondents were asked to indicate which of the services are digitalised and at what level they are offered digitally (local, regional and/or national) or to state that the services were not delivered digitally at all or that the respondents were not aware if they are available or not. The explanation of what is meant with services "available" or "offered" to citizens of a city at local, national or regional level is, as follows:

    - **Local level**: Services offered by a local-level provider (e.g. municipal authority or agency).

    - **National or regional level:** The service "provider" is a "supra-local" body (e.g. a regional or national authority/agency, such as a health authority);

    - **Not aware**: The service is not provided digitally at any of the levels or the respondent was not aware if it exists or not.

- **Process and results of digital transition** – the intention is to understand the factors that facilitate or constrain digital transition and to get an idea of the results the cities have realised due to their digitalisation efforts.

For examining the cities' level of digitalisation, the services were classified into three categories according to their complexity: basic (basic services offered by public administrations), intermediate (services of medium complexity offered by public administrations) and advanced (services of advanced complexity offered by public administrations). A weighting was assigned to each of the categories (basic=1, intermediate=2, advanced=3) to measure their level of digitalisation.

The table 4.1 below presents the 57 services included in each of the 9 themes and their classification with regard to how basic, intermediate or advance a service is considered to be. The table also shows the number of cities that responded if a service is digitalised at local, regional and/or national level.

Based on the number of digital services provided at local, regional and national level and their respective weights, a digital score was calculated for each city. Using their digital scores, it was possible to measure the cities' level of digitalisation and to classify them into cities with high, medium or low local digital score (LDS).

Table 4.1: Services included in each of the service themes, their classification and number of cities offering each service

Services per service theme	Service complexity	Local	Regional/National
e-inclusion of citizens to local governance			
Find information via website	Basic	127	6
Trace the Council decision-making process	Intermediate	89	8
Follow streamed Council's meetings	Intermediate	68	16
Trace applications' proceeding by local authorities	Intermediate	63	12
Checking one's personal data from databases and registers	Intermediate	43	27
Participate in local government budgeting and strategies through voting online	Advanced	33	9
Spatial planning and construction			
Find information via website	Basic	119	8
Explore land use plans and proposals via dedicated GIS services	Advanced	96	20
Apply for planning and building permits	Basic	84	16
Obtain land use and cadaster data online via land registry	Intermediate	68	30
Participate in online public consultations on plans	Advanced	59	9
Social and welfare services			
Find information via website	Basic	115	11
Apply for support online	Basic	59	25
Report abuse online	Basic	36	26
Receive direct online support via chat/video call	Advanced	15	11
Join an online support community	Intermediate	9	14
Education			
Find information via website	Basic	114	13
Access PCs and interactive displays in primary education	Advanced	86	8
Monitor learning progress online (grades, events, assignments)	Advanced	57	23
Pay for the fees electronically	Intermediate	53	24
Apply for schools/course admission online	Intermediate	51	32
Obtain learning materials online	Intermediate	51	40
Participate in courses online	Intermediate	41	39
Public transport			
Find information via website	Basic	103	21
Use mobile apps for journey planning	Intermediate	57	38
Pay for the tickets electronically	Intermediate	44	41
Receive information about service interruptions, route changes, etc.	Intermediate	42	30
Track the public transport in real-time via digital timetables at stops	Advanced	40	26
Track the public transport in real-time via mobile apps	Advanced	38	29
Track your journey by using the onboard electronic displays	Intermediate	36	25
Road infrastructure & parking			
Find information via website	Basic	81	27
Pay for the parking electronically	Intermediate	55	30
Track statistical and real-time information on parking vacancies	Advanced	38	19
Get road information via digital information boards	Intermediate	36	41
Track statistical and real-time information on road congestion and roadworks	Advanced	24	34
Pay for the road tolls electronically	Intermediate	17	45
Health			
Find information via website	Basic	82	26
Make appointments online	Intermediate	43	34
Use e-prescriptions	Advanced	31	34
Apply for local, regional or national aids online	Intermediate	24	33
Receive online medical care services (consultations, telemedicine)	Advanced	16	25
Submit a request for reimbursement online	Intermediate	15	24
Access medical records online	Intermediate	13	39
Culture, leisure and sports			
Find facilities and event calendars online	Basic	118	11
Register to clubs, libraries, courses, events online	Basic	85	18
Book or pay for the use of facilities and tickets	Intermediate	80	22
Register complaints	Intermediate	68	16
Use QR codes in museums, landmarks info points for additional information	Intermediate	67	17
Find books, manage your book loans and pay fines online	Intermediate	54	21
Borrow e-books	Intermediate	41	19
Book a library desk space for study/work purposes	Intermediate	29	20
Use mHealth services to communicate personal health data	Advanced	8	15
Tourism			
Find information via website	Basic	122	10
Use mobile tourist guide applications	Intermediate	86	25
Use interactive maps	Advanced	83	23
Use location based services for journey planning	Advanced	69	21
Leave feedback to share with others	Basic	61	23

Furthermore, for exploring differences between cities, the cities have been grouped into the following categories according to their size:

(1) **Small and medium-sized towns**: below 5 000 inhabitants to 50 000 inhabitants

(2) **Small and medium-sized cities**: 50 000 to 250 000 inhabitants

(3) **Large cities**: 250 000 to more than 1 000 000 inhabitants

50% of the responses to the survey were from small and medium-sized towns, 30% from small and medium-sized cities and 20% from large cities.

In addition, for examining differences in the digitalisation of services at a regional level, cities were grouped into 4 regions – Northern, Western, Eastern and Southern Europe. Southern European cities were the most responsive (37%) followed by Eastern (29%), Western and Northern European cities (17% respectively).

4.1.3 Case studies

The survey was supplemented by a qualitative analysis by conducting four case studies on cities that are in different stages of digital transition. The aim of the case studies is to better understand each city's digital strategy and its efforts in the digital transition process, including how the transition is supported from a funding perspective.

A two-step approach was followed in the selection of case studies. The first step was to use networks relevant to the topic of this study to identify cities, i.e., cities that are members of these networks would be considered eligible case study candidates. The second step involved applying a set of criteria to the cities identified through the networks, thereby narrowing the field of possible case study candidates further.

The following networks were used to develop a matrix a list of cities:

- Metrex
- Green Digital Charter
- European Digital City Index 2016
- Urban Agenda Partnership for Digital Transition
- North-seasmart cities
- Spanish Smart Cities Network
- European SmartCities

The following criteria were applied to the list of cities identified in the initial step:

- **Capital city** – at least two of the case studies should not be based on capital cities;
- **Representation** – the number of times a city is found to be present in the networks;

- **City size** – the sizes of the cities chosen to be case study candidates should vary. Here the OECD-EC definition of cities and their commuting zone was relied upon (European Commission, 2012)[19];

- **Region within Europe** – each geographic region (Northern, Southern, Western and Eastern Europe) should be represented by a city;

- **Member State size** – the case study candidates should ideally represent different sized Member States;

- **Number of other case studies** available for consultation.

The outcome of this process was the selection of Zaragoza, Helsinki, Eindhoven and Sofia for the four case studies.

Representatives from each city were first contacted by telephone to be introduced to the topic of the study after which a follow-up email was sent containing a questionnaire with specific questions regarding the city's digitalisation efforts, e.g., what triggered these efforts, what challenges were encountered and how these were overcome, how public-private partnerships were/are being leveraged, etc. Follow-up interviews took place with respondents where further clarity was needed on the feedback through the questionnaire.

4.2 Data analysis approach

The desk research revealed that there is not much data available about the state of digital transition, despite digital transition being high on the policy agenda for the past several years. As such, in order to examine the digital transition in Europe and the factors driving this process, the study follows a two-step approach. Firstly, it analyses data at city level, using information collected through the survey and performs correlations with secondary data collected from Eurostat (NUTS II level) with the aim of showing the comparative picture of digital transition between the different territorial levels and from this to draw conclusions. Secondly, it supplements this analysis by analysing the information gathered from the case studies.

The table 4.2 below provides a detailed information on the data analysis approach of the study.

Table 4.2: Description of data analysis approach

Sections	Data collection	Method of analysis	Expected outcomes
Cities level of digitalisation and factors that facilitate or constrain digital transition	Survey	Descriptive analysis Comparative Analysis	Study the level of digitalisation of cities Examine the factors of digital transition that are the main drivers behind or the barriers for advancements in digital transition (e.g. digital strategy, budget, cooperation etc.)
Impacts of digitalisation on cities' services	Survey	Descriptive analysis	Explore different impacts of digital transition on cities' services
Capital cities', countries' and regions level of digitalisation	Survey Desk research of secondary data at NUTS II level	Descriptive analysis Comparative analysis	Study the level of digitalisation of capital cities, of countries and regions Explore the linkages and potential impacts of digital transition on the socio-economic development in European regions
Models of digital transition	Case study (in a form of questionnaire) Desk research	Qualitative analysis Analysis of documents	Study cases of cities in digital transition

4.3 Timetable

The study officially commenced in May 2017 with the research and collecting of data. The survey questionnaire was launched in mid-June and was open until mid-July to provide respondents with adequate time to provide input. Similarly, the case studies were conducted over a period of one month. The study was completed on 22 September 2017 with a view to being used as an input to the discussions during the key meetings of the Estonian Presidency of the Council of the EU during the second half of 2017.

5 Cities' level of digitalisation and factors that facilitate or constrain digital transition

This section is focusing on understanding digital transition at city level by examining different factors. In particular, it analyses the relationship that these factors have with the level of digitalisation of cities, their size and their geographical location. The purpose of this section is to determine which of those factors are the drivers behind or the barriers for advancements in digital transition.

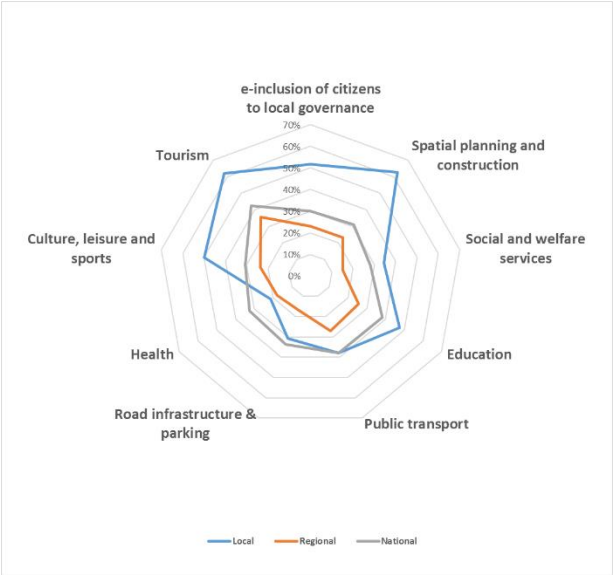
This part of the study analyses how urban and regional authorities differ in Europe; how do different models of government interventions (regarding funding, skills, etc.) generate favorable impacts; the role of public private partnerships in digital transition; and the need for more cooperation and common platforms.

5.1 Digital transition of services provided by cities

Figure 5.1 shows the level of digitalisation of each of the 9 service themes based on the number of cities digitally offering those digital services within each theme at local and supra-local level (regional and national levels). The 9 service themes represent a total of 57 services (table 4.1).

The most digitalised service themes at local level are spatial planning and construction (63%), tourism (62%), e-inclusion of citizens to local governance (52%), culture, leisure and sport (50%) and education (48%). The services lagging behind are health (21%), social and welfare services (34%), road infrastructure and parking (31%). As can be seen in Figure 5.1, the majority of services are provided at local level, except for the services health and road infrastructure and parking which are mainly provided at national level. At regional level, there is a lower number of digital services provided.

Figure 5.1: Digitalisation of service themes at local, regional and national level



The following map shows the geographical distribution of cities that at local level score 80% or higher on the 9 different service areas. For some services areas, cities all over Europe score high while for other service areas there is a large regional variety. For instance, many cities in Southern Europe score high in the service themes of tourism and spatial planning and construction, while cities in Eastern and Northern Europe score high in the service themes of education or public transport. The detailed analysis of this map can be found in Annex 1.

Map 5.1: Cities with 80 percent or higher digital score in each of the nine service themes

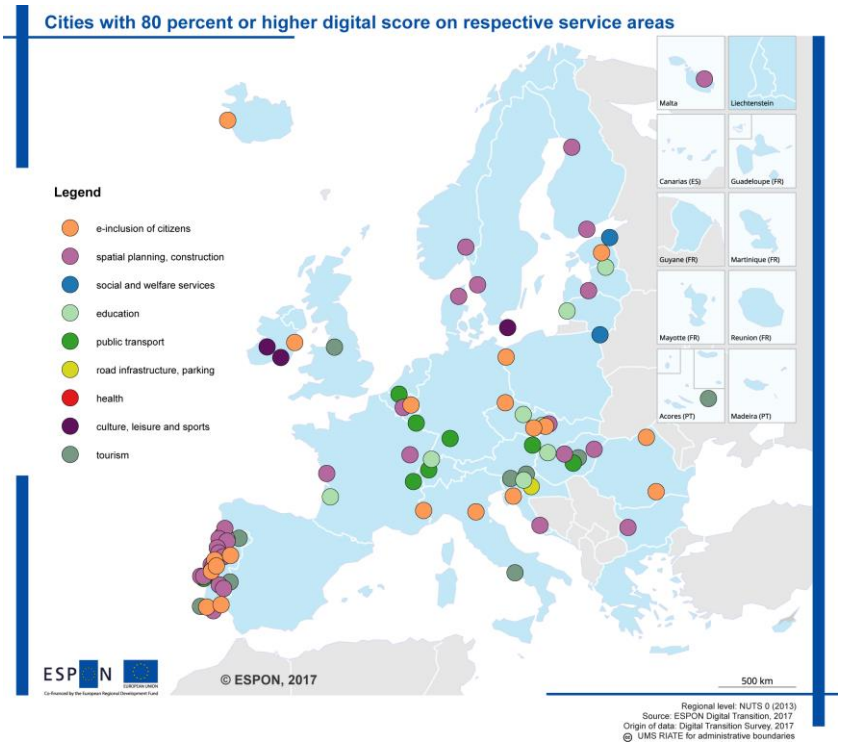


Figure 5.2 below shows the share of services that are digitalised at the level of towns, small and medium-sized cities and large cities, at regional level and at national level. The figure includes the 57 services under 9 different themes (table 4.1).

As regards the e-inclusion of citizens in local governance, the majority of cities allow citizens to trace the council decision-making process online. Tracing applications and checking personal data from databases and registers are not that popular services as they are provided by fewer cities. Northern European cities are more developed than other European cities in the provision of services under this theme.

Spatial planning and construction services are primarily provided at the local level as well as at national level in Northern Europe. Popular services under this theme include the online applications for planning and building permits and exploring land use plans and proposals via dedicated GIS services.

Social and welfare services are less digitalised compared to other service themes. Information is available online and some cities also offer applications for support online, however, online support services via chat or video call are provided by few cities.

For education, many services are generally provided at the local level. Northern and Western European cities are more advanced in this service theme than other European cities. Northern cities are more active than other cities in providing digital services with online applications for admission, for monitoring of progress and learning materials made available online.

As regards the public transport services, these are mainly delivered at the local level however, many advanced services are also provided at regional and national levels, particularly in Northern and Western Europe. Larger cities are digitalising public transport services with more advanced services being tracking journeys in real-time and receiving information about service disruptions.

Road infrastructure and parking services are not that digitally developed compared to other service themes. The services of tracking real-time information on parking vacancies, road congestion and roadworks are available in larger cities.

In health services, finding information and making appointments online are the digital services that are most widely available at local level. More advanced health solutions like e-prescriptions, access to online medical records or telemedicine are generally not offered at local level. Northern cities are more developed in the provision of digitalised health services than cities in other European regions.

Culture, leisure and sports services are primarily provided at the local level. Finding facilities and event calendars and online registrations for clubs, courses and events are popular services across all city sizes in Europe. Other services such as borrowing e-books, managing loans and paying fines, and booking a library desk space are more widely available in small and medium-sized and larger cities.

Tourism services are provided by many cities across Europe. Larger cities have the highest rates in the provision of mobile tourist guide applications. Location-based services for journey planning are widely available in all of the larger cities. With the exception of online information, few tourism services are provided at the regional and national levels.

Figure 5.2: Share of services that are digitalised at the levels of small and medium- sized towns (T), small and medium-sized cities (S) and large cities (L), at regional and/or national level

5.2 Cities' level of digitalisation

Comparison was made using the LDS of the cities to examine the level of digitalisation of cities in terms of services provided digitally to the citizens at local level. Table 5.1 below shows that the majority of cities have a medium LDS while a large number of cities have a low LDS. Only about 10% of surveyed cities have a high LDS.

Table 5.1:Classification of cities according to their LDS

Digital classification	Description	Number of cities	Percentage
Cities with a High LDS	Cities that generally offer a high number of digital services at local level, with a large proportion of these considered to be advanced digital services	13	9.6%
Cities with a Medium LDS	Cities that generally offer fewer digital services at local level, with a lower proportion of these considered to be advanced digital services	65	47.8%
Cities with a Low LDS	Cities that generally offer a limited number of digital services at local level with a higher proportion of these considered basic digital services	58	42.6%
Total	-	136	100%

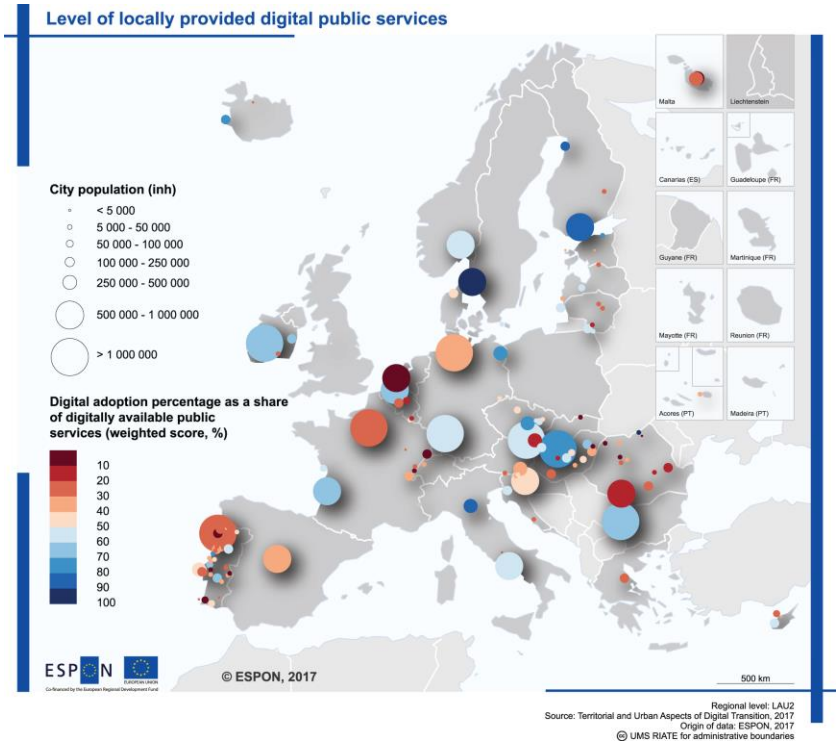
Cities differ in their the state of digital transition as some cities were found to have more digitalised services than others. The most digitally advanced cities in terms of services provided to the citizens at local level are located in Northern Europe. Cities like Gothenburg (SE), Oulu (FI), Helsinki (FI) are some of the good examples as they have a digital strategy and resources in place for digital transition and they offer a wide range of services to their citizens and businesses. There are also other cities that display similar characteristics in Southern Europe such as Bologna (IT) and Pombal (PT) as well as in Eastern Europe like Brno (CZ) or Szczecin (PL). It should be noted that although these cities have the highest digital ranking, it is likely that there are other more advanced cities that were not captured by the survey.

In addition, there are differences in the range of services between cities of different sizes across Europe. For the 57 services examined, larger cities provide more digitalised services than small and medium-sized cities and towns. Northern European cities also are more digitally advanced independent of city size whereas Western European small and medium-sized towns have the lowest share of digitalised services.

The map 5.2 below shows the uptake at the local level of the 57 digital services provided by cities across Europe. It includes the 57 services under 9 different themes. It can be seen that

larger cities provide more services compared to smaller cities and towns. Smaller cities and towns tend to offer a narrower range of services digitally at local level.

Map 5.2: *Digital transition of city services by city size for services provided at local level*



As regards the assessment on the level of digitalisation of their city's services, many cities consider that their level of digitalisation is average (or 40%) compared to other cities, while 27% consider that it is higher than the average and 32% reported that it is lower than the average.

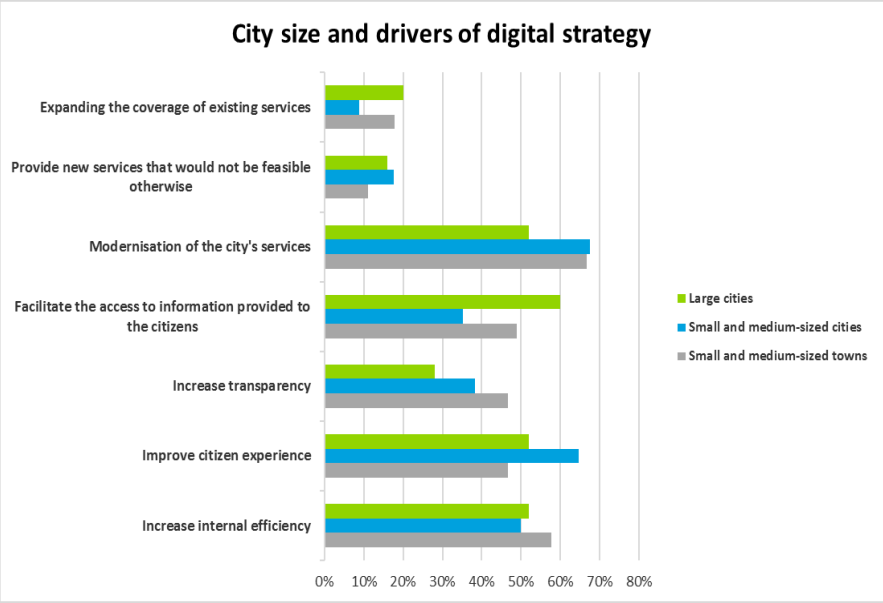
5.3 Digital Strategy

Developing a digital strategy is about setting strategic goals, priorities and using digital initiatives to increase the performance of a city. Only 17% of cities have a digital strategy that has been implemented. For 16% of cities, their digital strategy is at an adoption stage while for 41% of the cities it is at planning stage.

The larger the city the more inclined it is to have a digital strategy at implemented or adopted stage. In particular, as regards large cities, 35% of them have implemented their digital strategy, 35% of them have also adopted their digital strategy while 23% of them have their digital strategy at planning stage. As for the small and medium-sized cities, 11% of them have implemented their digital strategy, 21% of them have it at adopted stage while the majority (53%) of them have their digital strategy at planning stage. Besides, as for the small and medium-sized towns, 14% of them have implemented their digital strategy, 6% of them have their digital strategy at adopted stage, however, for most of them, (41%) their digital strategy at planning stage.

Cities that have implemented their digital strategy have a person that has the responsibility to oversee/manage the city's digital strategy and a special budget dedicated for the digitalisation of services. The drivers of a city's digital strategy differ among other things according to its size, as can be seen in Figure 5.3. Specifically, cities of different sizes view the increase in internal efficiency as an important driver, small and medium-sized cities value more the improvement of citizen experience than others and small and medium-sized towns put more emphasis in increasing transparency compared to other cities. In addition, for small and medium-sized towns as well as for large cities facilitating the access to information provided to the citizens is an important driver for their digital strategy. For small and medium-sized towns as well as for small and medium-sized cities, an essential driver is also the modernisation of city's services. However, the provision of new services that would not be feasible otherwise as well as expanding the coverage of existing services seem to be less important as drivers for having a digital strategy for the cities.

Figure 5.3: City size and drivers of a city's digital strategy

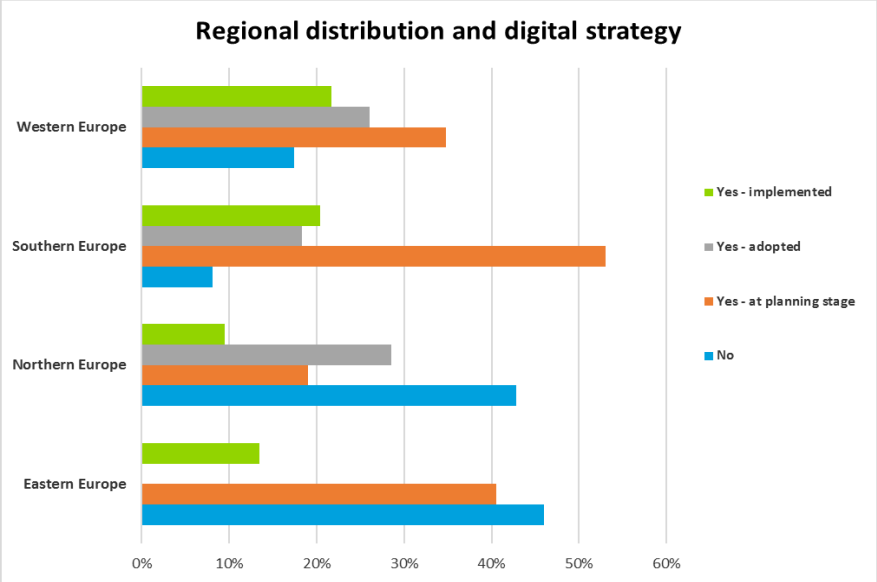


As can be seen in Figure 5.4, cities across Europe are at different stages of development of their digital strategy. In Western Europe, 22% of the cities have implemented their digital strategy, 35% of the cities have their digital strategy at planning stage and 26% of the cities have adopted their digital strategy. In Southern Europe, 53% of the cities have their strategy at planning stage, 20% of the cities have implemented their digital strategy and 18% of the cities have adopted it. In Northern Europe, only 10% of the cities have implemented the digital strategy, 29% of the cities have adopted it and for 19% of the cities their digital strategy is at planning stage. In Eastern Europe, 41% of cities their digital strategy is at planning stage while 14% of the cities have adopted their digital strategy.

The drivers of digital strategy are not the same across Europe. For instance, for Western European cities the main driver is the improvement of citizen experience, for Northern

European cities there are the improvement of citizen experience and the modernisation of the city's services while for Southern and Eastern European cities is the modernisation of the city's services. For Eastern and Southern European cities, significant factor is also the increase in transparency which is not an important element for Northern European cities.

Figure 5.4: Regional distribution and digital strategy



5.4 Digital leadership

The role of a digital leader is an important function that is expected to substantially influence the digital transformation of cities. Digital leaders can cultivate a new mindset within administrations and steer investments in new technologies. Overall, 39% of the cities have a person within the local authority responsible for overseeing and managing the city's digital strategy.

43% of the large cities, 41% of the small and medium-sized cities and 37% of the small and medium-sized towns have a digital leader in place. The larger the city, the more inclined it is to have a digital leader. 44% of the cities that have a person within the local authority responsible for overseeing and managing the city's digital strategy have also a special budget reserved for the digitalisation of services. 45% of the Southern European cities and 41% of the Western European cities have a digital leader in place while only 35% of the Northern European cities and 32% of the Eastern European cities have such a post assigned.

5.5 Budget

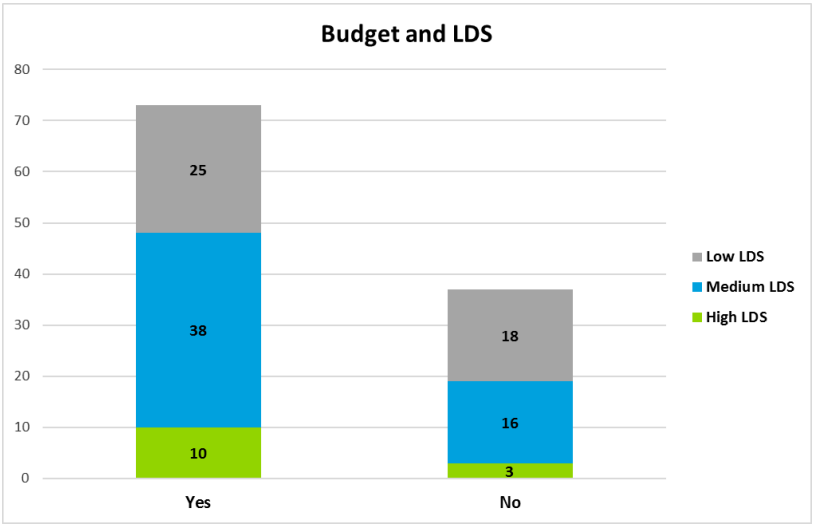
66% of the cities have a special budget reserved for the digitalisation of their services. For 64% of these cities, the main source of this budget is the city's own budget. For 12% of these cities, transformation is mainly financed by the regional or national budget. A quarter of cities rely on the EU programmes. In many cases, a combination of different funding sources is

used for the digitalisation of a city's services. Almost all large cities have their own budget for the digitalisation of services, whereas small and medium-sized cities and towns tend to rely more on EU programmes and national or regional budgets as well. For instance, for the city of Sofia, own funds were secured through the municipal budget and the establishment of the Sofia municipality Fund for Applied Research on Digitalisation, as a Public-Private Partnership (PPP). On national level, the National Innovations Fund of the Ministry of Economy and the National Fund contributed. Additional funds where secured through EU funding stemming both from the Operational Programme 2014-2020 and specific funding programmes such as Horizon2020, COSME, Interreg, European Investment Plan, Jeremie and Transborder cooperation programmes amongst others.

The larger the city, the more inclined it is to have a budget reserved for the digitalisation of services. 73% of Southern European cities, 67% of Eastern European cities, 63% of Northern European cities and 55% of Western European cities have a special budget reserved for the digitalisation of services.

Figure 5.5 shows that the majority of cities that have a dedicated budget for the digitalisation of the services have medium LDS. It is also important to note that more than 75% of cities with a high LDS have a dedicated budget for the digitalisation of the services.

Figure 5.5: Impact of budget on the level of cities' digitalisation



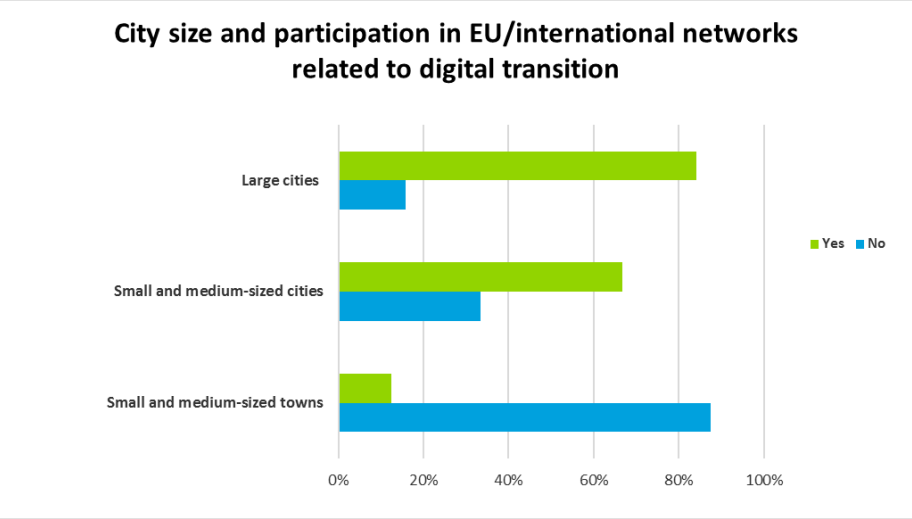
5.6 Local and international cooperation

a) Engagement in European and/or international networks

41% of cities participate in European and/or international networks such as Eurocities network, Smart cities network, Urbact network, and in dedicated smart city teams and projects that are funded by the Horizon 2020 programme. As can be seen in figure 5.6, large and small and medium-sized cities engage in such networks while the majority of small and medium-sized towns do not.

The largest proportion of cities that participate in EU/international networks have a medium LDS while the largest proportion of cities that do not participate in such networks have a low digital score. 61% of the Western European cities participate in EU/international networks related to digital transition while only 42% of the Southern European cities, 33% of the Northern European cities and 33% of the Eastern European cities participate in such networks.

Figure 5.6: City size and participation in European/international networks

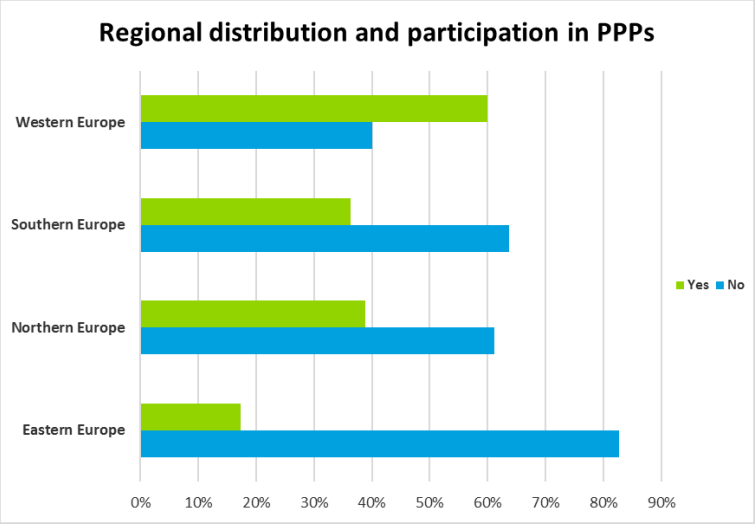


b) Participating in public-private partnerships

Similarly, only 36% of the cities participate in PPPs. Large and small and medium-sized cities engage in such networks while the majority of small and medium-size towns do not. Those cities that participate in PPPs have a high LDS.

60% of the Western European cities participate in PPPs related to digital transition whereas only 36% of the Southern European cities, 39% of the Northern European cities and 17% of the Eastern European cities participate in PPPs. For example, for the city of Eindhoven, located in Western Europe, the implementation of digital transformation was based upon the establishment of public-private partnerships or other types of collaborations for the digitalisation of different services. Funding was secured through a mix of public-private funding. The city provided funds to a specific initiative or project, however the partners contributed with own funds, knowledge and time.

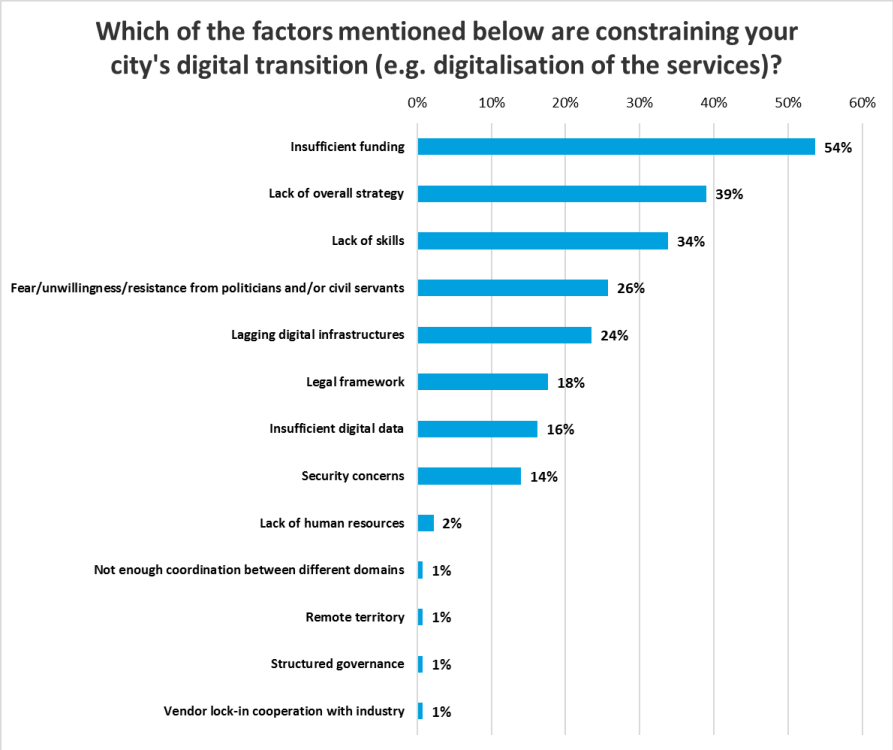
Figure 5.7: Regional distribution and engagement in PPPs



5.7 Factors constraining digital transition

Altogether, 13 factors that constrain digital transition were cited by respondents are presented in Figure 5.8 below. Lack of sufficient funding is considered to be the main restricting factor, with 54% of respondents indicating that it is a problem. For smaller and medium-sized cities and towns, lack of the overall strategy and lack of funding are main factors that constrain their digital transition. The 2 main constraining factors – insufficient funding and lack of overall strategy – could become effective drivers to spur on a city's digital transition if enough funding and a clear digital strategy are present. It should be mentioned that participants were given the possibility to identify up to three factors constraining their city's digital transition. Lower scores in some of the factors shows that these are not in the main list of challenges related to digital transition.

Figure 5.8: Factors constraining digital transition



Lack of skills is also pointed out as an important factor that hinders digital transition. Digital skills for people in public administrations are vital for making the eGovernment a reality. Currently, staff in many of the public sector institutions lack the necessary digital skills, which can range from very basic user skills for everyday practices to advanced skills that can enhance economic growth.

European and national regulations do not seem to be a major constrain of digital transition. European and national regulations provide the framework within which the cities embed their local strategies. The digitalisation efforts and strategies on national level can be the triggers for a strategy at local level. However, it is evident that regulatory frameworks lag behind the actual transformation and in those areas where voids or no clarity exists, cities need to reflect well and think ahead on the implications of the digitalisation of their services.

5.8 Effects of digital transition

There are some additional factors that were examined that show the positive effects of digital transition for cities. These relate to the level of citizen satisfaction with digital services, the utilisation of data gathered from digital services and the readiness of cities to respond to digital trends and opportunities.

Level of citizen satisfaction with digital services: When city officials of public administration were asked to what extent citizens are satisfied with the digitalisation of the services offered by their city, more than 11% of respondents indicated that citizens are very satisfied, while 71% indicated that they are quite satisfied. Digitalisation is a key economic driver for cities that facilitates growth and job creation. For instance, the main economic impact for Sofia is related to the speeding up of the development of the ICT sector, which has generated more jobs in the sector. In addition, citizens and businesses have easier access to relevant information and the administrative burden and paperwork has been reduced significantly. Increased participation in decision making processes of citizens through the established on-line platforms raises awareness and commitment, while better access to information on local services and utilities facilitate their lives. Internally, the transparency on the financial policy of the municipality has experienced a boost, as the digital transformation has allowed for a better control on the implementation of the municipal programmes and plans.

Use of data gathered from digital services: 76% of the cities use the data gathered from digitalised services to improve these services or to facilitate the decision-making processes. Data usage can accelerate the digitalisation efforts as cities can understand the needs of the citizens and design products that meet these needs. By respecting privacy concerns of citizens, cities can analyse this data and use them to improve their services. For some cities the use of data has been a core part of their digital strategy. For instance, the aim of Eindhoven's digital strategy is to use data and smart technologies to improve life in the city through people, partnerships, co-creation and experimentation.

Readiness to respond to digital trends and opportunities: 25% of the cities are confident while another 67% of the cities are very confident of their city's readiness to respond to digital trends and to seize digitalisation opportunities when they arise. The fact that respondents were Chief Digital Officers, heads of IT departments or IT managers explain why the results are so positive. Although, the fact that less than one in four are very confident shows that there are still challenges.

5.9 Conclusion

At local level, cities digitalise mostly services related to spatial planning and construction, tourism, e-inclusion of citizens to local governance and culture as well as leisure and sport (50%).

The most digitally advanced cities in terms of services provided to the citizens at local level are located in the Northern Europe and include cities such as Gothenburg (SE) and Oulu (FI).

There are differences in the range of digitally offered services between cities of different sizes across Europe. Larger cities provide wider range of digitalised services than small and medium-sized cities and towns at local level and are more digitally advanced. Northern

European cities are more digitally advanced whereas Western European small and medium-sized towns have the lowest share of digitalised services.

There are only some cities that have a digital strategy that has been implemented and a digital leader responsible for the city's digital strategy. The majority of cities have a budget reserved for the digitalisation of services while only a few of them participate in EU/international networks related to digital transition and in PPPs. The larger the city, the more inclined it is to have the previously mentioned characteristics. The two main factors that constrain digital transition of the cities are the insufficient funding and the lack of overall strategy. These two factors seem to affect smaller and medium – sized cities and towns in particular.

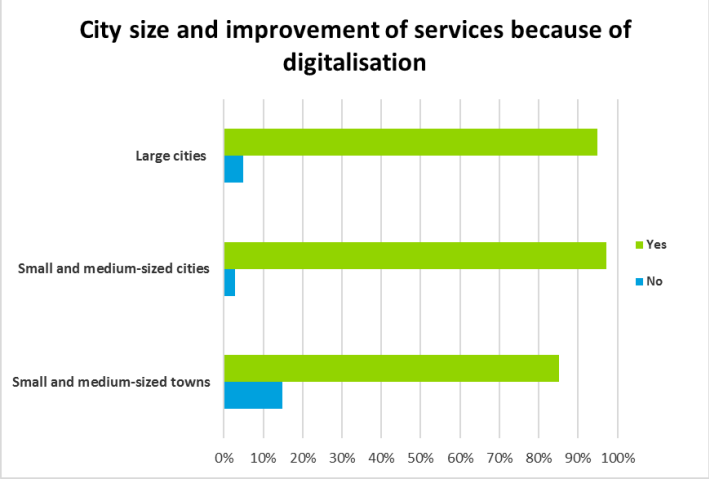
City officials consider that citizens are satisfied with the level of digital services provided by their city and they are confident about their city's readiness to respond to digital trends. The majority of cities also use the data gathered from the use of digitalised services to improve these services or to facilitate the decision-making.

6 Impacts of digital transition on cities' services

This chapter presents the different impacts of digital transition on cities' services based on the results of the survey. In particular, it examines whether the services of the cities have improved as a result of digitalisation, if there is an uptake of specific services because of digitalisation and the effects of digital transition on organisations' operating and staffing costs, by giving insights on the characteristics of the cities (such their size or their geographical location).

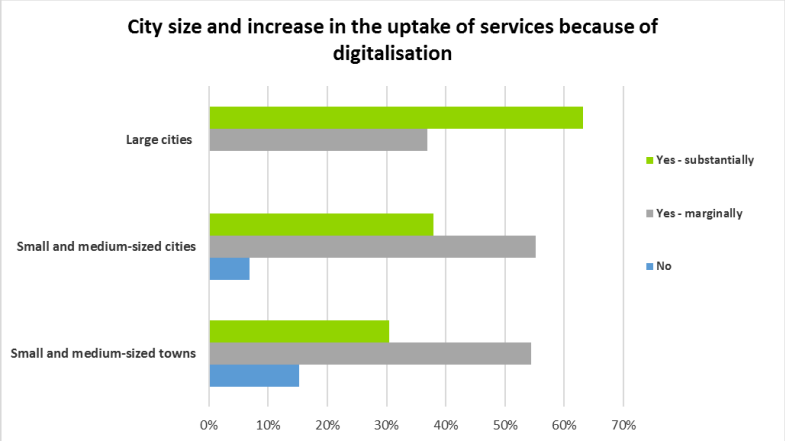
Improvement of services because of digitalisation: For more than 90% of cities, services have improved because of digitalisation. Large cities and small and medium-sized cities have the highest improvements in their services due to digitalisation. Those cities that did not have such an improvement are generally small and medium sized towns with medium and low LDS. In relation to larger cities, they seem to lack technical competences and budgetary resources to improve their services through digitalisation and are not able to benefit from economies of scale. While all cities in Northern Europe are capable of improving their services through digitalisation, up to 20% of cities in Western, Eastern and Southern Europe have not seen their services improve.

Figure 6.1: City size and improvement of services as a result of digitalisation



Increase in the uptake of specific services because of digitalisation: 39% of the cities have noticed a substantial increase in the uptake of specific services as a result of digitalisation while 51% of the cities a marginal increase. As figure 6.2 shows, the larger the city, the more substantial is the increase in the uptake of specific services. Larger cities due to their demographic characteristics are more likely to host millennials with digital skills that are prone to develop and take up digital services. 70% of small and medium-sized towns report no or only marginal increase in the uptake. No large cities report no increase in uptake of services due to digitalisation.

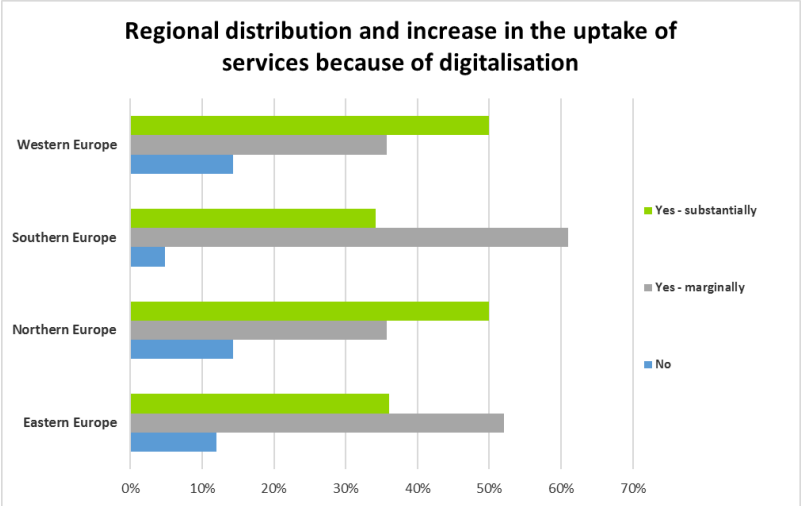
Figure 6.2: City size and increase in the uptake of services as a result of digitalisation



Cities that have a digital strategy and a budget reserved for the digitalisation of services tend to have a more substantial increase in the uptake of specific services than cities that do not exhibit these characteristics. Figure 6.3 shows that up to 50% cities in Western and Northern Europe have seen a substantial increase in in the uptake of services because of digitalisation while up to 15% of cities in Western, Southern, Northern and Eastern Europe have not seen a growth in this domain.

The uptake of services can support policy outcomes and increase citizen satisfaction. There are several geographic, socio-economic and digital indicators that may affect the uptake of services. For instance, Helsinki has a relatively high number of indicators such as employment in technology sectors, high interaction with authorities and online purchase of goods compared to other cities.

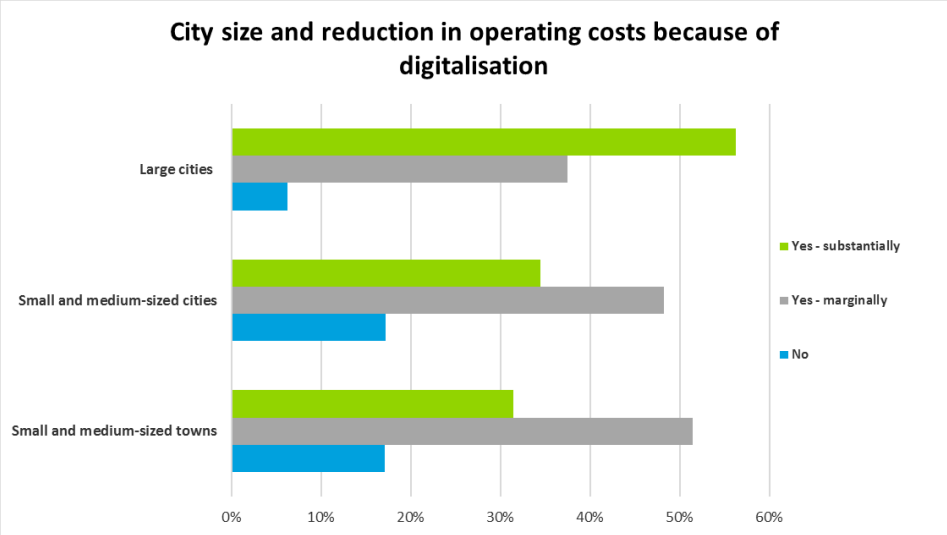
Figure 6.3: Regional distribution and increase in the uptake of services as a result of digitalisation



Effect of digital transition on organisations' operating and staffing costs: For 85% of the cities, digitalisation of services has resulted in reduced operating costs. The higher the LDS of a city, the more substantial decrease is observed in its operating costs due to digitalisation. As can be seen in Figure 6.4 large cities tend to have a substantial decline in operating costs

compared to smaller and medium-sized cities and towns as theyare more inclined to benefit from economies of scale.

Figure 6.4: City size and reduction in operating costs as a result of digitalisation



Cities that have a digital leader and a budget reserved for the digitalisation of services are more likely to have a substantial reduction in their operating costs than cities that do not have these digital features. Western Europe has the biggest number of cities with a substantial reduction in their operating costs whereas up to 36% of cities in Western, Southern, Northern and Eastern Europe have not seen a reduction in this domain.

For 60% of the cities, digitalisation of services has resulted in reducing staffing costs. The larger the city, the more substantial is the impact that digitalisation has on its staffing costs. Furthermore, cities that have a digital leader and a budget reserved for digitalisation have substantial or marginal reduction in staffing costs than the cities that do not have these digital characteristics. In terms of geographical location, Western Europe has the greatest number of cities with a substantial decrease in their staffing costs due to digitalisation while Northern and Eastern Europe have the biggest number of cities (up to 46%) that do not have a reduction in this domain.

Digitalisation makes administrative processes simpler and more efficient. For instance, by implementing a document management system, staffing costs can be reduced. The application of data storage and the use of data analytics can help cities to improve their operational processes and reduce operating and staffing costs.

6.1 Conclusion

The analysis found that, due to digitalisation, the vast majority of cities improved the services provided to citizens, an increase in the uptake of specific services has been recognized, and operating and staffing costs have been reduced. The larger a city, the more likely it is to have a greater performance in these factors. Larger cities can benefit from economies of scale, are

more likely to have a digital strategy, digital leadership and a special budget for the digitalisation of their services, all factors needed to draw full benefit from digitalising services. Small and medium-sized cities and towns seem to face more challenges in keeping up with digital developments as they lack technological competences and budgetary resources to digitalise their services in some cases.

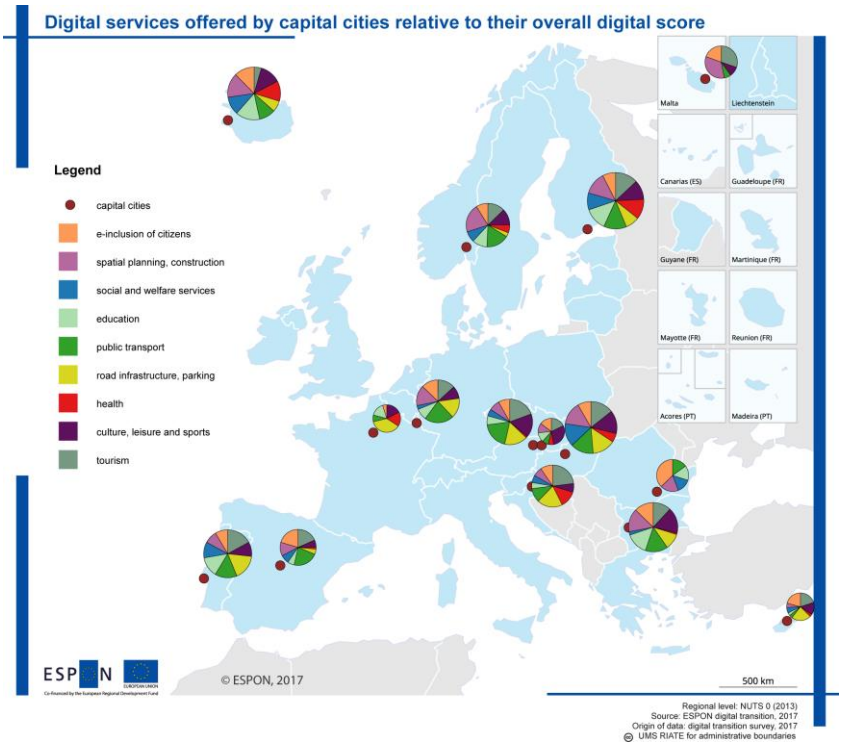
7 Capital cities' and regions' level of digitalisation

This section presents the level of digitalisation of the capital cities participated in the survey and the level of digitalisation per region (south, east, north, and west). It also examines how European regions differ from cities as regards their level of digital transition. In addition, it analyses the linkages and potential impacts of digital transition on the socio-economic development in European regions using the data collected from the survey and performing correlations.

7.1 Capital cities' level of digitalisation

As regards the level of digitalisation of the capital cities participated in the survey, the LDS (digital services offered to the citizens at local level) and the regional/national, digital score (digital services offered to the citizens at regional and national level) were calculated. The capital cities with the highest LDS are located in Northern and Eastern Europe and include capital cities like Helsinki (FI), Reykjavik (IS), Budapest (HU) and Sofia (BG). These capital cities have a digital strategy, they engage in European and/or international networks to promote digital transition and they participate in PPPs. Although, these capital cities rank as the most digitally advanced in our study, there may be others more advanced that were not captured by the survey.

Map 7.1: Digital services offered by capital cities relative to their overall digital score



The map above presents the relative importance of the digital service areas in the capitals. In particular, it shows the total digital score in percentage of 9 service areas for each capital captured by the survey. It provides an overview of the difference in the overall LDS of the capitals (represented by size of diagram) and the relative score on the different service areas.

For example, some capitals do not offer digital services in a specific area at all, while others cover all the service areas rather equally.

7.2 Regions' level of digitalisation

Further analysis was conducted to understand the digitalisation of services at a regional level. Comparison was made using the average digital scores of the cities in each region. As can be seen from the table below the most digitally advanced region at local level as well as at regional and national is Northern Europe. On the contrary, the least developed region is Southern Europe.

Table 7.1: Level of digital services offered per region

Region	Average LDS	Average regional/national digital score
Northern Europe	56	24
Western Europe	48	22
Eastern Europe	44	18
Southern Europe	38	18

As regards the performance of these regions in the service themes, Northern Europe performs best in the following: education, culture, leisure and sports and health. Western Europe performs better in the service themes of public transport, culture, leisure and sports and education. Eastern Europe has more advanced the service themes of tourism, culture, leisure and sports, public transport, education and e- inclusion of citizens to local governance. Southern Europe performs best in the following service themes: culture, leisure and sports and spatial planning and construction.

7.3 Correlation with socio-economic and digital indicators

The indicators that were collected to capture the digital transition and the socio-economic development at regional level are presented in the table 7.2 below. To analyse the linkages and potential impacts of digital transition on the socio-economic development in European regions, correlations are performed between these indicators and the level of digitalisation of cities.

In addition to these indicators, there are also other indicators available for digital transition, such as the DESI indicator (European Commission, 2017c), but this provides information for the digital state at country level. The indicators analysed in the paragraphs below give information for lower geographical scales such as capital cities.

Table 7.2: Contextual indicators used to analyse digital transition at regional level

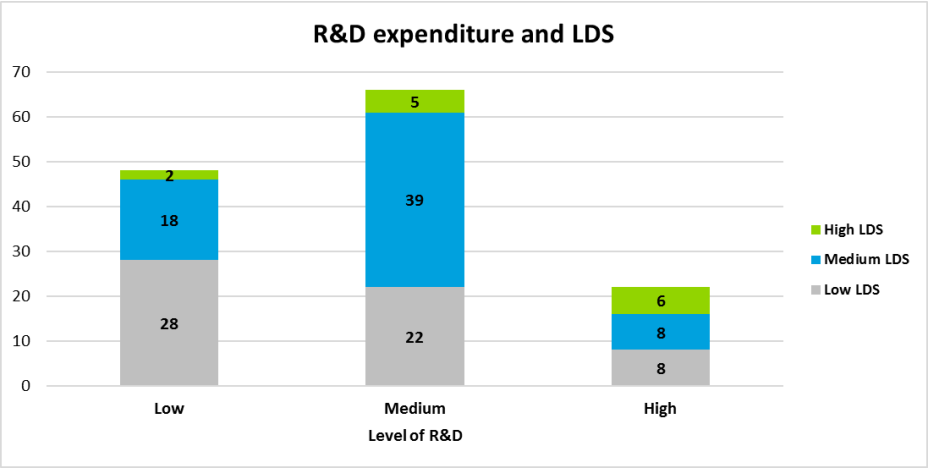
Data set indicators			
Context	**Indicator**	**Measure**	**Source**
Socio-economic	Total intramural R&D expenditure (GERD)	Percentage	Eurostat

	(NUTS II)		
Digital environment	Households that have broadband access (NUTS II)	Percentage	Eurostat
	Online interaction with public authorities at (NUTS 0, I & II)	Percentage	Eurostat
	Individuals who ordered goods or services over the internet for private use in the last year (NUTS II)	Percentage	Eurostat

Firstly, the total intramural R&D expenditure as a percentage of GDP at NUTS II level was analysed. The Europe 2020 strategy sets as target on R&D expenditure 3 per cent of the GDP. This target can hardly be achieved everywhere in Europe. Regions that fulfil the target are mainly located in Germany, Belgium, Sweden and Finland, among others. Regions that are lagging are parts of Eastern Europe, and Southern parts of Italy, Portugal and Spain.

When comparing the total intramural R&D expenditure as percentage to GDP with the LDS of cities, it can be seen that regions with high and medium levels of R&D expenditure have a higher proportion of cities with high and medium LDS than regions with low LDS. Moreover, regions with low level of R&D expenditure have a large number of cities with low LDS. Regions were classified as high when more than 2% of GDP is spent on R&D, medium if total expenditure is between 1% and 2%, and low if total expenditure is below 1% of GDP.

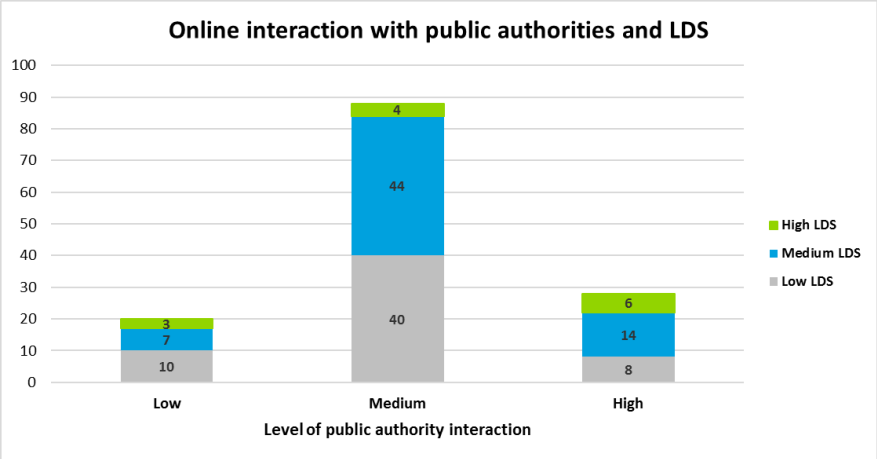
Figure 7.1: Level of R&D expenditure compared to digital score



Secondly, the ratio of people who have used the internet for interaction with public authorities at NUTS II level was examined. Regions with the lowest ratio of people who have used the internet for interaction with public authorities are identified in South Eastern European countries, where Romania and Bulgaria are the least developed countries. The highest rates are in Northern Europe. Scandinavian countries show rates over 74% in most of their regions.

When comparing the LDS of the cities with the number of individuals who use the internet for interaction with public authorities, the regions where interaction is considered high contain a higher proportion of cities with high LDS in terms of their digitalised local service provision. However, the majority of respondents are from cities located in regions with medium level of online interaction with public authorities.

Figure 7.2: Level of online interaction with public authorities compared to digital score

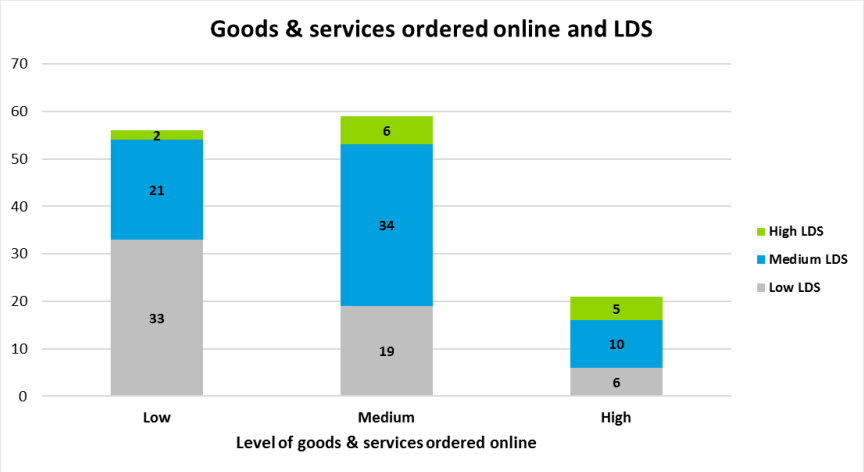


Thirdly, the share of people who ordered goods and services over the internet for private use at NUTS II level was studied. This indicator demonstrates how accustomed people are to using online means versus traditional ones to acquire goods and services. It could be used to infer the willingness of people to use online means instead of traditional ones when making use of public services.

The Eastern and Southern European regions predominantly lag behind the regions of Western and Northern Europe. Regions with the minimum ratio of 10% can be found in Romania, Bulgaria, Southern Italy, Greece, and Northern Portugal. While regions falling into the highest bracket are located in Germany, Norway, Sweden, Denmark, Luxembourg, Switzerland and the UK. It is interesting to note that in the latter three countries, over 75% of the total population have used internet services as a means to order goods and/or services.

When comparing the LDS of the cities with the percentage of individuals who ordered goods or services over the internet for private use, the figure 7.3 shows that a larger proportion of cities with a high digital score are located in regions where a high percentage of individuals order goods and services online. It is also clear that the number of cities with a low digital score increases as the percentage of individuals who order goods and services online decreases.

Figure 7.3: Level of goods or services ordered online compared to digital score

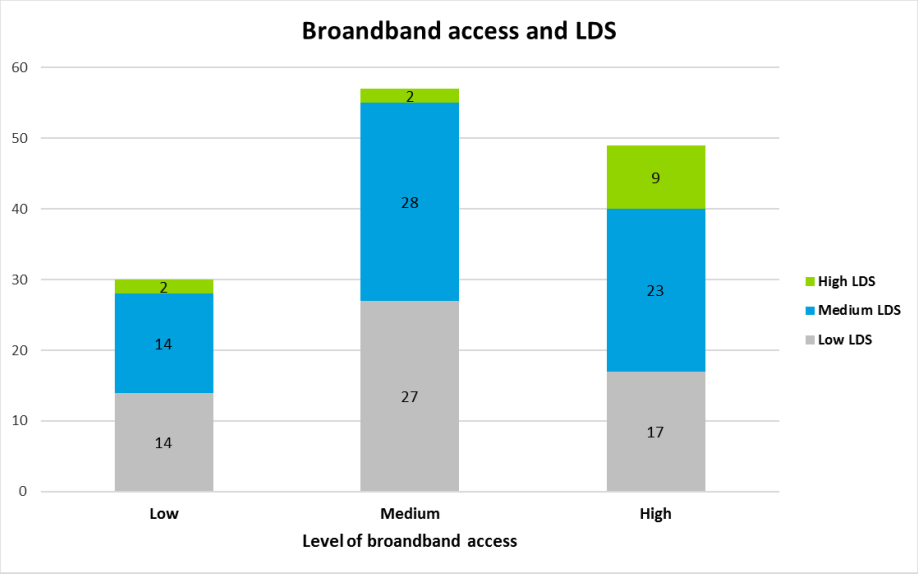


Fourthly, the growth of households with broadband access at NUTS II level was analysed. Broadband access is an important factor for cities to operate successfully in a global business environment. Access to high capacity telecommunication networks is a key aspect for enhanced competitiveness and growth as the provision of services and the capacity to operate in a global scale rely on fast and efficient broadband connections.

Regions with the highest growth are Ireland, Northern Italy and Eastern Europe. In contrast, the regions with the smallest increase are situated in Northern and Western Europe. This phenomenon in low growth regions can be explained by the higher share of households that already have access to broadband or the infrastructure and/or geographical limitations as most regional differences can be assigned to rural-urban disparities. The relatively high percentages of households with broadband access in the Nordic countries reflect these countries' pro-active public policies to invest in broadband access, as a measure to promote territorial cohesion.

When comparing the LDS of the cities with the broadband access of regions, it can be seen from figure 7.4 that the regions with high and medium level of broadband access have more cities with higher and medium levels of digital score than the regions with low level of broadband access. It is interesting to note that comparatively higher numbers of cities with a low digital score can be found in regions with high or medium levels of broadband access.

Figure 7.4: Level of broadband access compared to digital score



7.4 Conclusion

The capital cities investigated within this study with the highest LDS are Helsinki (FI), Reykjavik (IS), Budapest (HU) and Sofia (BG). These capital cities have a digital strategy, they engage in European and/or international networks related to digital transition and they participate in PPPs.

As regards the level of digitalisation of regions, there are still considerable differences, with Northern countries being more digitally developed, especially in comparison with the countries in Southern and Eastern Europe.

In addition, it was found that cities that have high LDS are located in regions with advanced states of digital environment (level of R&D expenditure as a percentage of GDP, level of individuals who use the internet for interaction with public authorities, level of individuals using the internet for ordering goods and services and level of broadband access). However, the majority of the cities that participated in the survey are cities with medium LDS and are located in regions with medium state of digital environment.

8 Models of digital transition (Case studies)

The section presents the case studies which focus on cities that are digitally advanced or in the process of transitioning digitally. They provide an understanding of each city's digital strategy and the efforts undertaken by the city towards implementing their strategy. The aim of the case studies is to gain a better understanding of each city's digital strategy and its efforts in the digital transition process, including how the transition was/is being supported from a funding perspective. The information gathered from the case studies further supplement the analysis performed in this study on digital transition.

8.1 Participation in Public private partnerships

The case studies show that the four cities all engage in public-private cooperation for the implementation of their strategies; however, the intensity of this cooperation and the frameworks chosen for the cooperation differ. The local government structure and public administration culture in the country affect the chosen framework. However, it is clear that for a digital strategy to be implemented successfully, cooperation between public bodies and the private sector (being it companies or civil society organisations) is necessary, and public-private partnerships can be a good way of ensuring high quality cooperation.

Box 1: A multiple helix approach

In October 2016, the Eindhoven Municipal Council adopted the Smart Society programme, which defines the vision of the city as a Smart Society. The strategy was designed and is implemented through a multiple helix approach (a cooperation of citizens, industry, Universities & government) to ensure the diversity of different perspectives to innovate and implement new technologies.

Box 2: Smart Kalasatama project

Smart Kalasatama in Helsinki is a development project in which an old harbor is transformed into a smart city district and a Living Lab in itself, construction started in the late 2000s and will continue until mid-2030s. Currently 70 companies are taking part in the project (representing all sizes from micro to large), and agile piloting is done for start-ups. It is an example of public-private cooperation where the private sector (up to mid-2017) has invested € 5 billion and the city of Helsinki € 600 million.

8.2 Strategy focus of the different cities (alignment/differences)

A commonality across the case studies is the digitalisation of specific municipal services related to infrastructure, smart lighting, smart energy or smart waste management, which are identified across the analysed cities. This alignment is most probably related to the relative ease of implementing these solutions, with already many experiences both in industry and public sector. The differences lie in the digitalisation of other services, mostly those relate to the direct interaction citizens have with regard to the capacity to influence local decision-making or for issues related to their well-being. Here there is a wide difference in focus with

for example Helsinki and Zaragoza emphasizing citizen participation and Eindhoven and Sofia focusing on innovative technologies and business.

Box 3: Helsinki Region Infoshare service

As part of Helsinki´s philosophy to create an open city through digitalisation, the cities of the Helsinki Metropolitan Area began sharing its public data as open data for anyone to use freely. These open datasets, are available through the Helsinki Region Infoshare (HRI) service, a web-based platform, which allows access to a wide range of data to develop applications and develop public decision-making, which won the European Commission´s award for innovation in public administration in 2013.

Box 4: Provision of different digitalised services

Sofia municipality currently provides a number of administrative e-services, including payments, complaints and contacts to the offices of the Mayor, chairperson of the Council etc. Other examples of digitalised services are: on-line access to decisions on master plans and investment projects: information for the public transport, schedules, routes, parking, parking permits, traffic, cycling routes and networks and an on-line registration system, which provides information about free places in kindergartens, links with relevant NGOs and other educational organisations, incl. education for parents.

8.3 Funding grassroots projects

Whatever the framework chosen or the funding mechanisms opted for, all cities promote and fund initiatives and projects from local companies and communities, which address different aspects of their digital strategies. The funded activities (either with or without co-funding from the private organisations involved) cover a broad range of initiatives and with different sizes from large smart lighting projects, to smaller activities that mobilise citizen participation.

Box 5: Key projects and initiatives

The programme of the city of Eindhoven has a wide approach covering different aspects of everyday life and municipal activities. Since its implementation several key projects and initiatives have been realized and/or are underway. The most prevalent Examples are Smart Lightning or Smart crowd management projects (Stratumseind 2.0 – making a clubbing district more attractive and profitable for businesses).

8.4 Conclusion

The analysed case studies present common elements, which provide relevant insights into approaches that have proven successful. It is evident that the design, definition and implementation of a successful strategy needs broad support from within the city´s governmental structures, the private sector and the citizens. Coordination and collaboration with the private sector is key, and public-private partnerships have proven to be a useful means to engage the private sector and ensure success of initiatives where their engagement

is vital. Raising support and involving citizens in the process, while ensuring active involvement of relevant stakeholders is served well by implementing a broad range of smaller activities and initiatives from the local companies and communities, facilitating citizens' involvement. Implementing the strategy requires considerable funding and the analysed cities use a wide array of different funding sources, from own funds to other public (e.g. national) and private funds (co-funding by companies or even crowdfunding).

9 Policy recommendations

Overall, it can be concluded that public administrations are well aware of the advantages of digitalisation and have been actively engaging in the modernisation of processes and services though at various speeds and to a different extent across Europe.

Notwithstanding this positive assessment, the following recommendations are put forward to further enhance the digitalisation of cities.

National and regional levels

Recommendation 1: Cooperation among cities is essential

The majority of the cities do not participate in European/international networks related to digital transition. The cooperation between cities needs to be enhanced for cities to be able to exchange information, learn from best practices developed in other cities and foster the development of new ideas. Thus, cities should develop their capabilities in terms of human and financial resources to participate in such networks.

Although the majority of cities do not participate in PPPs, cities should consider cooperation with public and private entities in order to develop their level of digital maturity, advance new ideas and benefit from the experience and know-how of other actors. Participation in PPPs will give cities the possibility to attract funding for the implementation of their digital strategy given that the lack of funding is one of the most important factors that hinder a city's digital transition. The digitalisation of education should be considered as a priority as it may also contribute towards addressing the issue of lack of skills, which is one of the main constraining factors of digital transition. The transport sector also poses many opportunities as the paradigm is shifting towards e-mobility and autonomous vehicles.

Recommendation 2: Support the digital transition of small cities and towns

Small cities and towns face more challenges in keeping up with digital developments in terms of skills, budget and resources. Therefore, public authorities should set up specifc national programmes for funding, sharing services and enhacing peer learning and skills. Policy action is needed to ensure that towns and smaller cities are able to cope with the challenges they face in the digitalisation of their services. Capacity building in these cities can be strengthened through networking and collaboration to facilitate the uptake of digital solutions by local authorities.

Medium-sized and large cities

Recommendation 3: Make use of the data and open up to support the development, testing and rolling-out of advanced digital solutions

To make full use of the possibilities arising from digitalising local services, cities need to develop their data analysis capacity. Competences on data analysis will help to adapt the digital services to the needs of the citizens, improve the digital journey of the citizens and identify new opportunities for digitalisation.

In addition, cities should open up their infrastructure and environments and serve as living labs and testbeds for implementing digital solutions. Opening up public data should also be a part of this process while respecting the data protection regulation. In this context, developing partnerships with the private sector and research organisations and collaborating with regional and national authorities is important to ensure coordination on the development of digital public services.

Recommendation 4: Promote awareness and support

The survey shows that city officials are not equally informed about the digitalisation efforts of their cities. Sufficient emphasis should be put on communication and training initiatives towards city officials in order to ensure that the digitalisation efforts of cities are well communicated and ultimately well supported. It is of the utmost importance to avoid a situation in which the digital agenda is only supported by a "few chosen ones" in a central digital team. The widest possible support among all levels of city officials needs to be secured and city officials should strive to build a supportive culture as well as a networked and team-based organisational structure.

Recommendation 5: Develop digital talent

In order to sustain an ambitious digital agenda, it is imperative to develop an internal capability by recruiting, retaining and developing staff with digital skills. Cities should identify digital advocates across all departments and give them the opportunity to develop and grow through the experiments and initiatives launched within the city's digital agenda.

Small cities and towns

Recommendation 6: Commit to and make digital strategy a core part of cities' policy

A clear digital strategy, accompanied with political commitment and stakeholder engagement, a dedicated budget and digital leadership for its realisation, stand out as key factors for the success of digital transition of city services. According to the findings of the study, insufficient funding and lack of an overall strategy are the main factors constraining the digital transition of small cities and towns. Here national governments and the EU have a role to ensure these pre-conditions are met throughout the European territory.

It is noteworthy that EU cohesion policy as a whole covers almost all these needs through investments in urban ICT projects (ERDF), training (ESF), digital infrastructure (ERDF and

EAFRD) and the ex-ante requirements for strategies. An effort is needed to bundle these opportunities for cities and facilitate access to them.

Cities with a low to moderate level of digital services, should consider performing an exhaustive digital maturity assessment. In particular, they should provide detailed information on the current state of digitalisation of services, define a roadmap to renew infrastructure and digitalize (further) services, determine possible sources of funding as well as to identify potential partnerships with private and public actors.

The strategy needs to be laid down in a policy document and translated into a concrete action plan on operational level, with targeted performance indicators and clear responsibilities assigned.

The overall vision of the strategy should be developed in close cooperation with public and private players and stakeholders to ensure support from the outset and create a sense of joint ownership.

Recommendation 7: Benefit from EU and national programmes

The fact that a lack of funding is the most frequently named barrier and that relatively few cities use EU and national funding programmes for their digital strategy indicates that these programmes are not sufficiently accessible to the cities. This seems to affect smaller cities and towns in particular. Cities need to step up their efforts in getting informed about the funding possibilities that exist at national and EU level and their capacity to benefit from them. Given the finding from the studied cases regarding the importance of local and business engagement for successful projects, Community-led Local Development (the EU dedicated tool for using on a partnership basis at sub-regional level the European Structural and Investment Funds) could be more widely used by cities.

From a different perspective; regional, national and EU institutions should make sure their funding schemes are easily understandable and accessible to cities, especially the smaller ones with less administrative capacity. The Urban Portal (European Commission, 2017f)[20] and EU Action for Smart Villages (European Commission, 2017g)[21] set up by the Commission are good examples in this regard.

Cities are recommended to explore the possibilities of public-private partnerships in which a share of the funding is provided by private players, as part of their contribution to specific initiatives within the strategy.

Recommendation 8: Start small

Cities with a low level of digital maturity should start first with small-scale experiments (Proof-of-Concepts) on services that are, on the one hand, appropriate for digitalisation but on the other hand are not crucial for the wellbeing of citizens. This allows for failure while, at the

same time, the cities can gain experience through multiple experiments. Such experiments could be driven by a cooperation with other actors like universities, local science parks as well as tech-driven companies and start-ups. When successful, these experiments can build on each other and drive larger digitalisation efforts.

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List of Annexes

Annex 1 – Results of the questionnaire

To capture the urban dimension of cities across the EU, an online survey was carried out for collecting data on the level of digitalisation. The survey was sent to city officials in the EU 28 Member States as well as to Iceland, Liechtenstein, Norway and Switzerland. The survey was disseminated through the following city networks: Eurocities[1], Urban Development Group (UDG)[2], Council of European Municipalities and Regions (CEMR)[3], METREX[4], and URBACT[5]. The platform used for disseminating the survey was the EU Survey platform[6], the European Commission's tool used to create surveys of public interest.

Description of the participants

The survey received in total 147 responses from 136 cities from the following 31 countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom. The only country that did not reply to the survey was Liechtenstein.

In the case of cities for which duplicate replies were received, for the purpose of the analysis, only one answer per city was retained. We have thus chosen the replies based on the type of the respondents by selecting those whose function and organisational affiliation were the most relevant for the context of the study.

Most of the cities that participated in the survey were from Portugal, while for some of the countries we received only one response. There is a limitation thus in terms of country coverage, as a bigger number of cities per country would give a clearer view of the level of digitalisation per country.

[1] Eurocities, available at: http://www.eurocities.eu/

[2]Urban Development Group (UDG), available at: http://ntccp-udg.eu/udg

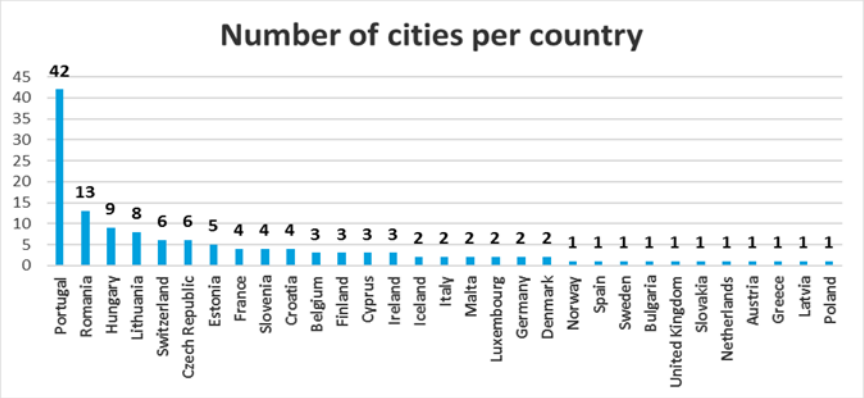
[3]Council of European Municipalities and Regions (CEMR), available at: http://www.ccre.org/

[4]METREX, available at: http://www.eurometrex.org/ENT1/EN/Members/members.php

[5] URBACT, available at: http://urbact.eu/

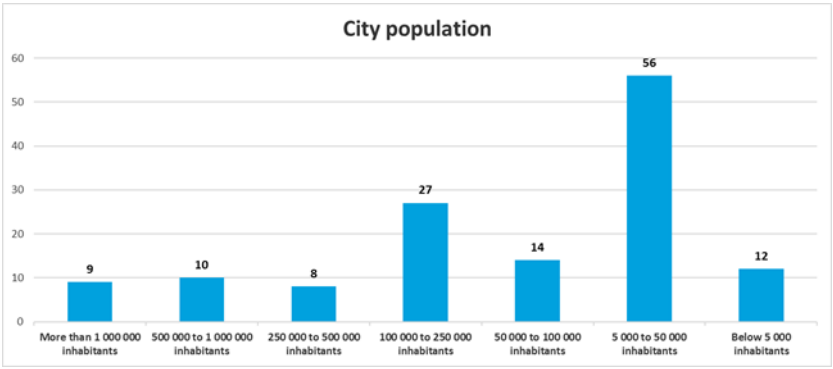
[6]EU Survey platform, available at: https://ec.europa.eu/eusurvey/home/welcome

Figure 9.1 Number of cities per country



The majority of cities that participated in the survey were small to medium size with 5 000 to 50 000 inhabitants (56 cities) and 100 000 to 250 000 inhabitants (27 cities). In addition, the rest of the cities that took part in the survey had 50 000 to 100 000 inhabitants (14 cities), below 5 000 inhabitants (12 cities), 500 000 to 1 000 000 inhabitants (10 cities), more than 1 000 000 inhabitants (9 cities) and 250 000 to 500 000 inhabitants (8 cities).

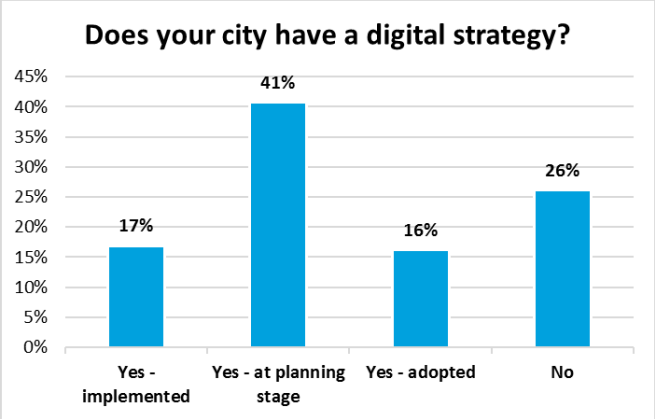
Figure 9.2: City population



Digital Strategy and leadership

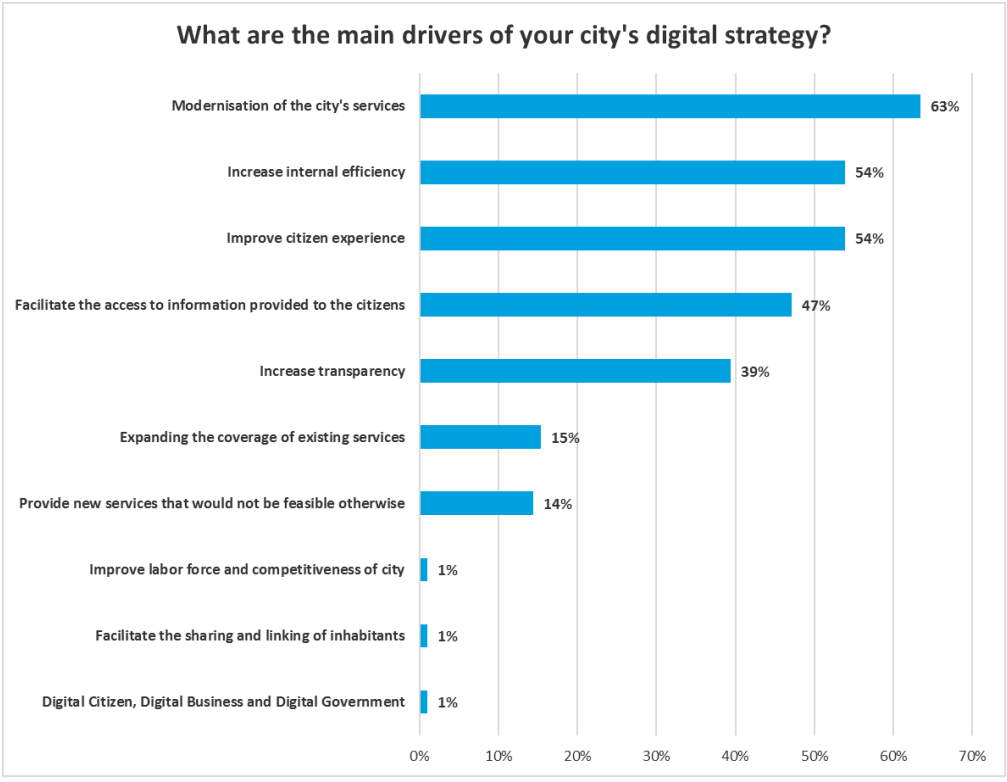
Many cities mentioned that they have a digital strategy which is at planning stage (53 cities or 41%), while others said that it has been adopted (21 cities or 16%). Only some cities indicated that their digital strategy has already been implemented (22 cities or 17%) while some of them (34 cities or 26%) do not have a digital strategy.

Figure 9.3: Digital strategy



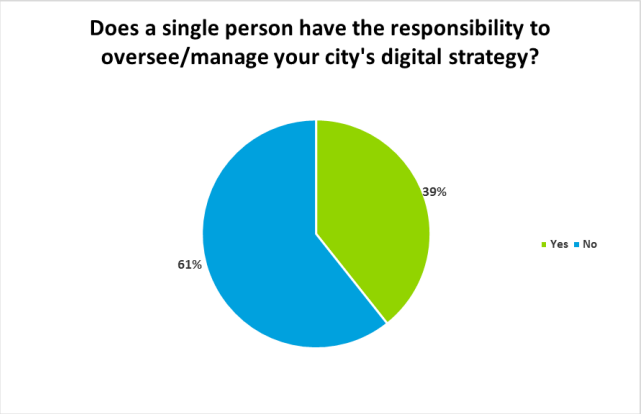
The cities that have a digital strategy indicated that the main drivers of their digital strategy are: the modernisation of the city's services (63% of the respondents), the increase internal efficiency (54% of the respondents), and the improvement of citizen experience (54% of the respondents). For some of the cities important drivers of their city's strategy are: the facilitation of the access to information provided by the citizens (47% of the respondents), the increase in transparency (39% of the respondents), the expansion of the coverage of existing services (15% of the respondents) and the provision of new services that would be not be feasible otherwise (14% of the respondents). For the rest of the cities, important drivers are: the improvement of labor force and competitiveness of the city (1% of the respondents), the facilitation of sharing and linking the inhabitants (1% of the respondents) and the digital citizen, digital business and the digital government (1% of the respondents).

Figure 9.4: Main drivers of digital strategy



In addition, the majority of the cities when asked if a single person has the responsibility to oversee/manage their city's digital strategy (e.g. ICT coordinator, Chief Information Officer), answered no (71 cities or 61%), while 46 cities (or 39%) replied yes.

Figure 9.5: Management of digital strategy

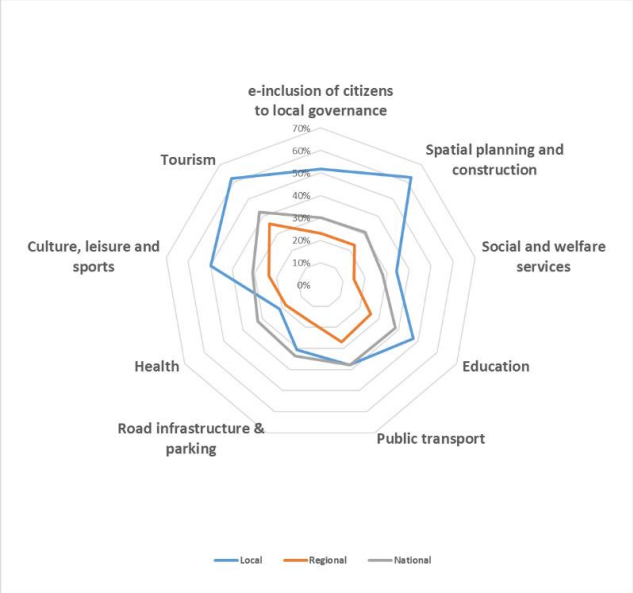


Digitalisation of city services

To measure the level of digitalisation, we asked cities to indicate the level of digitalisation of the services that fall within nine service themes, namely: e-inclusion of citizens to local governance; spatial planning and construction; social and welfare services; education; public transport; road infrastructure and parking; health; culture, leisure and sports; and tourism. The cities were asked to indicate whether services that were falling under the nine service themes were provided digitally at local and/or regional and/or national level.

The most digitalised service themes at local level are spatial planning and construction, tourism, e-inclusion of citizens to local governance and culture, leisure and sports while at regional or national level, the most digitized themes are tourism, public transport and education.

Figure 9.6: Digitalisation of services by service theme



The following table presents the 57 services included in each of the 9 themes and their classification with regards to how basic, intermediate or advance a service is considered to be. The table also shows the number of cities that responded if a service is digitalised at local, regional and/or national level as well as the number of cities that replied that are not aware if a service is provided digitally at any of the levels or if it exists or not.

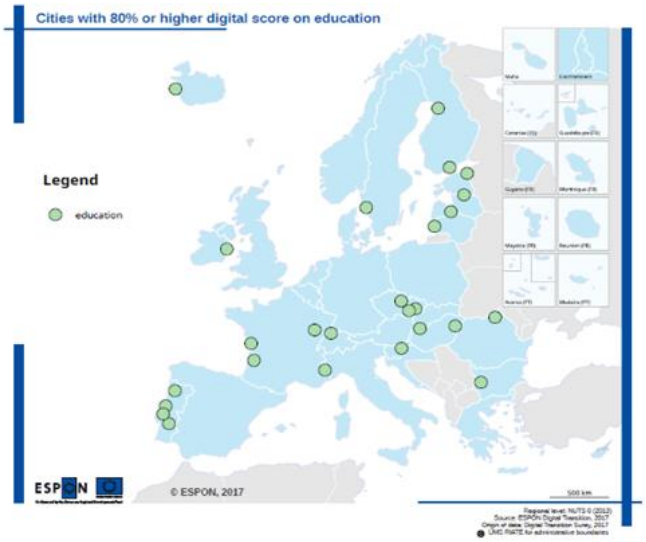
Table 9.1: Services included in each of the service themes, their classification and number of cities offering each service

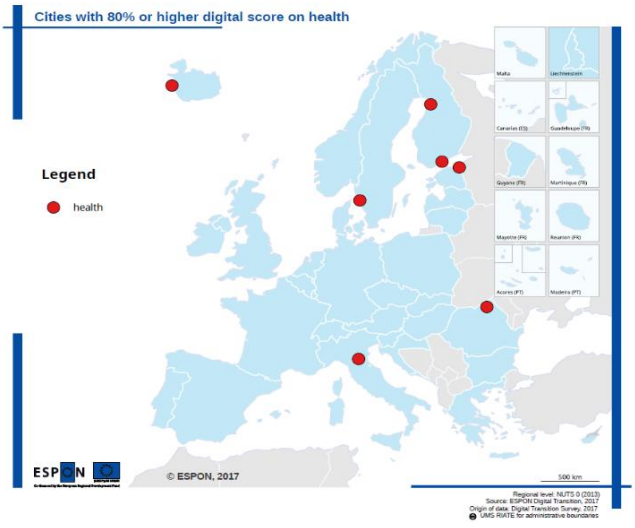
Services per service theme	Service complexity	Local	Regional/National
e-inclusion of citizens to local governance			
Find information via website	Basic	127	6
Trace the Council decision-making process	Intermediate	89	8
Follow streamed Council's meetings	Intermediate	68	16
Trace applications' proceeding by local authorities	Intermediate	63	12
Checking one's personal data from databases and registers	Intermediate	43	27
Participate in local government budgeting and strategies through voting online	Advanced	33	9
Spatial planning and construction			
Find information via website	Basic	119	8
Explore land use plans and proposals via dedicated GIS services	Advanced	96	20
Apply for planning and building permits	Basic	84	16
Obtain land use and cadaster data online via land registry	Intermediate	68	30
Participate in online public consultations on plans	Advanced	59	9
Social and welfare services			
Find information via website	Basic	115	11
Apply for support online	Basic	59	25
Report abuse online	Basic	36	26
Receive direct online support via chat/video call	Advanced	15	11
Join an online support community	Intermediate	9	14
Education			
Find information via website	Basic	114	13
Access PCs and interactive displays in primary education	Advanced	86	8
Monitor learning progress online (grades, events, assignments)	Advanced	57	23
Pay for the fees electronically	Intermediate	53	24
Apply for schools/course admission online	Intermediate	51	32
Obtain learning materials online	Intermediate	51	40
Participate in courses online	Intermediate	41	39
Public transport			
Find information via website	Basic	103	21
Use mobile apps for journey planning	Intermediate	57	38
Pay for the tickets electronically	Intermediate	44	41
Receive information about service interruptions, route changes, etc.	Intermediate	42	30
Track the public transport in real-time via digital timetables at stops	Advanced	40	26
Track the public transport in real-time via mobile apps	Advanced	38	29
Track your journey by using the onboard electronic displays	Intermediate	36	25
Road infrastructure & parking			
Find information via website	Basic	81	27
Pay for the parking electronically	Intermediate	55	30
Track statistical and real-time information on parking vacancies	Advanced	38	19
Get road information via digital information boards	Intermediate	36	41
Track statistical and real-time information on road congestion and roadworks	Advanced	24	34
Pay for the road tolls electronically	Intermediate	17	45
Health			
Find information via website	Basic	82	26
Make appointments online	Intermediate	43	34
Use e-prescriptions	Advanced	31	34
Apply for local, regional or national aids online	Intermediate	24	33
Receive online medical care services (consultations, telemedicine)	Advanced	16	25
Submit a request for reimbursement online	Intermediate	15	24
Access medical records online	Intermediate	13	39
Culture, leisure and sports			
Find facilities and event calendars online	Basic	118	11
Register to clubs, libraries, courses, events online	Basic	85	18
Book or pay for the use of facilities and tickets	Intermediate	80	22
Register complaints	Intermediate	68	16
Use QR codes in museums, landmarks info points for additional information	Intermediate	67	17
Find books, manage your book loans and pay fines online	Intermediate	54	21
Borrow e-books	Intermediate	41	19
Book a library desk space for study/work purposes	Intermediate	29	20
Use mHealth services to communicate personal health data	Advanced	8	15
Tourism			
Find information via website	Basic	122	10
Use mobile tourist guide applications	Intermediate	86	25
Use interactive maps	Advanced	83	23
Use location based services for journey planning	Advanced	69	21
Leave feedback to share with others	Basic	61	23

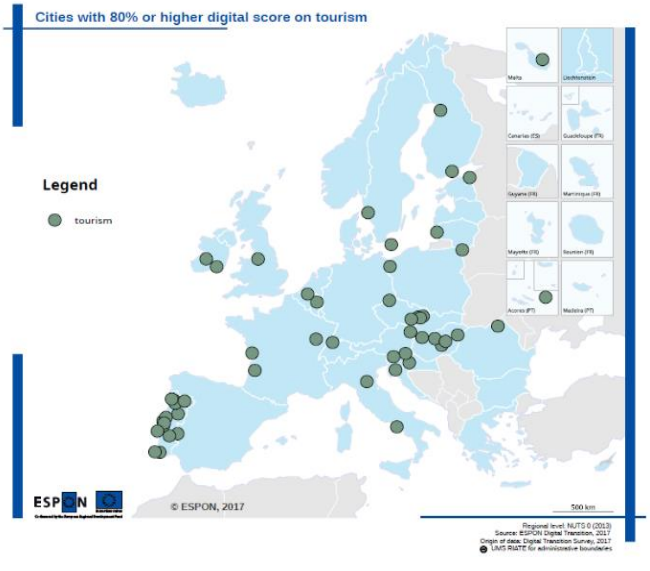
Digitalisation of cities per service theme

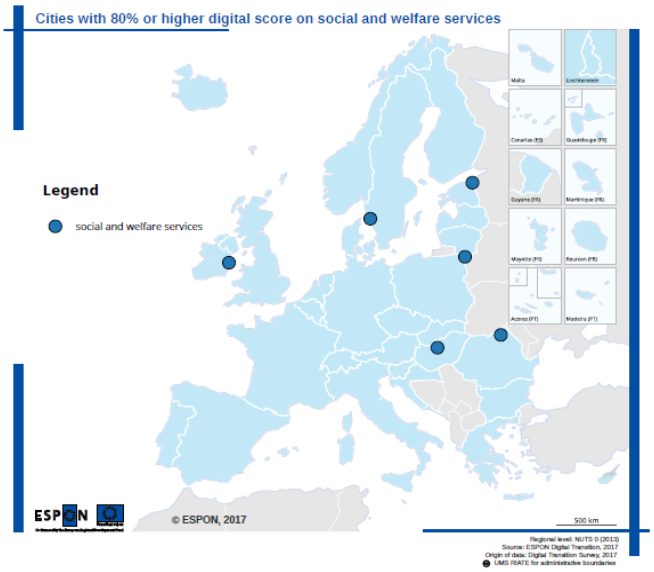
The following maps shows the location of cities that score 80% or higher on the 9 different service areas. For some services areas cities all over Europe score highly, for other service areas there is a large regional variety.

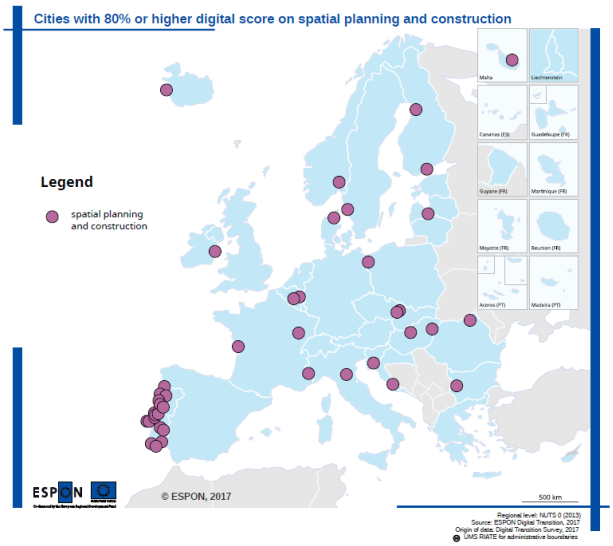
Maps9.1: Cities with 80 percent or higher digitals core on respective service areas

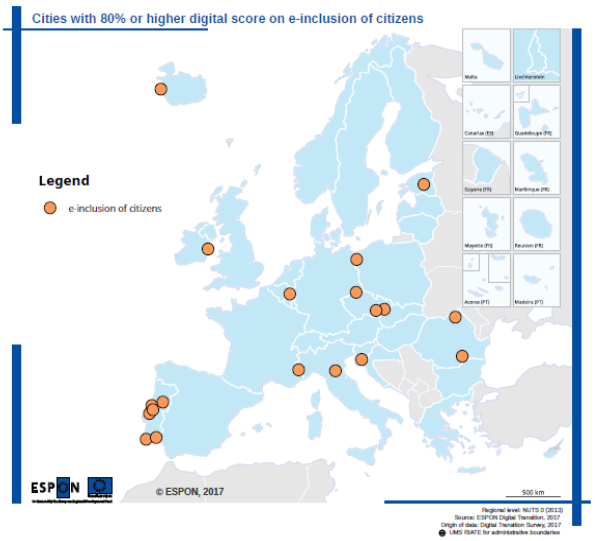


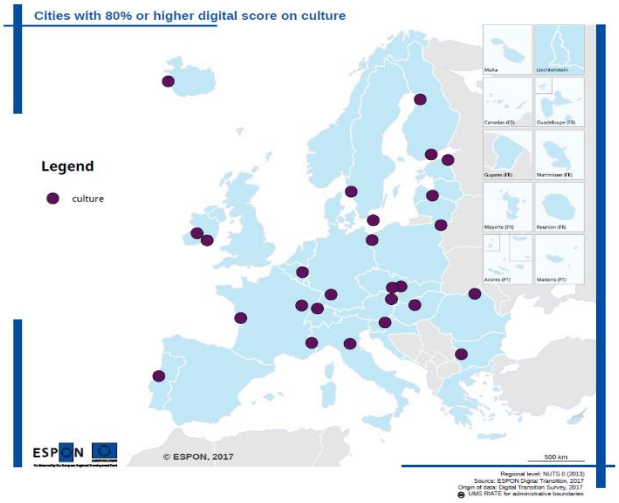


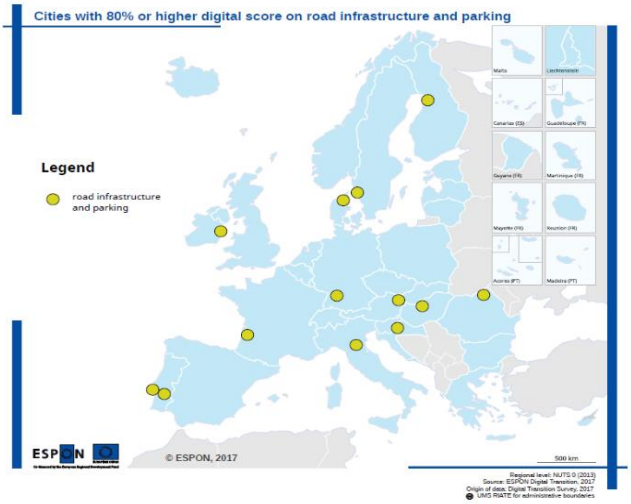


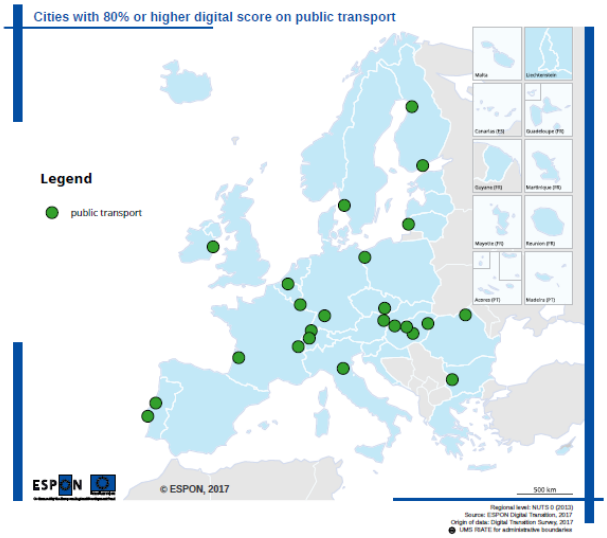








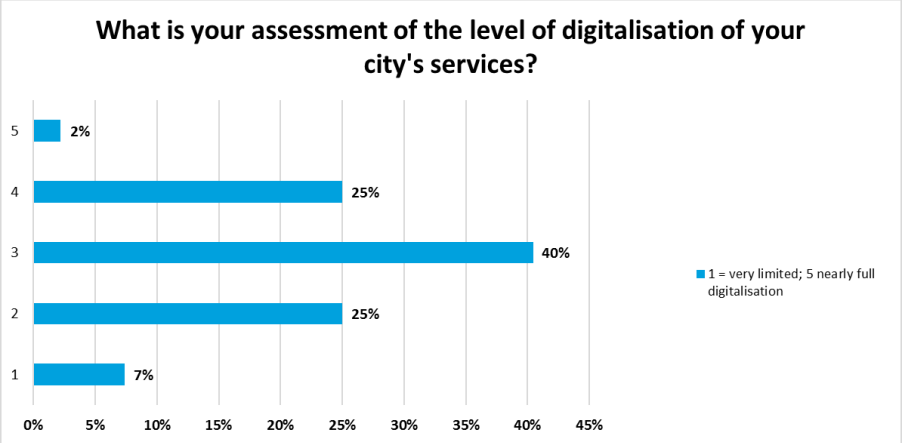




Process and results of digital transition

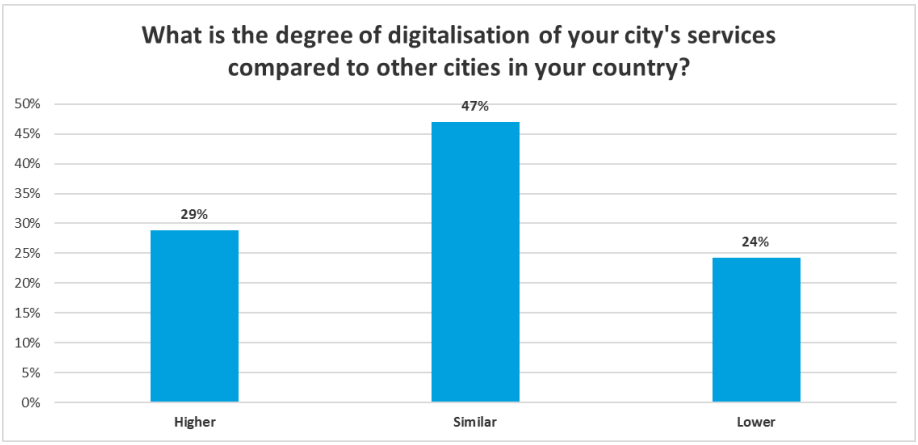
We asked the cities to indicate on a scale of 1 to 5 (1 very limited or none, 5 nearly full digitalisation) their assessment of the level of digitalisation of their city's services. Many cities responded that the level of digitalisation is average (55 cities or 40%) compared to other cities, 37 cities (or 27%) consider that the level of digitalisation is higher than the average and 44 cities (or 32%) reported that their level of digitalisation is lower than the average.

Figure 9.7: Assessment of the level of digitalisation of the services provided at city level



Furthermore, 62 cities (or 47%) replied that the degree of digitalisation of their city's services is similar (or 47%) and 38 cities (or 29 %) consider that it is higher than other cities in their country. Also, some of the cities (32 cities or 24%) believe that the degree of their city's digitalisation is lower than other cities in their country.

Figure 9.8: Digitalisation of services compared to other cities

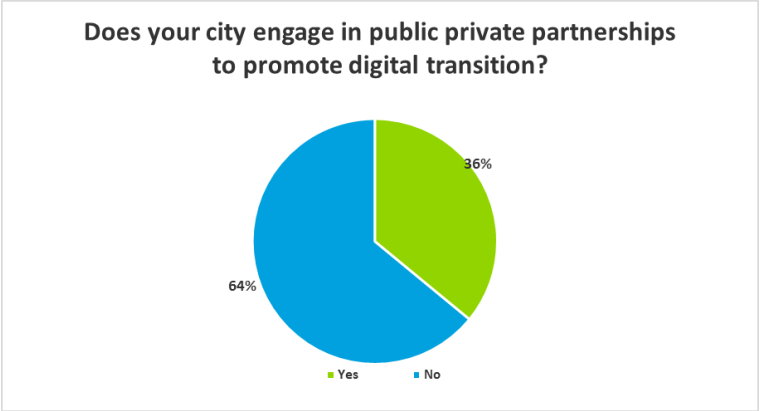


Most of the cities indicated that their city does not participate in any European/international network related to digital transition (62 cities or 59%), while only some of the cities (43 cities or 41%) participate in such networks.

Figure 9.9: Participation in European/international networks related to digital transition

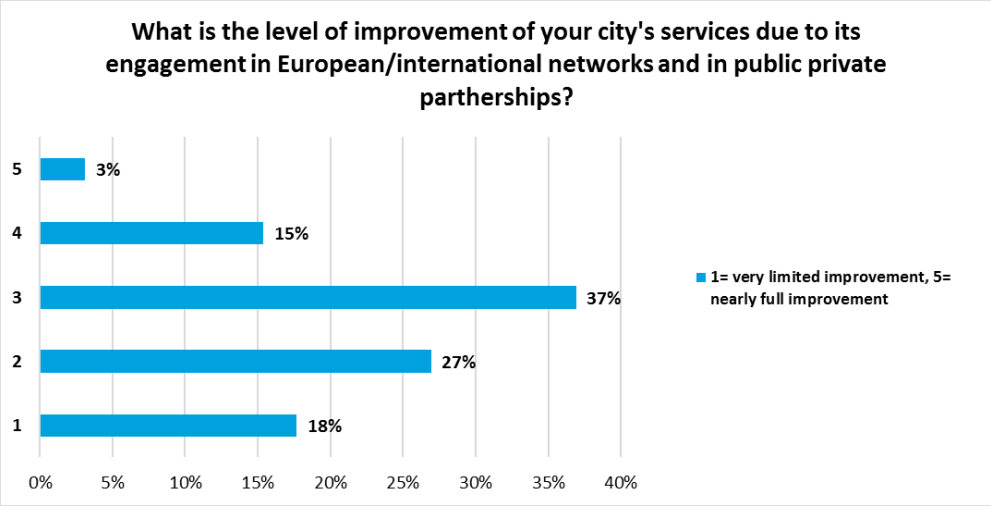
A great number of cities (57 cities or 64%) reported that they do not engage in public-private partnerships to promote digital transition while some cities (32 cities or 36 %) engage in such partnerships.

Figure 9.10: Engagement in public private partnerships



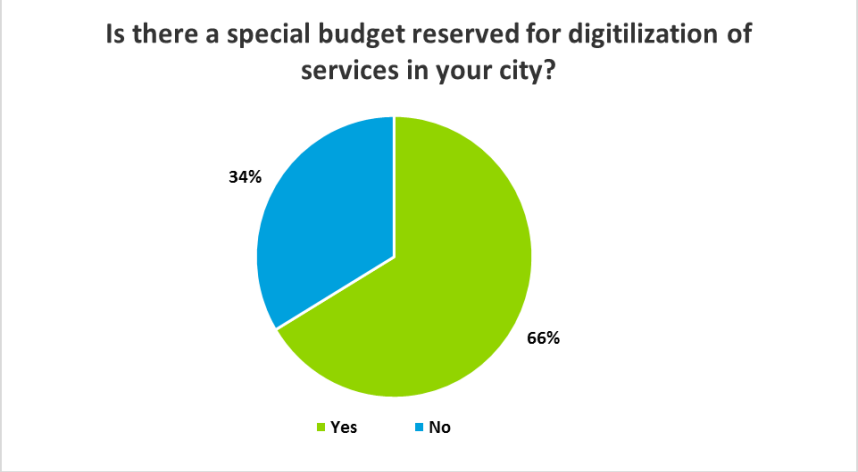
Most of the cities indicated that the level of involvement of their city's services due to their engagement in European/international networks and in public private partnerships is medium to high (72 cities or 55%). Besides, a great number of cities (58 cities or 45%) reported that their level of involvement is low due to lack of engagement in European/international networks and in public private partnerships.

Figure 9.11: Level of improvement of the participation of cities in European/international networks in public private partnerships



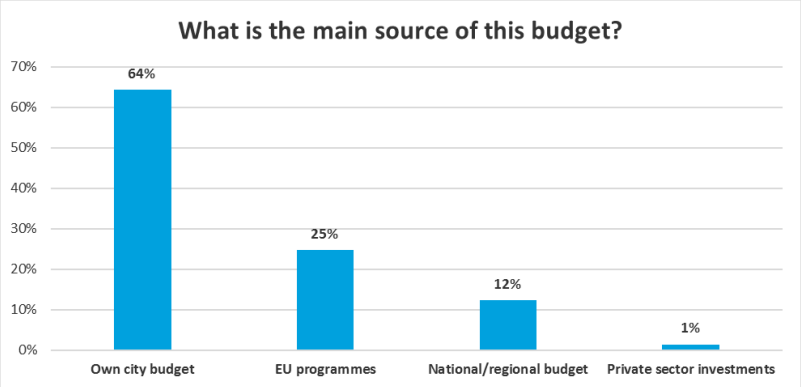
Most of cities (73 cities or 66%) reported that there is a special budget dedicated for digitalisation of services, while 37 cities (or 34%) mentioned that there is not such a budget.

Figure 9.12: Special budget reserved for digitalisation of services



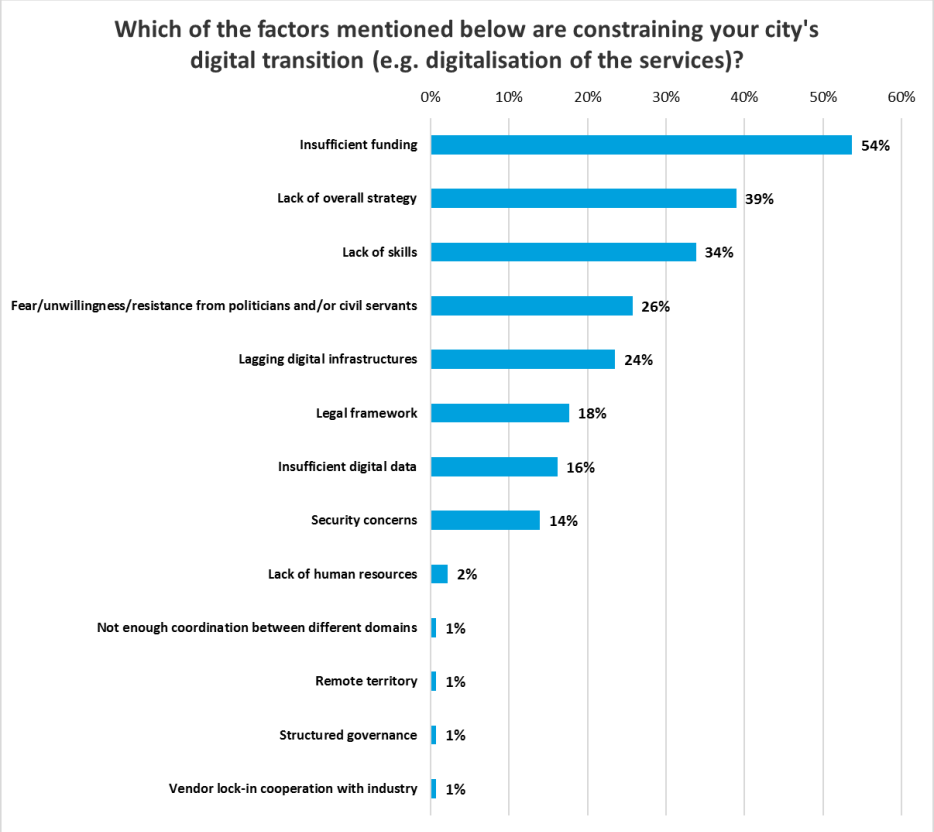
The cities that mentioned that there is a budget for the digitalisation of the service, indicated that the main source of the budget is coming from the own city budget (47 cities or 64%) while some of them indicated that it is coming from EU programmes (18 cities or 25%). Only a few of them mentioned that the main source of this budget is from national/regional budget (9 cities or 12%) and from private sector investments (1 or 1%).

Figure 9.13: Source of the budget for digitalisation of services



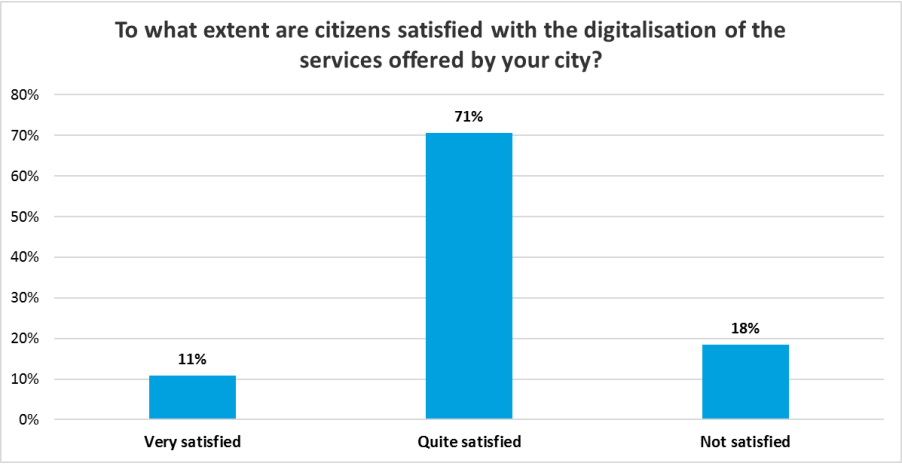
The cities responded that the main factors constraining their city's digital strategy are the insufficient funding (73 cities or 54%), the lack of overall strategy (53 cities or 39%), the lack of skills (46 cities or 34%), the fear/unwillingness/resistance from politicians and/or civil servants (35 cities or 26%), the lack of digital infrastructures (32 cities 24%), the legal framework (24 cities or 18%) and the insufficient digital data (22 cities or 16%). In addition, some cities consider as important factors the following: the security concerns (19 cities or 14%), the lack of human resources (3 cities or 2%), not enough coordination between different domains (1 city or 1%), remoteless of territory (1 city or 1%), structured governance (1 city or 1%) and vendor lock in cooperation with industry (1 city or 1%). Also, some cities (10 cities or 7%) considered the reasons given not applicable.

Figure 9.14: Factors constraining digital transition of cities



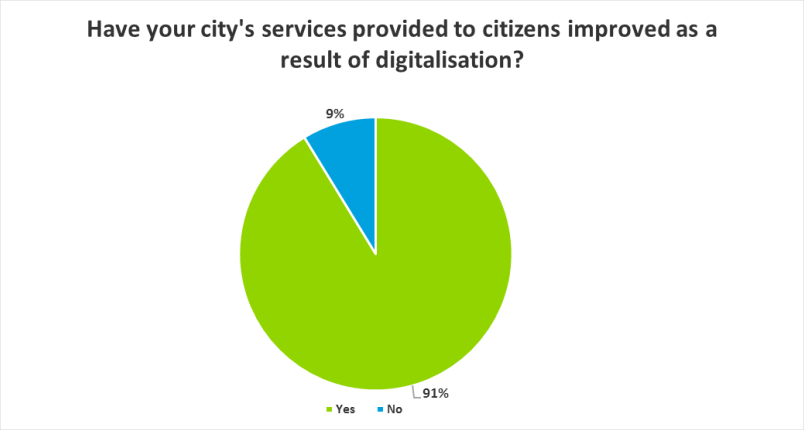
More than half of the cities (65 cities of 71%) reported that they are quite satisfied with the digitalisation of the services provided by their city while some of the cities (10 cities or 11%) are very satisfied. Some cities (17 cities or 18 %) reported that they are not satisfied.

Figure 9.15: Citizen's satisfaction with the digitalisation of the services offered at city level



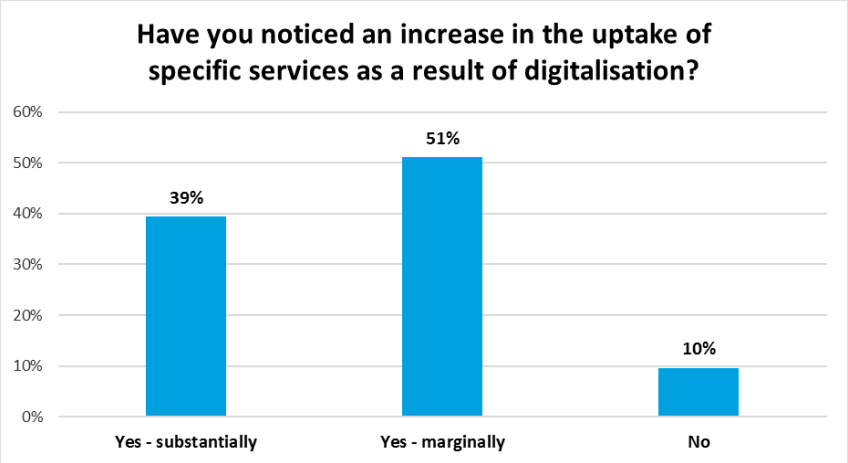
The majority of the cities (94 cities or 91%) replied that their cities' services provided to citizens have improved because of digitalisation while 9 cities (or 9%) stated that the services provided to citizens have not improved because of digitalisation.

Figure 9.16: Improvement of cities' services because of digitalisation



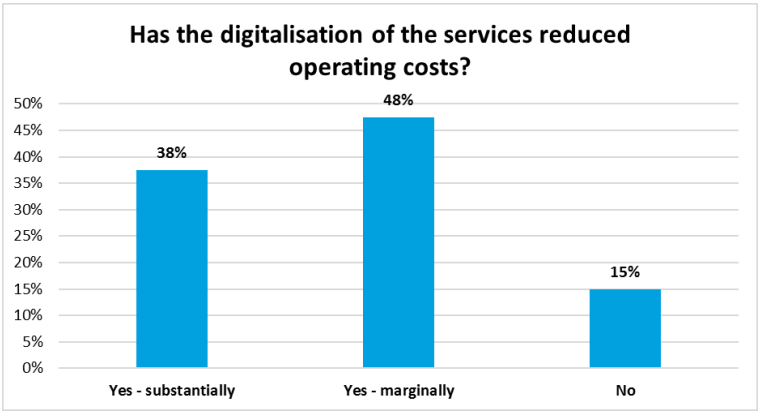
More than half of the cities replied that they have noticed an increase in the uptake of specific services as a result of digitalisation (37 cities or 39% replied yes-substantially, while 48 cities or 51% replied yes-marginally). The rest of the cities answered no (9 cities or 10%).

Figure 9.17: Increase in the uptake of specific services because of digitalisation



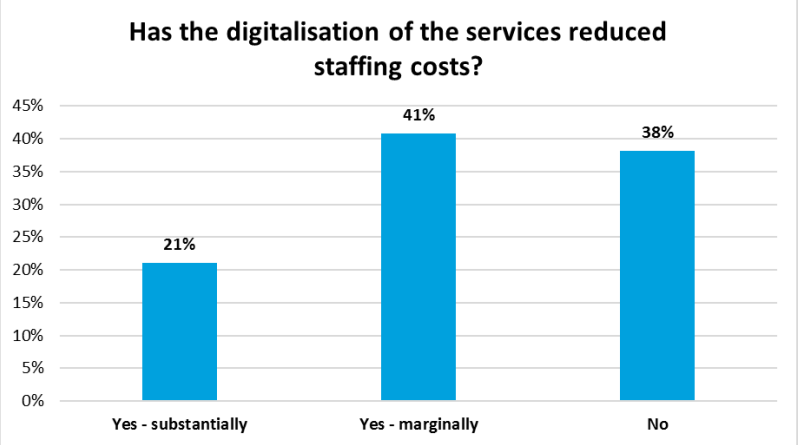
The majority of cities responded that the digitalisation of services has resulted in reducing operating costs as 30 cities (or 48%) replied yes-substantially and 38 cities (or 38%) replied yes-marginally while only 12 cities (or 15%) replied no.

Figure 9.18: Reduction in operating costs because of digitalisation of services



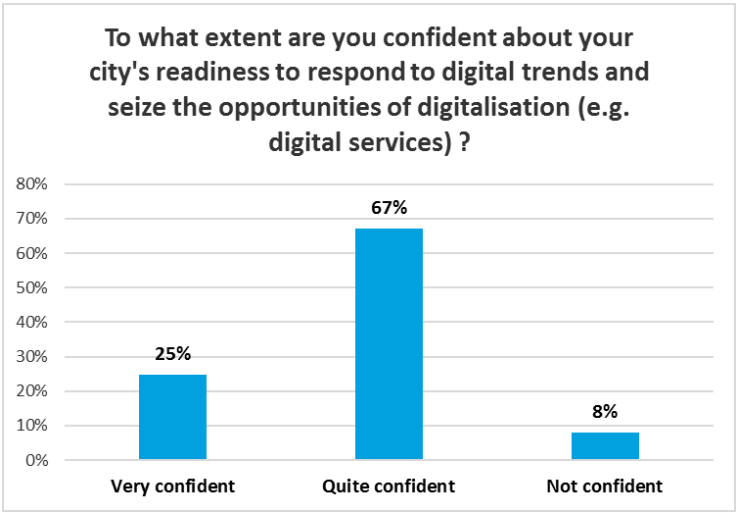
31 cities (or 41%) replied that the digitalisation of services has resulted in marginally reducing staffing costs while 16 cities (or 21%) said that it has resulted in substantially reducing staffing costs. 29 cities (or 38%) replied no.

Figure 9.19: Reduction in staffing costs because of digitalisation of services



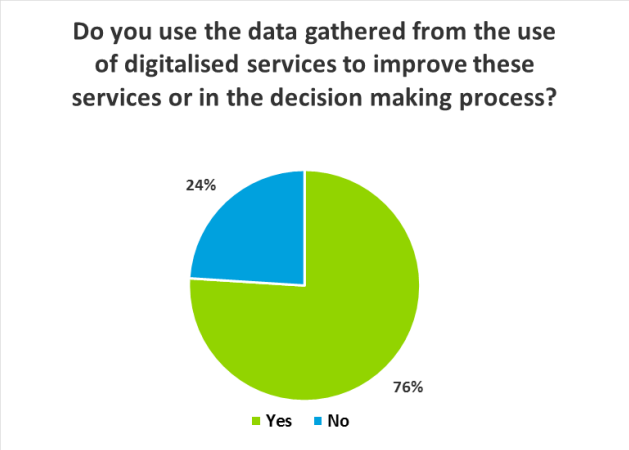
84 cities (or 67 %) indicated that they are quite confident about their city's readiness to respond to digital trends and seize opportunities of digitalisation. Also, 31 cities (or 25%) said that they were very confident while 10 cities (or 8%) reported that are not confident.

Figure 9.20: Confidence about the readiness of the city to respond to digital trends and seize opportunities of digitalisation



Regarding the use of data gathered, 76 cities (or 76%) confirmed that they use the data gathered from the use of digitalised services to improve these services or in the decision-making process, while 24 cities (or 24%) do not.

Figure 9.21: Usage of data gathered from the use of digitalised services



Annex 2 – Case study reports

The case study on Helsinki

Introduction

Table 9.2: City factsheet – key indicators

Factsheet - Helsinki	GDP 2015 (in million €)	R&D Expenditure 2014 (% of GDP)	Employment in Tech 2006 (% of total employment)	Households with BB 2016 (% of households)	Online interaction with authorities 2016 (% of individuals)	Online purchase of goods 2016 (% of individuals)
	80958	3,74	9,5	95	88	75

Source: Eurostat

Helsinki, the capital of Finland, is located in the south of the country, and has a population of almost 630 000 that is growing due to migration and a high birth rate. The largest age group in the city is 20 to 30 years old. The city represents 30% of the gross national product and 42% of the national research and development expenditure is done in the universities and research centers located in its metropolitan area. Services represent 88% of all jobs, with ICT, business services, tourism and culture as the main sectors.

Helsinki uses design as a strategic tool to improve the life of its citizens, based upon the work on open data and design initiatives. It was the World Design Capital in 2012. A good example is the Smart Kalasatama project, with the goal to manage resources and create services in an intelligent way and be a model district for intelligent city development.

Overview of the city's digital strategy

In early 2000's, Helsinki wanted to provide e-services, with efficiency in service provisioning being the first target. In fact, the main drivers for the strategy are the increase of internal efficiency, modernise the city´s services, the improvement of the citizen´s experience

Already since 2007, the city´s metropolitan area has benefited from a network of "Living Labs" which provides the opportunity to test and experiment, offering a space where users can work with developers on innovative smart city services.

The smart city strategy of Helsinki is part of the Helsinki City Strategy Programme 2013-2016, which focused on design and how to use it in city development: (1) how to become a competitive city; (2) as a tool to reinvent public services; and (3) as a way to enhance the competitive edge of companies operating in Helsinki.

For Helsinki its smart city strategy is not only about infrastructure and technologies, it also means progressing in open engagement of the citizens and communities and pioneering in open data and transparency.

As part of this philosophy to create an open city through digitalisation in 2010, the cities of the Helsinki Metropolitan Area began sharing its public data as open data for anyone to use freely. These open datasets, are available through the Helsinki Region Infoshare (HRI) service, a web-based platform, which allows access to a wide range of data to develop applications and public decision-making. This service won the European Commission´s award for innovation in public administration in 2013.

Through Open Ahjo, an open programming interface to the city's case management system, the decisions made by officials and councillors are available for free re-use as open data.

The current strategy focuses on several themes, among which are open city development, open innovation, open data and open source code. These are combined to offer innovation opportunities for developers (amongst others through Smart Kalasatama; HRI), accessible information on city services, operations and decision making (e.g. open Ajho) and makes it easier for citizens to influence these processes and provides opportunities for companies and organisations, including new entrepreneurs and start-ups innovating in new digital services. As a result more than 1000 public data sets have been opened for unrestricted use.

Smart Kalasatama is a development project in which an old harbor is transformed into a smart city district and a Living Lab in itself, construction started in the late 2000s and will continue until mid 2030s. Currently 70 companies are taking part in the project (representing all sizes from micro to large), and agile piloting is done for start-ups.

Helsinki has advanced well in its digitalisation efforts, with the majority of the services in the following fields digitised: e-inclusion, spatial planning and construction, social and welfare services, education, public transport, road infrastructure and parking, culture, leisure and sports and tourism. Digitalisation of health related services is done on national level mainly (and with a high level of digitalisation as well.

Funding for the strategy come from different sources, stemming from own budget, national funding, European funding and contributions from the private sector.

Helsinki is part of the Six City Strategy, a joint strategy of six Finish cities, which runs between 2014 and 2020 and consists of common development of smart solutions and implementation of experimental projects. It is funded by European Regional Development Fund, European Social Fund, the Finnish Government and the participating cities. The Smart Kalasatama project is funded by the private sector (which up to mid 2017 has invested € 5 billion) and by the city of Helsinki (with € 600 million).

Forum Virium Helsinki, a private non-profit organisation owned by the city, is responsible for development of new urban digital services in collaboration with the private sector, the municipality and other public sector organisations and the citizens of Helsinki. The organisation's projects cover six key domains: smart city, wellbeing, new forms of media,

innovative public procurement, innovation communities and growth services. It was founded in 2005 by the city and several media and telecommunication companies, e.g. Nokia and TeliaSonera. Its budget has increased considerably since then. The City of Helsinki covers the basic costs, while funds for projects come from various sources, such as for instance European and national public funds, commissions from the city and other municipalities and membership fees of companies.

Helsinki is highly ranked in smart city related indexes, e.g. the CITIE Index 2015, which surveyed the level of support to innovativeness and entrepreneurship in 40 cities worldwide, ranked Helsinki third, the two leading cities being New York and London.

Key questions to city officials / relevant actors about digital transition in their city

- How did the digital strategy come about?

The efforts came out of the city´s organisational renewal process, which developed a new city strategy and analysed the city´s digital maturity, starting from the existing IT programme. This process has been the main frame from the realisation of the goal of providing e-services with efficiency in service provisioning being the first target.

Increasing transparency and facilitating access to information to citizen´s (i.e. open data) has been – and continues to be – very important. This has partly led to other points of focus in the digitalisation efforts such as the modernization of city services and the improvements of internal efficiencies through using open API's to facilitate flow of data between IT-applications.

- What worked well/ did not work well during the implementation of the digital strategy?

One of the biggest challenges Helsinki faced was the re-engineering of service provisioning. Digitalisation is not about replacing existing processes merely with on-line and/or electronic forms, but it requires a different mindset and way of working, as well as learning new tools.

The development of tools and methods on city level worked particularly well, e.g. common components for identifications, payment processes and a city level account for customers have been successfully implemented. However there are still many IT-systems, many of them legacy systems that do not adapt well to the new demands and processes.

- What funding was used and how did the city ensure access to these funds?

Funding was attracted from a wide range of source, combining internal local funds, the city´s innovation fund, specific programme related funds, (e.g. ICT-program) with national and EU funding.

- What has been the socio-economic impact of the strategy?

People are now able to interact with the city through its e-services, and citizen´s on-line activism has increased.

Citizens and companies are participating in the creation of digital services through open data and open source code.

An example is MOOSE, a student-made mobile application that uses the data collected by HRI to help exchange students easily find housing, events on campus and more.

Conclusion

The early start of the efforts already back in 2000 have led solid foundations for the development and implementation of Helsinki´s smart strategy, making it ranked among the world´s top smart cities. Seeing digitalisation as re-engineering instead of making digital what was manual has been key to the advancement and success of its e-services.

Many services have been digitalised but effort remains to integrate and adapt the many legacy systems which are still running.

The city has been able to mobilise citizens and the private sector around a wide range of activities and projects, with a smart city district being a living lab in itself.

Case study report of Zaragoza

Introduction

Table 9.3: City factsheet – key indicators

Factsheet - Zaragoza[7]	GDP 2015 (in million €)	R&D Expenditure 2014 (% of GDP)	Employment in Tech 2006 (% of total employment)	Households with BB 2016 (% of households)	Online interaction with authorities 2016 (% of individuals)	Online purchase of goods 2016 (% of individuals)
	24 458	-	3	80	53	47

Source: Eurostat

Zaragoza, a city with over 700 000 habitants, is the fifth largest city in Spain. It has won the Green Digital Charter (GDC) 2016 Award on "Citizen participation and impact on society" and is considered one of the most advanced cities in the country when it comes to digitalisation of municipal services for the citizens.

Overview of the city's digital strategy

In 2003, Zaragoza initiated a strategy to become a knowledge society, taking as reference point the eEurope initiative (Communication eEurope: An Information Society for All), and covering a wide range of areas including amongst others telecommunication infrastructures and electronic administration. However, this strategy is not restricted only to the use of technology, but has a wider approach towards the economic model of the city.

The aims of this strategy were to:

- Create and set up innovative businesses to foster economic growth and the creation of skilled jobs;
- Use the new technologies to provide more efficient public services;
- Guarantee all citizens, entities, companies and institutions the exercise of their full rights of access to the communications networks;
- Make the most of technological change to develop a new, cohesive city planning and create economic opportunities;
- Make Zaragoza a national and international reference point in the light of its approach to technological change and innovation.

This has led the foundations for the current strategy developing a powerful innovation infrastructure platform. The economic crisis forced to adapt some of the initial ideas and

[7]Except for the GDP indicator, all the other indicators for Zaragoza concern the Region of Aragon.

projects, but without losing sight of the need to develop a digital public realm and foster new digital businesses.

The strategy Zaragoza 2020 is a strategic framework for the city and its environment in the period between 2011 and 2020, it builds upon the former efforts maintaining the principles of participation, consensus, public-private collaboration and sustainability. Zaragoza in this framework is seen as an innovative city, integrating technologies across all social, economic and cultural areas.

The Open Government Strategy in the Digital City 2012-2015 is composed of six pillars of which the key ones are sustainability and competitiveness. Technology is seen as a change and efficiency agent decisive for the success of the strategy. Within this setting several initiatives have been implemented such as:

- Traffic management – a large network of sensors and artificial vision cameras has been implemented;
- Improvement in telecommunications with one of the most extensive Wi-Fi networks in the country;
- Implementation of free software in the municipality;
- Development of electronic administration, being one the Spanish cities with the most internet based services;
- Open data policy that aimed to increase transparency; improve internal efficiency and create economic value through re-use of the data.

Especially relevant here are the following projects, which have been key to the success of the implementation of the strategy in the city:

- Smart Citizen Card, (RFID based) which allows the delivery of twenty different services from bus, tramway, public libraries, public Wi-Fi, public bikes, theatres, swimming pools etc. Everything that you can think of in terms of public services can be carried out with it with the philosophy of “All in One Digital Key”.
- Open Urban Lab, the co-creation lab of the city, to co-create and conduct open innovation sessions with entrepreneurs and citizens, people from the universities and municipal public servants.
- A civic and innovation ecosystem of several start-up incubators and the program “100 Ideas ZGZ” conceived to set bottom-up ideas in motion, using the city as an innovation platform.

The city has a specific department dedicated to providing transversal tools and integrating multiple domains of city operations, called the Smart City Department.

For the implementation of the strategy the city has made use of national funding and investment programmes in the period between 2005 and 2010. It has participated as a partner in several European funded projects on the topic, which has provided additional funding for the implementation of the strategy.

The Foundation “Zaragoza Knowledge City” was created in 2004 by the Municipality as a public-private project to promote the knowledge society with participation of the social work of Ibercaja (a savings bank), the Universities of Zaragoza and San Jorge and three individuals. Since its creation the activities of the foundation have been funded mainly with private funds.

When asked about how the digitsal strategy was developed, a Smart City manager mentioned: “The driver for these changes and main character in this play is the citizen. We do not just want to make good services for the citizens in the center, but we want the new services in the city to be done together with the people and this is what we could call “engaging by doing”. Then there is a parallel set of projects that deals with fab labs and teach yourself initiatives that are very linked to this – so it is all about giving away power and the capacity to make things to the citizens.

The City has used a mix of own funds, national funding and European funding, both through structural funds, as well through the participation in specific projects under the Research and innovation Frameworks. The latter focussed on specific initiatives and activities and not used to fund the overall and wider approach of the strategy.

Conclusion

Embedding the first steps on the way to become a digital city in the eEurope initiative has laid solid foundations for the strategic development, and although the economic crisis forces to take up some of the initial ideas and projects, the city has been able to adapt to the situation and continue on the path to become a digital city and foster new digital businesses.

Having a dedicated department in charge of transversal tools and integrating domains has been key for the successful implementation the strategy, which places the citizen at the center of all activities.

Case study report on Eindhoven

Introduction

Table 9.4: City factsheet – key indicators

Factsheet - Eindhoven[8]	GDP 2015 (in million €)	R&D Expenditure 2014 (% of GDP)	Employment in Tech 2006 (% of total employment)	Households with BB 2016 (% of households)	Online interaction with authorities 2016 (% of individuals)	Online purchase of goods 2016 (% of individuals)
	102 154	2,73	4,1	96	73	73

Source: Eurostat

Eindhoven is the fifth-largest city in the Netherlands, with a population of about 220 000, located in the south of the Netherlands in the province of Noord-Brabant. The Eindhoven region is one of the powerhouses of the Dutch economy, accounting for fourteen percent of the country's gross domestic product. 40% of all investments in research and development in the Netherlands are made in the Eindhoven region.

The Eindhoven region is home to Brainport, a breeding ground for innovation and the home base for world-class companies (e.g. Philips, DAF Trucks and ASML), and knowledge and research institutions (e.g. Eindhoven Technology University of Eindhoven), which through their cooperation are positioning the area as a reference in the field of innovative technologies.

Overview of the city's digital strategy

The basis for the strategy was laid down in the coalition agreement "Expeditie Eindhoven", subscribed by the political parties forming the municipal government, which expressed the ambition to transform the city into a Smart City, and the first formally approved policy document mentioning the living lab approach.

In July 2015, the city signed an agreement with Technical University Eindhoven to develop a series of roadmaps which would lay the foundations for the implementation of the programme. In October 2016, the Municipal Council adopted the Smart Society programme, which defines the vision of the city as a Smart Society, going a step further than a Smart City which places efficiency central. The programme is based upon five lines:

- Data
- Infrastructure
- Living labs

[8]All the other indicators for Eindhoven concern the Region of North Brabart.

- Community & ecosystem
- Communication

All initiatives belong to one of these lines.

The aim of the programme is to use data and smart technologies to improve life in the city through people, partnerships, co-creation and experimentation. The programme explicitly recognizes that the municipal organisation and structure need to be adapted to ensure adequate and successful implementation of the programme.

Through the multiple helix approach (a cooperation of citizens, industry, Universities & government) the city uses the diversity of different perspectives to innovate and implement new technologies. The programme has a wide approach covering different aspects of everyday life and municipal activities. Since its implementation, several key projects and initiatives have been realized and/or are underway, examples are Smart Lightning or Smart crowd management (Stratumseind 2.0 – making a clubbing district more attractive and profitable for businesses).

Digitalisation of services is done either by the city directly or these services are offered by partners or providers. For example, the city´s spatial planning and construction services is advanced with many features available, a similar situation can be found with regards to social and welfare services, where the majority of services are digitalised. The effort in the field of e-inclusion is well underway as is for road infrastructure and parking although slightly less advanced than the others.

Services related to culture, leisure and sports are not offered through the city´s website but through partner´s site, however under the same brand as the city.

E-services related to education, beyond finding information via website, are not provided by the city but by the educational institutions themselves, the ones related to public transport (except receiving information about service interruptions, route changes etc.) are also not provided by the city but through providers and the market. Health services are not provided on local level.

Funding is secured through a mix of public-private funding. The city provides funds to a specific initiative or project; however the partners contribute either with own funds, knowledge and/or time, depending on the multiple helix partners involved in a specific initiative or project. A good example is the Smart Lighting project where the consortium partners Philips and Heijmans receive the amount reserved for the maintenance of street lighting and uses this money not only for the maintenance but also for developing innovative concepts and new features for it.

The budgets for 2017 and 2018 are over 1 300 000 € per year.

Key questions to city officials / relevant actors about digital transition in their city

- How did the digital strategy come about?

The main drivers of the digital strategy for Eindhoven were to improve citizen experience, facilitate access to information provided to the citizens and modernisation of the city´s services. Eindhoven positions itself as a city for technology, knowledge and design, implementing a digital strategy is thus a logical step. A multiple helix approach, in which citizens, industry, universities and government were involved, provided the different perspectives to innovate and implement new technologies.

Another trigger was the frustration regarding the silos created in services provided by national and local governments, from a historical perspective, losing sight of the end-user, the citizen. This has led to a motivation to innovate and transform the local service model.

The goal for the coming year is to move towards a human-centers and data driven model (following the example of Estonia); to increase user experience and work towards more efficient and effective government.

- What worked well/ did not work well during the implementation of the digital strategy?

The ecosystem based upon the multiple helix approach and the partners participating inspire the innovation and support the transformation of the city.

Many of the initiatives and activities implemented are experimental, and impact is not always measured properly, this is one of the areas where improvements are needed.

The marketing of the digitalised services need to be improved. As a local government the city hardly uses marketing strategies to “sell” the services to the citizens. These strategies will ensure that end-users will actually want to use the product or service and not only indicating to need it.

The city is well aware that the end-user perspective is to be the starting point for the digital transformation, and not the systems that are already place. This requires out-of-the-box thinking and the exploitation of new approaches which need to be complemented with a diverse and learning environment. It is this context that will be able to bring about the change in the way of working.

- What funding was used and how did the city ensure access to these funds?

The city procured internal funding for its own IT-infrastructure, investing in programs to innovate and develop the infrastructure and related service models. Additionally, co-creation takes place with business partners through living labs or get funded by national government or EU programs, always with a view of re-use by other cities.

The city is also involved in national programs for the development of infrastructure for the country as whole, although this does not procure funding it does allow for lobbying to obtain results and anticipate on calls.

- What has been the socio-economic impact of the strategy?

The city has perceived an improvement in the communication towards citizens, however no formal impact measurement system is put into place to confirm this.

New applications and new businesses were generated related to the development of the Open Data portal, which made all open data from the city available, the success of this innovation has lead the city to become an example for other cities in the Netherlands in this field.

The development of the Internet of Things (IoT) charter is an outcome of the strategy. The charter developed a few simple common principles to apply to a architecture of all current and emerging IoT initiatives. They were developed to safeguard public interest, stimulate innovation, foster a sustainable ecosystem of partners and encourage socially responsible business models. The first experiments with the application of this charter across the city are positive.

Conclusion

The multiple helix approach has generated a solid and wide support base for the strategy and the implementation of a wide range of projects and initiatives, the co-funding of these by other national, EU and/or private funds being it in cash or kind has proven a viable approach.

The implementation of the digital transformation in Eindhoven is based upon the establishment of public-private partnerships or other types of collaborations for the digitalisation of different services. For instance, services related to public transport are offered through providers or the market, in education by the educational institutions themselves and for culture, leisure and sports through partner sites.

Awareness about the need to change the paradigm and start thinking from a user-perspective, is creating the right context, structure and environment for the digitalisation efforts and is one of the pillars of the advancement of the city in this field.

Case study report on Sofia

Introduction

Table 9.5: City factsheet – key indicators

Factsheet - Sofia[9]	GDP 2015 (in million €)	R&D Expenditure 2014 (% of GDP)	Employment in Tech 2006 (% of total employment)	Households with BB 2016 (% of households)	Online interaction with authorities 2016 (% of individuals)	Online purchase of goods 2016 (% of individuals)
	17 989	1,39	8	64	24	21

Source: Eurostat

Sofia is the capital and the largest city of Bulgaria and the 15th largest city in the European Union. It is located in western Bulgaria, at the foot of Mount Vitosha and approximately at the center of the Balkan Peninsula.

Overview of the city's digital strategy

The city´s strategy is aligned with the country strategy to trigger the digitalisation efforts on municipal level, initiated in 2001. It is embedded in a wider development strategy for the district for 2014-2020.

In December 2015, the City Council of Sofia developed its own Smart Specialisation Strategy and was the first one to design a regional innovation strategy for smart specialisation in Bulgaria. The process started at the end of 2014 with the creation of an expert group, who during 2015 met with different public and private stakeholders to develop the 2025 strategic vision. This vision is to become an innovation centre through technologies, talent and tolerance, with a focus on three industries: ICT, creative and re-creative industries and life sciences and biotech.

Sofia (1.3 million inhabitants), capital city of Bulgaria, is a social and economic metropolitan center contributing about 30% to the national GDP. Its ambition towards a smart city are laid down in the Sustainable Energy Action Plan 2012-2020 with integrated actions for the implementation of energy management, holistic energy planning and renovation of the building stock, integrated measures in the transport and waste management.

While some cities are ahead in opening data and extracting social and economic benefits from datasets than others that are just beginning to publish open government data. The capital Sofia was Bulgaria's first city to open data. Sofia's urban mobility website has been providing detailed information on urban transport, schedules and routes. Bulgaria, which started publishing public open data only by 2015, with the aim to have more than 300 open datasets in the years after.

[9]Except for the GDP indicator, all the other indicators for Sofia concern the Region of Yogozapaden.

The Innovation Strategy for Smart Specialization of Sofia is a document outlining the sectorial specialization of the economy of the capital of innovative potential and priorities in the development of research and innovation. The Innovation Strategy of Sofia aims to enhance the smart specialization of the capital through promotion of Sofia as a smart city. The Innovation Strategy cultivates an environment with a high quality of life for citizens and good governance, and stimulates the creation of better conditions for synergy of the major economic sectors in an innovation ecosystem and through the efficient use of ICT.

E-governance in Bulgaria has been in development since 2001. In the latest "Global E-government Survey" from 2012, Bulgaria was ranked 60th, which puts it among the worst performers in the EU. Eurostat data reveals that in 2013 only 23% of individuals in Bulgaria used Internet to interact with the country's public authorities (among which only 18% were satisfied with using the e-services), which is the lowest rate in the EU. In comparison, the average percentage for EU27 is 42% of all individuals (with 32% of those satisfied with using the e-services). The figure for enterprises is also the lowest in the EU - 59% of Bulgarian enterprises interacted with public authorities online in 2013, compared to 72% in EU27. Sofia is an example of city that despite the less advanced digitalisation of services on country level, has made relevant progress in this field.

In April 2013, the Ministry for Transport, Information Technologies and Communication announced that 50 new administrative e-services for citizens and enterprises will be developed and piloted in Sofia Municipality as a step towards the development of an integrated information system in the municipality and the advance of e-governance in the country. The project has been financed by the Operational Programme Administrative Capacity.

Sofia municipality currently provides a number of administrative e-services, including payments, complaints and contacts to the offices of the Mayor, chairperson of the Council etc. Within the municipality, the following areas are good examples of digitalised services:

- The Directorate of Architecture and Planning provides on-line information about its work and decisions on master plans and investment projects;
- The municipal company "GIS Sofia" provides consultations and on-line information about land cadastre and registers through its own GIS based information system;
- The municipal enterprise "Sofproect" responsible for Sofia Master Plan, provides information and platform for public consultations on all issues related to the spatial development;
- The Urban mobility Centre provides information for the public transport, schedules, routes, parking, parking permits, traffic, cycling routes and networks; Kindergartens –

registration system, which provides information about free places, links with relevant NGOs and other educational organisations, incl. education for parents;

- Sofia city public library – provides access to all digitalized books' funds, periodicals and archives. Virtual tour in the library.

The Sofia Development Agency is responsible for the coordination and implementation of Sofia's Smart Specialisation Strategy. In 2014, it established the Sofia Fund for Innovations, a public-private fund with the aim to mobilise resources for new business creation. It has also organized to underpin the Smart Specialisation Strategy and to tackle urban problems through technological innovation.

Key questions to city officials / relevant actors about digital transition in their city

- How did the digital strategy come about?

The objective to establish itself as a capital of the new digital market in South-East Europe and to take a leading position in the production and distribution of movies, computer and video games, mobile apps, digital products and services the area is the baseline for the development of the strategy.

- What worked well/ did not work well during the implementation of the digital strategy?

The city has made good progress on the development of specific activities and services, with the information via websites developed in all aspects, and with the access to personal information related to health, taxes and other general data available for all citizens. The free hosting of petitions and platform, used by professionals for protection of natural and cultural heritage, is working well.

Other aspects, such as obtaining documents, services, tracing procedures and reporting for emergencies have been partly developed.

Despite the many efforts and resources invested, the stakeholder involvement models remain mainly short-term oriented, with a focus on relationship building, and not always fully addressing the lack of internet access and ICT literacy of specific social groups. More coordination is needed between the state and local administrations to implement integrated approaches with more long-term strategic goals and models.

- What funding was used and how did the city ensure access to these funds?

A combination of different funding sources was mobilised for the implementation of the strategy. Own funds were secured through the municipal budget and the establishment of the Sofia municipality Fund for Applied Research on Digitalisation, as a Public-Private Partnership (PPP). On national level the National Innovations Fund of the Ministry of Economy and the National Fund contributed.

Additional funds where secured through EU funding stemming both from the Operational Programme 2014-2020 (more specifically the priorities related to digitalisation) and specific funding programmes such as Horizon2020, COSME, Interreg, European Investment Plan, Jeremie and Transborder cooperation programmes amongst others. Bank loans, private investments and crowdfunding where also used.

- What has been the socio-economic impact of the strategy?

The main economic impact is related to the speeding up of the development of the ICT sector has generated more jobs in the ICT sector, especially for higher qualified professionals, a change which has transformed the city´s employment structure.

With regards to access and transparency, citizens and businesses have easier access to relevant information and the administrative burden and paper work has been reduced significantly. Increased participation in decision making processes of citizens through the established on-line platforms raises awareness and commitment, while better access to information on local services and utilities (such as healthcare, education, water and electricity supply and central heating) facilitate their lives.

The quality of the information on cultural activities; heritage and tourism has been increased.

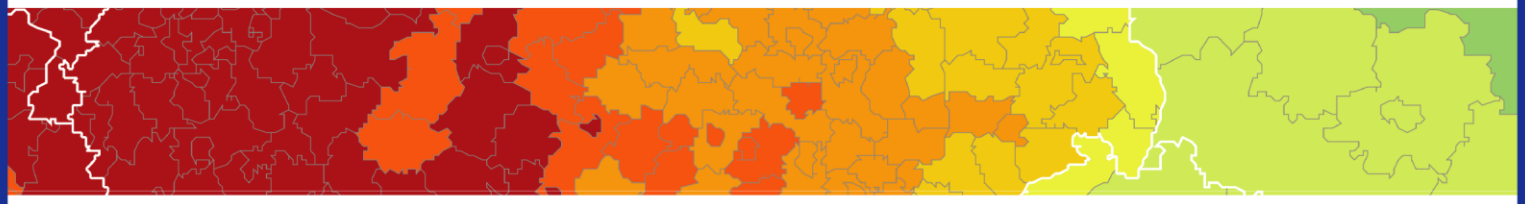
Internally the transparency on the financial policy of the municipality has experienced a boost, as the digital transformation has allowed for a better control on the implementation of the municipal programmes and plans.

Conclusion

Despite being situated in a less-advanced country when it comes to digitalisation of services and their use on national level, Sofia has advanced significantly in the digitalisation of services in different fields, with education, public transport and tourism taking the lead. The triggers for the strategy: increased transparency, facilitate the access to information provided to the citizens and modernisation of the city's services laid the foundations for a specific innovation strategy for smart specialisation, and being part of a larger strategy for the development of the district as whole is an asset.

Securing a wide range of funding sources has been key, using own funds as well as national and European funding, combined with private funding.

Although there are still challenges to be addressed, mainly related to long-term stakeholder involvement (including the involvement of ICT-excluded social groups), the city has generated a positive impact both on economic level (mainly through the speeding up of the ICT sector) as well as on social level (e.g. citizen access to relevant information on health, heating service etc.).



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