



DIGITAL CITIES CHALLENGE

Digital Transformation Strategy for the city of Guimarães

Build Guimarães' Digital Future

July 2019



Digital Cities Challenge

Digital Transformation Strategy for the city of
Guimarães: Build Guimarães' Digital Future

Paulo Novais (lead expert)

Augusto Ferreira (thematic expert)

Carlos Neves (local expert)

with the contributions of the Digital City leadership team

Ricardo Costa (city project manager)

Sérgio Gonçalves (city representative)

Ricardo Machado (economic and business
representative)

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Executive Summary: Guimarães digital transformation

Guimarães a central node in the Digital Cities Challenge network

The Digital Cities Challenge an initiative of the European Commission helps to achieve sustainable economic growth in Guimarães through the integration of advanced technologies. The initiative fosters complementarities and synergies between existing policies involving digital priorities (e.g. city's digital programmes, smart sustainable strategy, urban greening strategy, national and regional innovation strategies for smart specialisation), and the newly planned policy actions supporting digital transformation.

The ambition is that Guimarães will act as model for other Portuguese and European cities. By developing and testing novel policy levers in a collaborative approach with the involvement of other cities as peers it will demonstrate how to reap the benefits offered by the transformative power of digitalisation. It will showcase how to fill the gaps which are currently hindering Guimarães to advance and capture the benefits of digital transformation.

The implementation of the digital transformation trajectory in the city of Guimarães

In Guimarães, the Digital Cities Challenge was launched in April with a first study on the city by the expert team. In parallel, the city completed the Digital Cities Self-Assessment Tool, leading to the collection of 22 contributions on behalf of the local community of stakeholders. Based on this information, the city team (i.e. city representatives supported by a team of external experts) developed the current digital transformation strategy. The process was carried out interactively, as the team organised at least five local stakeholder workshops aimed at validating findings and collectively building the strategy and identifying key priorities. In addition to this, city representatives participated in four Digital City Challenge academy seminars which brought together representatives from all other participating cities, in light of sharing experiences and exchanging thoughts on the results of the Challenge.

The digital transformation strategy for Guimarães: Build Guimarães' Digital Future

The mission, vision and ambition statements vis-à-vis the digital future of Guimarães are the result of a broad consultation process based either on individual meetings or the completion of an online survey; the statements were put together by the city core team and discussed with stakeholders in various meetings and workshops.

Intending to be the anchor point of the subsequent digital strategy, these statements consider an in-depth analysis of the city's strengths and challenges and reveal what Guimarães most hopes to achieve in the long term as a digital city.

On this basis, the city of Guimarães has defined the following mission:

“Foster local development, economic growth and citizens’ engagement by deploying innovative digital solutions that reinforce the identity of Guimarães and improve the quality of life of people”.

In order to reach this goal, it will pursue the following ambitions:

- People and organisations throughout the city will have access to high quality digital infrastructure, services and applications.
- Digital technologies will actively be used by skilled people.
- Existing and new companies will use digital technologies to improve their business.
- Citizens and organisations will improve their living standards by increasingly using digital technologies in their social, leisure and cultural activities.

The roll-out of this strategy will be guided by the implementation of eight operational objectives:

- OO1: Development of the digital infrastructure
- OO2: Support the development of digital services and applications
- OO3: Increased digital proficiency in the local population
- OO4: Development of digital skills in public services and traditional businesses
- OO5: Digitalisation of local businesses
- OO6: Creation of new job opportunities
- OO7: Promotional campaigns of Guimarães’ digital future
- OO8: Development of digital services throughout the community of Guimarães

The strategy roadmap for the city of Guimarães

The city has identified the list of activities to be implemented in the short, medium and long terms, in order to make its strategic mission and ambition a tangible reality. As such, a total of 12 (twelve) specific activities have been identified, under the different operational objectives of the strategy. Examples of key activities to be implemented as part of the strategy include the upgrading and reinforcement of digital infrastructures, creating a connected city by providing

a wide range of wireless networks (i.e. Wifi, 4G+ and 5G technology, LiFi, NBIOT and LoraOne), which will pave the way for new digital services and businesses, and an ecosystem for testbed solutions. An open data plan, based on the digital transformation strategy, will define standards and best practices in open data implementation. Along with this plan an open data and best practices platform will be established to create the necessary base for opening data, to improve data quality (existing and new datasets), to increase data consumers engagement, and to support new services and applications development based on open data initiatives.

Training and digital transformation awareness activities will be at the centre of Guimarães's digital strategy. Actions for digital awareness and raising campaigns will be ensured as the base of a continuous dissemination programme across city stakeholders and social layers, promoting the importance of digital technologies, training and their adoption.

The following four pilot activities - "I9G", "Guimarães Resilient and Innovative District", "Cooperative Streets" and "Binaural Concerts - Guimarães Jazz" - have been identified by the local working group as the pilot activities for immediate implementation, in order to launch the implementation phase of the digital transformation strategy and start generating short term results.

The outlines of the governance of the digital transformation strategy have also been defined:

- The City Council of Guimarães represents the citizens and by all means has the legal responsibility to supervise the whole operation. Naturally, the Guimarães Council, as the owner, has the responsibility to approve the strategy and review its implementation.
- The Strategy Steering Committee is the executive body responsible for making decisions regarding the implementation and the revision of the strategy. The City Councillor in charge of e-governance chairs the committee. The members of the committee are the stakeholders who have responsibility for implementing the strategy. The Steering Committee will have other members, namely stakeholders with skills that are crucial for the successful implementation of the strategy.
- Normal and daily operations are coordinated by the Coordination Office. In our case, the Intelligent System Division will have this responsibility and will act as the bridge between the strategy implementation structure and the municipality.

Finally, a performance framework for the strategy has also been designed, so as to ensure regular monitoring and appraisal of the strategy implementation.

1. Introduction to the Digital Cities Challenge

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

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

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



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

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

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

The commitment of Mayors is key to the success of fostering economic growth, increasing prosperity as well as well-being across European cities. The engagement of political leadership will be of much value to achieving digital transformation in European cities, providing strategic orientations and ensuring that the process of developing and operationalising the strategy supporting digital transformation is translated into a portfolio of relevant actions supporting each other towards achieving a common goal and tailored to the local context. Such efforts need coordination to ensure that effort and dedication undertaken by the city administration is directed to best effect.

As a result of this, the Digital Cities Challenge has directly engaged with the Mayor of the supported cities. In December 2029, the on Mayors Conference was organised in Brussels to reflect upon the ongoing work and co-design the technological transformation trajectory of European cities.

This digital transformation strategy presented in this document has been developed in the framework of the field advisory services delivered in the Guimarães. It represents the main output linked to the participation of the city in the Digital Cities Challenge. The strategy will be the main guiding document for the city to embark on its journey to unleash the power of digital transformation for growth and competitiveness.

2. Overview of the digital maturity assessment for Guimarães

The city of Guimarães is on the path of digital transformation, achieving an overall maturity score of 2 out of 4 according to the assessment of 22 stakeholders who participated in the Self-Assessment exercise during the period from November 2018 to January 2019.

The strengths of the City are the existence of a good digital infrastructure, also considering that many digital initiatives are already being implemented, and a considerable ICT skilled workforce available from local Higher Education Institutions with a focus on Engineering and ICT areas.

The main weaknesses of the city are access to public funding in digital transformation areas, the low level of digital skills in the non-digital sector and the difficulty to retain and attract digital talent.

Briefly, we can conclude:

- Guimarães's technological framework objective is to develop innovative technological solutions, both digital and social innovations, which tackle challenges faced by the daily needs and difficulties of the citizens;
- Guimarães has an interesting digital infrastructure as a baseline for the digital transformation of the city;
- There is a reasonable level of digital education in the available workforce thanks to the excellent role played by the University of Minho, the Polytechnic Institute of Cávado and Ave and supported by other scientific, technological and educational stakeholders;
- There is an insufficient number of open data set in the city;
- The inter-business and business-academia collaboration is insufficient. While it is absolutely necessary for the digital transformation of the city, the collaboration culture is rather limited; although the city has citizens with a knowledge of IT, there is a lack of specialised workers focused on cutting edge technologies and specialised IT. While these types of skills are produced in the different Universities of the city, however, and

because of the close proximity to bigger cities like Porto and Braga, which offer better financial conditions, the city has a problem in retaining and attracting talent to the city.

A separate assessment report has been produced for the city of Guimarães, as part of the Digital Cities Challenge.

3. Mission and Ambition statements

The mission, vision and ambition statements regarding the digital future of Guimarães are the result of a broad consultation process carried out with the city's key stakeholders through either individual meetings or the completion of an online survey. The main ideas were put together by the city core team and discussed with stakeholders in the Vision and Ambition Workshop.

Peer cities further reviewed the vision and ambition statements during the Academy seminar organised in Algeciras before their finalisation as follows:

Mission Statement

The city states that the fundamental purpose with its digital strategy is as follows:

“Foster local development, economic growth and citizens’ engagement by deploying innovative digital solutions that reinforce the identity of Guimarães and improve the quality of life of people”.

Ambition statements:

1. People and organisations throughout the city will have access to high quality digital infrastructure, services and applications

- Infrastructure: new and better broadband connections will be offered and more wi-fi hotspots will be created, particularly in the most valuable places for residents and visitors to learn, work and entertain.
- Access to services: businesses and people will have improved access to services delivered through digital and online tools.
- Hardware for disadvantaged groups. In the context of digital inclusion initiatives, conditions will be created for disadvantaged groups to have access to computer hardware.
- Public open data. The use and sharing of open data will be encouraged. An open data plan is to be implemented establishing the scope and typologies of data, as well as procedures for security, privacy, access and infrastructure issues. Priority will be given to information that is of value to the city's businesses and potential investors.

2. Digital technologies will actively be used by skilled people

- Reinforce digital literacy of relevant communities through the delivery of digital literacy programmes for local communities, particularly those that have special needs (e.g. economic disadvantages, emigration, disability, age (youth, seniors), etc).
- Strengthen career reorientation actions of workers wishing to be employed in jobs based on digital technologies (e.g. digital capacity building programmes for unemployed people).
- Empower small businesses' human resources in the area of digital technologies through awareness raising and training as well as programmes.
- Boost the cooperation with local Higher Education Institutions, so as to attract young university graduates to the job opportunities that will be created in the city.

3. Existing and new companies will use digital technologies to improve their business

- Digitalisation of local companies through the integration of digital technologies in the most prominent local economic sectors (e.g. textile, metallurgy, services, banking, tourism, agriculture).
- Creation of digital start-up companies. Strengthen the establishment and growth of digital start-up companies through the financing of new businesses and the provision of suitable business incubation services.
- New employment opportunities. Support the increasing number of people that work with digital technologies and under technology-enabled work practices (e.g. teleworking).
- Increase of online city services to businesses and extension of "Guimarães Marca" (Guimarães Seal) for Digital Initiatives so as to promote Guimarães' Digital Ambassadors as Guimarães' Digital Champions.

4. Citizens and organisations will improve their living standards by increasingly using digital technologies in their social, leisure and cultural activities.

- Promote Guimarães' digital future through a wide campaign that communicates the city's goals, strategies and activities in this topic.
- Strengthen the use of online services in areas such as education, culture, tourism, sport and environment. Promote collaboration throughout the city in the use of online services and digital resources by public and private providers.

- Promote digital art and creativity by supporting digital art and artists.
- Support the creation of digital resources about the identity of Guimarães, including content about local heritage and history.

4. Building Guimarães' Digital Future: the Digital Transformation Strategy for the city of Guimarães

4.1. Strategy orientation

The strategy mission aims to create a better future for Guimarães, taking advantage of digital technologies and contributing to the digital transformation of key and traditional economic activities in the city.

The digital transformation strategy encompasses four key dimensions, all considered critical for the city to be successful in harnessing the most advanced digital technologies in order to be more innovative, productive and prosperous, and to improve the day to day life of its citizens, businesses and visitors.

The four main dimensions of the digital strategy are:

- Digital infrastructure - providing access throughout the city to high-quality digital infrastructure, services and applications;
- People and skills - generating talent and skilled people in ICT;
- Economy and businesses - promoting access to data and the use of digital technologies to improve and create new businesses;
- Community - improving the living standards of the community using digital technologies in social, leisure and cultural activities.

In summary, Guimarães sees this digital transformation as a path to modernisation enabled by the use of advanced technologies.

Box 1 The links to other existing strategies at the city level

The orientations established for the digital strategy take into account a set of other strategic plans and key initiatives that the city has been implementing or intends to put into action in the near future, including in particular the following:

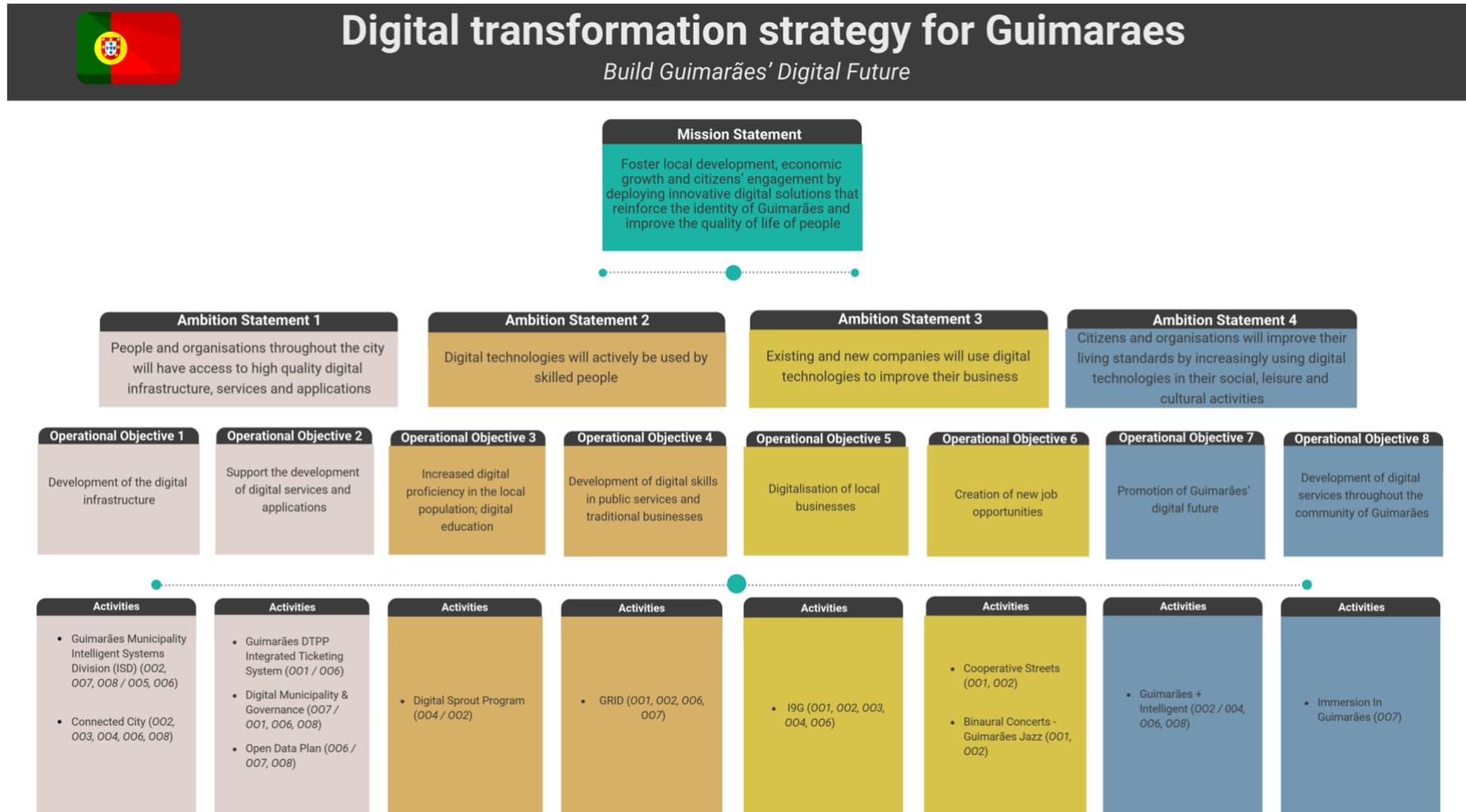
- The city is a UNESCO World Heritage in 2001, European Capital of Culture in 2012 and European City of Sports in 2013;
- Several recognitions/awards demonstrate that the city has, over the last years, been implementing a number of initiatives that put into practice advanced digital solutions in areas such as mobility, environment, tourism, culture, civic engagement and vulnerable groups' assistance.

There is a direct link between several initiatives including the Guimarães Resilient and Innovative District, Guimarães WiFi, Supplier portal/electronic billing and the MyCity platform.

This demonstrates that there is a tangible link between the initiatives that the city has already developed (e.g. Guimarães wifi, supplier portal/electronic billing and the MyCity platform) and the new initiatives it proposes to develop.

The following figure provides an overview of the full digital transformation strategy for the city of Guimarães. The individual components are described in further detail in the following sections and sub-sections.

Figure 1 Overview of the Digital Transformation Strategy for the City of Guimarães



4.2. Operational objectives

Operational objectives reflect the means through which the city of Guimarães will achieve its ambition statements. They represent the ‘how’ behind the high-level strategic vision which has been developed by the local working group. As demonstrated in the following figure, operational objectives are linked to one or several ambition statements. The city of Guimarães has identified 8 (eight) operational objectives for its digital transformation strategy.

The city team in collaboration with the city stakeholders selected these operational objectives. One important contribution was made by the Intelligent Systems division of the municipality for the identification of the operational objectives that were realisable and feasible for the city. Naturally, other operational objectives emerged during this process, but they were unpracticable or unrealistic in the present state of the city.

The following table provides a more detailed presentation of each of the operational objectives.

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Table 1 Presentation of the operational objectives of the Digital Transformation Strategy for the city of Guimarães

Operational objectives	Link to ambition statements	Success factors
Operational objective 1.1: Development of the digital infrastructure.	Linked to ambition statement 1	<ul style="list-style-type: none"> • Level of investment in technology, infrastructures, open data and real time systems • Amount of public and private funding raised • Collaboration level between higher education institutions to ensure existence of expertise needed • Replication capability level
Operational objective 1.2: Support the development of digital services and applications	Linked to ambition statement 1	<ul style="list-style-type: none"> • Awareness level • Amount of public and private funding raised • Replication capability level • Number of companies attracted to the provision of new digital services and applications • Collaboration level between higher education institutions to ensure existence of expertise needed • Number of open data and real time systems
Operational objective 2.1: Increased digital proficiency in the local population; digital education	Linked to ambition statement 2	<ul style="list-style-type: none"> • Amount of public and private funding raised • Active involvement between all stakeholders (organisations, newcomers, unemployed and volunteers) • Number of digital literacy actions taken
Operational objective 2.2: Development of digital skills in public services and traditional businesses	Linked to ambition statement 2	<ul style="list-style-type: none"> • Coordination level between all funding-financing institutions • Digital sector specialisation (number of training actions duly identified, training actions carried, qualification level in digital areas and number of specialised people attracted and retained) • Active involvement between all stakeholders (business partners engaged)
Operational objective 3.1: Digitalisation of local businesses	Linked to ambition statement 3	<ul style="list-style-type: none"> • Amount of public and private funding raised • SME investment in digital technologies/testbed models' awareness level • Level of technology support & investment and digital qualified competences retained

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Operational objectives	Link to ambition statements	Success factors
		<ul style="list-style-type: none"> • Awareness and digital sector specialisation • Active involvement of all stakeholders
Operational objective 3.2: Creation of new job opportunities	Linked to ambition statement 3	<ul style="list-style-type: none"> • Awareness and digital sector specialisation • Number of companies attracted to Digital Transformation (DT) awareness, advice and training • Active public-university-organisations-communities (PUOC) partnerships in place • Digital sector specialisation (nr of training actions taken, qualification level in digital areas and nr. of specialised people attracted and retained) • Level of technology support & investment and digital qualified competences retained • Active involvement of all stakeholders
Operational objective 4.1: Promotional campaigns of Guimarães´ digital future	Linked to ambition statement 4	<ul style="list-style-type: none"> • Active public-private partnerships (PPPs) and PUOC in place • Coordination level between all funding-financing institutions • Awareness and commitment level ((re)implementation & monitoring) • Degree of visibility and promotion • Active involvement of all stakeholders
Operational objective 4.2: Development of digital services throughout the community of Guimarães	Linked to ambition statement 4	<ul style="list-style-type: none"> • Amount of public and private funding raised • Active involvement and awareness of all stakeholders • Degree of visibility and promotion

5. Digital strategy roadmap and planned activities

The roadmap is the component of the digital transformation strategy that describes the practical implementation of the strategy, including priority activities and governance. Priority activities refer to the specific actions through which the strategy will be implemented. An activity can be described as a tangible and concrete action, which has a beginning and an end, accompanied by a specific objective and resources for its implementation. The results of activities (**i.e. outputs**) are meant to contribute to reaching the operational objectives identified in the previous section.

5.1. Overview of proposed activities

The digital transformation strategy for the city of Guimarães will be implemented through a group of activities, identified in the framework of the Digital Cities Challenge. Activities are meant to contribute to reaching the operational objectives defined in the framework of the strategy, which in turn will contribute to the city's ambition and mission. The list of priority activities may be expanded with time. For now the city has decided to implement 12 (twelve) activities, as described in the following table.

Activity name	Link to Operational Objectives	Main implementing partner (i.e. the owner of the activity)	Brief description and goals
Activity 1.1.1 Guimarães Municipality Intelligent Systems Division (ISD)	Linked to operational objective 1.1 Secondary link to operational objectives 1.2, 4.1, 4.2, 3.1, 3.2	Guimarães Municipality (ISD and EDD-Economics Development Division), University of Minho, Telecommunications Institute and Private Companies	Municipality strategy for Digital Transformation, Smart Cities and Industry 4.0 together with other divisions and relevant players to coordinate the roadmap implementation, propose activities, obtain and provide data, and identify funds, etc
Activity 1.1.2 Connected City	Linked to operational objective 1.1 Secondary link to operational objectives 1.2, 2.1, 2.2, 3.2, 4.2	Guimarães (ISD, EDD and Information Systems Division), University of Minho and TICE	Connected city, will provide a wide range of wireless networks (wifi and 5G testbed technology, LiFi NBIOT/LoraOne to businesses, university and community)
Activity 1.1.3 Guimarães DTPP Integrated Ticketing System	Linked to operational objective 1.1 Secondary link to operational objectives 1.2, 3.2	Quadrilatero Association (Guimarães, Braga, VN Famalicao and Barcelos Cities)	DTPP will dematerialise and integrate 4 cities' public transportation ticketing system that will allow citizens to go by bus, train or other ways of transport, using the same ticket and paying only the travelled route independently of the number of shipments
Activity 1.2.1 Guimarães + Intelligent	Linked to operational objective 1.2 Secondary link to operational objectives 2.2, 3.2, 4.1, 4.2	Guimarães Municipality and Oporto polytechnic institute	G+i would be an open platform for knowledge interchanging where access to digital projects' description, replicability, open data, and real time data will be provided
Activity 1.2.2 Open Data Plan	Linked to operational objective 1.2 Secondary link to operational objectives 3.2, 4.1, 4.2	Guimarães Municipality and Minho University (Computer graphics Centre)	The Open Data Plan will address key ingredients for successful Open Data initiatives as well as addressing barriers that Guimarães might face along the way and how these can be best tackled

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Activity name	Link to Operational Objectives	Main implementing partner (i.e. the owner of the activity)	Brief description and goals
Activity 1.2.3 Digital Municipality & Governance	Linked to operational objective 1.2 Secondary link to operational objectives 1.1, 3.2, 4.1, 4.2	Guimarães Municipality, University of Minho, CCG and ICT partners	Digital transformation of processes and city services, using digital tools to improve our interactions with citizens and businesses. The base key to this goal is to understand user's perspective and remake products, processes, and policies around what citizens want
Activity 2.1.1 Digital Sprout Program	Linked to operational objective 2.1 Secondary link to operational objectives 1.2, 2.2	Guimarães Municipality and Minho University	DSP digital awareness raising campaign will ensure continuous dissemination across city stakeholders, and social layers about the importance of digital technologies, training and their adoption
Activity 4.1.1 I2G – Immersion in Guimarães	Linked to operational objective 4.1 Secondary link to operational objectives 4.2	Guimarães Municipality and Minho University (Computer graphics Centre)	The I2G project is a cultural, touristic and community building effort in the municipality of Guimarães

A detailed presentation of each activity is presented in the Appendix I.

5.2. The pilot activities

Aligned with Guimarães Executive strategy and based on the 4 fundamental pillars: mobility, environment, economy and culture, the city of Guimarães has decided to implement a digital strategy, carrying out the following first pilot activities:

Activity 1.1.4 Cooperative Streets

The general objective of this action is to progress, in the framework of the C-Roads Platform, towards the digitalisation and decarbonisation of the transport sector. The activities are focused on the deployment of 5 C-ITS pilots in the Atlantic Corridor in Portugal, covering relevant sections of the core network and comprehensive network and two urban nodes. The Quadrilátero node, which encompasses a total of 4 cities (Guimarães, Braga, V.N. Famalicão and Barcelos), is committed to invest and test pilots that will emphasise the implementation of C-ITS services. These pilots will define a clear path for the implementation in a real environment and for monitoring and evaluating the results before large scale deployments, in close cooperation with the C-Roads Platform.

Activity 3.1.1 I9g

9G is an innovation project designed for companies based in Guimarães. The municipality and Minho University have joined forces with the Government to create a new concept of regional innovation project aimed to transfer critical knowledge produced at the University to companies based in Guimarães. This project will act in several critical dimensions for businesses, i.e. research, development and innovation, human potential, productive capacity and industrial property.

The I9G will also have an innovative space for incubation of industrial companies with high added value that can benefit from the ecosystem created by this project. With it, it is intended to increase the organisational and knowledge capacity of companies, contributing to the achievement of one of the strategic objectives of the Municipality of Guimarães: the creation of highly qualified employment, which will attract new talent to the region.

Activity 4.1.2 GRID

Guimarães Resilient and Innovative District (GRID) will focus on creating attractive living conditions in a World Heritage Historic Centre and on establishing a vibrant ecosystem of companies, entrepreneurs and academia to implement effectively a holistic Digital Transformation covering public and private entities and engaging citizens. Guimarães established a demanding and ambitious plan to become smarter, sustainable and resilient

allowing not only its inhabitants to access improving services, but also to attract and retain new talent in historical areas, contributing to promote local growth, increasing cultural activities, inclusiveness and to cope with population ageing. Private developers are also investing in new housing for young professionals, creating additional pressure to enable the area with new mobility services, advanced ICT networks and, especially, implementing sustainability measures to improve quality of life for inhabitants and visitors. The project will contribute to re-engage citizens in decision processes, co-creating and co-developing services, but also promoting behavioural changes and transparent decision-making using a Blockchain platform. Tangible investments seek to integrate technology in a classified district area while allowing to develop sustainable and ethical business models for data and 5G network deployment in urban sensitive areas, and to effectively promote design and digital services usage. Digital skills capacity building will be transversal to all citizens.

Activity 4.1.3 Binaural Concerts - Guimarães Jazz

The objective of this project is to promote an interface between digital technology and performing arts, proposing the realisation of a musical performance using binaural sound technology within the framework of the Guimarães Jazz Festival.

The binaural sound technology aims to produce realistic 3D sound experiences, characterised by a notion of the space envelope and the spatial position of sound sources. This is achieved by capturing sound as nearly as possible as we humans hear the world around us. To do this, the sound must be recorded using a device composed of high-quality microphones placed within a realistic model of the human head and auditory canal.

This ensures that recordings are affected by the same reverberations caused by the physical space and modulations of the auditory channel to which a human listener would be subjected if placed in the same position as the recording device.

For this type of performance, it is proposed to have such a device placed on the stage. Each listener in the audience would use a pair of stereo headphones connected to the device on stage. Thus, listeners could, in their place, have the immersive experience of being among the artists.

5.3. Timetable for implementation

It is foreseen the strategy will be implemented for the next six (6) years and monitored during for the following three (3) years. Activities will be gradually implemented on the basis of the following indicative timetable:

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Table 2 Timetable for the implementation of the digital transformation strategy for the city of Guimarães

	Jan-Jun 2019	Jul-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022	Jul-Dec 2022	Jan-Jun 2023	Jul-Dec 2023	Jan-Jun 2024	Jul-Dec 2024	Jan-Jun 2025	Jul-Dec 2025	Jan-Jun 2026	Jul-Dec 2026	Jan-Jun 2027	Jul-Dec 2027	Jan-Jun 2028
1.1.1. Guimarães Municipality ISD																			
1.1.2. Connected City																			
1.1.3. Guimarães Integrated Ticketing System																			
1.1.4 Cooperative Streets																			
1.2.1. Guimarães + Intelligent																			
1.2.2. Open Data Plan																			
1.2.3. Digital Municipality & Governance																			
2.1.1. Digital Sprout Program																			

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	Jan-Jun 2019	Jul-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022	Jul-Dec 2022	Jan-Jun 2023	Jul-Dec 2023	Jan-Jun 2024	Jul-Dec 2024	Jan-Jun 2025	Jul-Dec 2025	Jan-Jun 2026	Jul-Dec 2026	Jan-Jun 2027	Jul-Dec 2027	Jan-Jun 2028
3.1.1. I9G																			
4.1.1. I2G – Immersion In Guimarães																			
4.1.2. GRID																			
4.1.3. Binaural Concerts - Guimarães Jazz																			

6. Strategy governance

The City Team and the city stakeholders agree that the existence of a governance structure dedicated to digital transformation is fundamental for the success of this process. This structure will be responsible for implementing the strategy defined and most of its members will be those entities involved in the Digital Cities Challenge project.

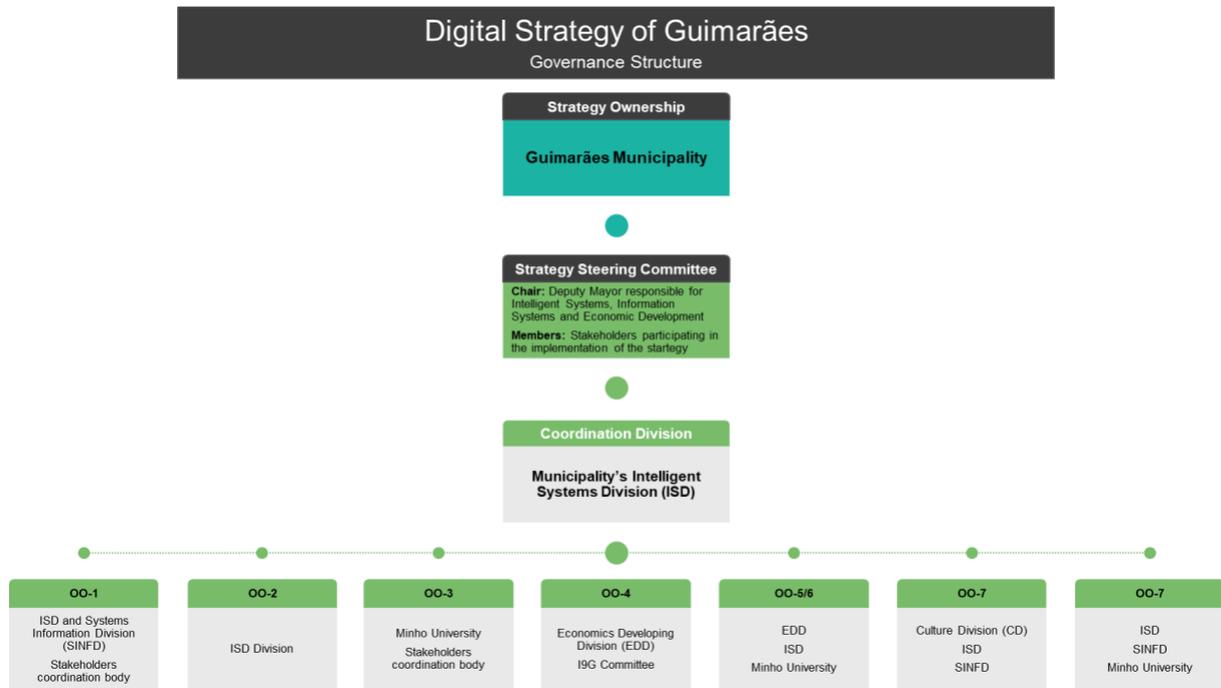
The proposed governance structure is presented in Figure 2. The City Council represents the citizens of Guimarães and by all means, has the legal responsibility to supervise the whole operation of the city. The Guimarães Council has the responsibility to approve the strategy and review its implementation on a yearly basis according to an annual review report prepared by the Strategy Steering Committee.

The Strategy Steering Committee is the executive body responsible for making decisions regarding the implementation and the revision of the strategy. The Deputy Mayor in charge of e-governance chairs the committee. The members of the committee are the stakeholders that have the responsibility of implementing the strategy. The Steering Committee will have other members, namely stakeholders with skills that are crucial for the successful implementation of the strategy. The Steering Committee will hold meetings every three months.

Normal and daily operations are coordinated by the Coordination Office. In the case of Guimarães, the Intelligent System Division will have this responsibility and will be the bridge between the strategy implementation structure and the municipality.

This body has as main tasks the monitorisation and coordination of the defined activities, in terms of implementation and compliance with deadlines. Regular progress reports will be sent to the Steering Committee every three months, and recommendations for actions that need to be taken for the efficient development and implementation of the strategy will be issued. Moreover, it will act as the secretariat to the Strategy Steering Committee and will support the Steering Committee in its reporting to the City Council.

Figure 2 Overview of the proposed Governance Structure for the city of Guimarães



7. Monitoring and evaluation of the Digital Transformation Strategy

In order to monitor and assess progress achieved as part of the digital transformation strategy, a performance assessment framework has been developed by the city team. In addition, the team has outlined preliminary evaluation plans and resources as part of an early evaluation plan.

7.1. Performance assessment framework

Strategy implementation and results monitoring will be conducted by the Coordination Division on the basis of the performance assessment framework presented in Appendix II. Three levels of monitoring indicators and targets have been defined:

- **Outcome indicators** have been established at the level of the Ambition Statements.
- **Intermediate outcome** indicators have been established at the level of operational objectives.
- **Output indicators** have been established at the level of activities.

The Municipality of Guimarães will be in charge of collecting data on all strategy monitoring indicators. However, it's expected that activities implemented by partners will also play a key role in generating, collecting and sharing performance data. This information will be used for internal monitoring and reporting purposes. As such it will be communicated to the Strategy Steering Committee on a regular basis.

The performance assessment framework will surely evolve as the city enters the full strategy implementation phase. The regularity and depth of monitoring will also be further specified by the steering bodies.

7.2. Strategy evaluation plan

In addition to monitoring the progress of strategy implementation, the Digital Transformation Strategy for Guimarães will undergo an internal evaluation within the next three years. The objective of the evaluation will mainly be to verify the extent to which expected strategy results have been achieved, review the relevance of selected strategy priorities and objectives, and review the efficiency of strategy implementation and governance schemes. The questions

guiding the evaluation exercise will be conducted by the Coordination Division with the support of the steering committee. In general, these evaluations will mostly analyse complex issues and capture intended and unintended effects, investigating the reasons why certain aspects of an activity or action have or have not been implemented as planned. Evaluations will be carried out either during the projects cycle (Mid-term Evaluation, Formative Evaluation) or at the end of an activity or action (Ex-post Evaluation, Final Evaluation, Impact Evaluation, Summative Evaluation).

An additional impact evaluation may be conducted after eight years of strategy implementation. Such evaluation will be mainly focused on assessing strategy outcomes and effective impact.

When relevant, individual activity managers will be encouraged to conduct activity-specific evaluations and assessments. The information drawn from activity evaluations and assessment will feed the general strategy evaluations.

8. Results achieved and next steps

The Guimarães team of experts agrees that the DCC initiative has been outstanding and essential for the city. Guimarães is on the path of a rapid and sustained digital transformation. The city and local stakeholders have participated together in past initiatives promoting digitalisation. Under those initiatives, efforts were mostly focused on addressing challenges related to the improvement of the performance of public administration and local governance enhancement.

The present initiative is to address the process of digitalisation on a new perspective, namely by encouraging local development, economic growth, and citizens' engagement through the deployment of innovative digital solutions that reinforce the identity of Guimarães and principally improve the quality of life of people.

The participation of Guimarães in the Digital Cities Challenge initiative has led to the achievement of very interesting results. The assessment of the digital maturity of the city has highlighted among the Municipality and local stakeholders the need for a digital transformation strategy and action plan. The Guimarães' DCC team has been in the genesis of a community building process, representing all sectors, engaged in workshops and assessments. This community is committed to play a central role in the overall process of the digital governance.

The digital transformation strategy involves four key dimensions (Digital Infrastructure; People and Skills; Economy and Businesses; and Community) with all of them considered critical for the future of the city. Guimarães sees this digital transformation as a path to modernisation enabled by the use of advanced technologies. The expert team has on this basis identified an initial start list of activities to be implemented in order to make its strategic mission and ambition a tangible reality, complemented by four pilot activities in the city.

The Digital Cities Challenge initiative provides therefore a solid basis for further work on Guimarães' digitalisation.

Appendix I: Detailed presentation of activities

Activity number 1.1.1: Guimarães Municipality Intelligent Systems Division (ISD)	
Link to operational objective	Linked to operational objective 1.1 Secondary link to operational objectives 1.2, 3.1, 3.2, 4.1, 4.2
Description	ISD creation was a municipality strategy for Digital Transformation, Smart Cities and Industry 4.0, with the purpose to collaborate with other divisions and relevant players, coordinating city digital transformation projects, intelligent cities and industry 4.0 actions, i.e. coordinate division roadmap and strategy implementation, propose activities, obtain and provide data and identify funds to support projects
Timeframe	<ul style="list-style-type: none"> Length: 3 months Estimated date of implementation: May 2018 Start: February 2018, Planned completion: 2028
Indicators to be achieved	Number of funding actions identified and number of actions successfully achieved Target: application to 10 funding calls (P2020, H2020, UIA, CEF, LIFE, INTERREG, URBACT among others) resulting in 4 success eligible projects
Estimated cost and source of funding	200.000€/year Guimarães Municipality Investment
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality

Activity number 1.1.2: Connected City	
Link to operational objective	Linked to operational objective 1.1 Secondary link to operational objectives 1.2, 2.1, 2.2, 3.2, 4.2
Description	Connected city, will provide a wide range of wireless networks (wifi and 5G testbed technology, LiFi NBIOT/LoraOne) to businesses, university and community
Timeframe	<ul style="list-style-type: none"> • Length: 16 months • Estimated date of implementation: April 2020 Start: May 2020, Planned completion: November 2024
Indicators to be achieved	Number of 5G antennas and % of city region covered Target: 10 antennas and 5% city centre region covered
Estimated cost and source of funding	1.644.390€ Portugal/North 2020 Funds / H2020 Funds / Private Sector
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality, PROEF and Telecommunication Institute

Activity number 1.1.3: Guimarães DTPP Integrated Ticketing System	
Link to operational objective	Linked to operational objective 1.2 Secondary link to operational objectives 1.1, 3.2
Description	DTPP will dematerialise and integrate 4 cities public transportation ticketing system that will allow citizens to go by bus, train or other ways of transport, using the same ticket, and paying only the travelled route independently of the number of shipments.
Timeframe	<ul style="list-style-type: none"> • Length: 23 months • Estimated date of implementation: February 2021 Start: April 2019, Planned completion: February 2021
Indicators to be achieved	Number of cities integrated Target: 12 cities
Estimated cost and source of funding	1.847.547€ Portugal 2020 / NORTE 2020 – Structural Funds
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Quadrilatero Association of Cities (Guimarães, Braga, VN Famalicao and Barcelos)

Activity number 1.1.4: Cooperative Streets	
Link to operational objective	Linked to operational objective 1.1 Secondary link to operational objectives 1.2, 4.2
Description	Cooperative Streets will aggregate and make available all the mobility and transport digital information, making it available to the National Access Point
Timeframe	<ul style="list-style-type: none"> • Length: 66 months • Estimated date of implementation: October 2019 Start: October 2019, Planned completion: November 2024
Indicators to be achieved	Implementation of the operational platform for mobility data 4 mobility verticals integrated
Estimated cost and source of funding	The implementation cost will be approximately 1,2M€, 50% of which covered by European funding and 50% by national public funding.
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Quadrilatero Association of Cities (Guimarães, Braga, VN Famalicao and Barcelos)

Activity number 1.2.1: Guimarães + Intelligent (G+i)	
Link to operational objective	Linked to operational objective 1.2 Secondary link to operational objectives 2.2, 3.2, 4.1, 4.2
Description	G+I It will be an open platform for knowledge and interchanging where access to digital projects', description, replicability, open data, and real time data will be provided.
Timeframe	<ul style="list-style-type: none"> • Length: 3 months • Estimated date of implementation: July 2019 Start: March 2019, Planned completion: July 2019
Indicators to be achieved	Number of projects and datasets available. Target: 12 projects and 33 datasets available
Estimated cost and source of funding	4.800,0€ Guimarães Municipality Investment
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality and Porto Polytechnic Institute

Activity number 1.2.2: Open Data Plan	
Link to operational objective	Linked to operational objective 1.2 Secondary link to operational objectives 3.1, 3.2, 4.1, 4.2
Description	The Open Data Plan will address key ingredients for successful Open Data initiatives as well as addressing barriers that Guimarães might face along the way and how these can be best tackled.
Timeframe	<ul style="list-style-type: none"> • Length: 17 months • Estimated date of implementation: mar 2020 Start: February 2019, Planned completion: April 2021
Indicators to be achieved	Plan finalisation and number of good practices measured Target: plan finalisation until 21 of April and monitorisation and measurement of at least 12 projects that represent good practices in the digital transformation and with the capacity of replication (i.e. monitoring parking lots, monitoring of traffic routes, traffic flows, digital public services, monitoring of air quality and noise, river flows , among others)
Estimated cost and source of funding	TBD (€) Guimarães Municipality Investment and Portugal 2020 / NORTE 2020 Structural Funds
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality, University of Minho, CCG (Computer Graphics Centre)

Activity number 1.2.3: Digital Municipality & Governance	
Link to operational objective	Linked to operational objective 1.2 Secondary link to operational objectives 1.1, 3.2, 4.1, 4.2
Description	Digital transformation of processes and city services.
Timeframe	<ul style="list-style-type: none"> • Length: 114 months • Estimated date of implementation: September 2018 Start: September 2018, Planned completion: June 2028
Indicators to be achieved	Number of services and processes digitalised Target: 20% of urbanism processes and services, 15% of attendance processes and services, 12% of environment services and 10% of human resources processes.
Estimated cost and source of funding	TBD (€) Guimarães Municipality Investment and Portugal 2020 / NORTE 2020 Structural Funds
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality, University of Minho, CCG and ICT partners

Activity number 2.1.1: Digital Sprout Program	
Link to operational objective	Linked to operational objective 2.1 Secondary link to operational objectives 1.2, 2.2
Description	DSP digital awareness raising campaign will ensure a continuous dissemination across city stakeholders and social layers about the importance of digital technologies, training and their adoption.
Timeframe	<ul style="list-style-type: none"> • Length: 102 months • Estimated date of implementation: April 2020 Start: April 2020, Planned completion: March 2028
Indicators to be achieved	Number of actions taken in digital transformation of processes, industry 4.0, digital marketing, process dematerialisation, the importance of IOT areas Target: 10% of city stakeholders
Estimated cost and source of funding	TBD (€) Guimarães Municipality Investment and Portugal 2020 / NORTE 2020 Structural Funds
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality and Minho University

Activity number 3.1.1: I9G	
Link to operational objective	Linked to operational objective 2.1 Secondary link to operational objectives 2.2, 3.1, 3.2
Description	I9G is based on the quadruple model providing the creation of an industrial base incubator, the requalification, training and retention of high academic skills, and the transfer of knowledge from universities to industry.
Timeframe	<ul style="list-style-type: none"> • Length: 66 months • Estimated date of implementation: January 2020 Start: January 2020, Planned completion: phase 1 April 2025
Indicators to be achieved	Number of unemployed people to requalify: 500 / Number of employees from companies to be requalified: 2000 / Number of patents to be filed: 30 / Number of highly qualified jobs to be created in companies and RTDI entities: 500 / Increase in exports: EUR 100 million
Estimated cost and source of funding	The implementation overall cost will be approximately 200M€ to be supported by government budget, both National and European structural funds and private funds.
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality, University of Minho, Guimarães Marca and BOSCH

Activity number 4.1.1: I2G – Immersion In Guimarães	
Link to operational objective	Linked to operational objective 4.1 Secondary link to operational objective 4.2
Description	The I2G project is a cultural, touristic and community building effort in the municipality of Guimarães. It is a tool for visitants to fully “immerge” in Guimarães in three different dimensions: getting to know the culture, getting to know the nature and getting to know the people through its community. For that, the project will use digital technologies such as the user’s smartphone, acoustic immersion, geotagged content, virtual navigation and gamification with cooperation or even competition. All of this not requiring any infrastructure in the terrain or maintenance costs (other than the informatics infrastructure), assuring therefore reasonable sustainability. From the user’s point of view, a tourist, he/she will use their own smartphone (or a loaned device), to have a virtual guide across the several city hotspots (cultural, parks, etc.). Events are triggered automatically (considering the location/proximity) and providing immersive audio content that will be provided by the contribution of the community in the right language, considering their interests, available time, etc. It will also make available augmented reality games (without any auxiliary devices other than headphones) that can be cooperative or competitive, providing entertainment, engagement and knowledge to the visitor. The resulting data, with the user’s permission, will be provided to the city’s open data platform and used as touristic information to support business creation of governance policies.
Timeframe	<ul style="list-style-type: none"> • Length: 24 months • Estimated date of implementation: March 2020 Start: February 2019, Planned completion: April 2021
Indicators to be achieved	Number of tourists using this service i.e. data sold by the open data platform, level of satisfaction, results of the gamification experiences (in terms of assessments trough out the gamification process – the knowledge tourists got from the visit), returning tourists and recommendation to others. Target: promote the use of the application, increasing use by 15% of tourists
Estimated cost and source of funding	Around 75.000 € Source of funding not yet determined
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality, University of Minho and Computer Graphics Centre (CCG)

Activity number 4.1.2: GRID	
Link to operational objective	Linked to operational objective 1.1 Secondary link to operational objectives 1.2, 2.2, 3.1, 3.2
Description	GRID project's main objective is to act as a launch pad for the Digital Transformation of Guimarães, covering not only public services but also enabling new and existing private local businesses to embrace digital transformation. This objective is challenging in our World Heritage historic centre, requiring tackling special constraints and limitations of a medieval built environment.
Timeframe	<ul style="list-style-type: none"> • Length: 66 months • Estimated date of implementation: September 2021 Start: October 2021, Planned completion: November 2026
Indicators to be achieved	Number of companies created: 104 / Number of jobs created directly: 419 / City's unemployment rate: 4,95% / Businesses contracted to provide city services which have data openly available: +25% / Percentage of labour force employed in the ICT sector: 7,18% / Number of STEM higher education degrees per 100 000 population: +1212 / Percentage of municipal datasets available to the public: 60% / Percentage of city services accessible online: 50%
Estimated cost and source of funding	The implementation cost will be approximately 6M€, 85% of which covered by European funding and 15% by private public/financing
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality (ISD - Intelligent Systems Division and EDD- Economics Development Division), University of Minho, Telecommunications Institute and Private Companies

Activity Number 4.1.3: Binaural Concerts - Guimarães Jazz	
Link to operational objective	Linked to operational objective 4.1 Secondary link to operational objectives 4.2
Description	The objective of this project is to promote an interface between digital technology and performing arts, proposing the realisation of a musical performance using binaural sound technology, within the framework of the Guimarães Jazz Festival.
Timeframe	<ul style="list-style-type: none"> • Length: 3 months • Date of implementation: November/2019 Start: September/2019, Planned completion: November/2019
Indicators to be achieved	Number of people attending and % of satisfaction Target: achieve the mark of the 2000 spectators, obtaining a satisfaction rate of 80%.
Estimated cost and source of funding	The implementation cost will be approximately 8.000€ financed by the Municipality of Guimarães
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Guimarães Municipality and Computer Graphics Centre (CCG)

Appendix II: Performance assessment framework

1. Strategy outcomes

Scope	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Ambition statement 1	People and organisations throughout the city will have access to high quality digital infrastructure, services and applications	Monitoring indicator 1: Availability of coax or fibre network at main business parks Indicator 2: Number of services and applications available	Indicator 1: TBD Indicator 2: increase of 15%	Indicator 1: Full coverage Indicator 2: increase of 50%	End 2025	Indicator 1: The information will be provided by main business parks and the economics developing division Indicator 2: The information will be provided by the Guimarães Municipality
Ambition statement 2	Digital technologies will actively be used by skilled people	Monitoring indicator 3: Share of companies in the main sectors of Guimarães that successfully hired professionals (in particular ICT) with the required qualifications from the local employment market	Indicator 3: 9% (INE: Statistics National Institute) Although Guimarães will perform a survey among the companies of Guimarães to confirm values	Increase by 20%	End 2027	Survey among the companies of Guimarães

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Scope	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Ambition statement 3	Existing and new companies will use digital technologies to improve their business	Monitoring indicator 4: The number of new startup companies that will be established, through the incubation and acceleration programmes	Low	More than 15	2027	Indicator to be inquired to the relevant public administration representatives
Ambition statement 4	Citizens and organisations will improve their living standards by increasingly using digital technologies in their social, leisure and cultural activities	Monitoring indicator 5: Number of organisations involved in the delivery of new online services in the fields of education, culture, sport, tourism and environment	Low	More than 15	2027	Indicator to be inquired to the relevant public administration representatives

2. Strategy intermediate outcomes

Scope	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational Objective 1.1	Development of the digital infrastructure	(1.1) Number of unique devices connected to wireless internet freely available at public spaces in last 12 months	15.000	50.000	End of 2022	Applications for monitoring devices connected to wi-fi networks
Operational Objective 1.2	Support the development of digital services and applications	(2.1) Number of Individuals who used the internet for interaction with public authorities (average for year)	9.150	25.000	End of 2023	City e-services monitoring
Operational Objective 2.1	Increased digital proficiency in the local population; digital education	(3.1) Students in digital subjects over the last 5 years [%]	Conduct a survey with local education institutions	Increase by 30% the certificates in computer literacy and IT training, degrees in IT areas	End of 2024	Monitoring digital education statistics
Operational Objective 2.2	Development of digital skills in public services and traditional businesses	(4.1) Share of companies offering training to their employees that are aimed at enhancing their digital skills [%]	Conduct a survey with local Industry Associations	Increase 30% digital trained employees	End of 2024	Monitoring digital training statistics in local companies
Operational Objective 3.1	Digitalisation of local businesses	(5.1) Companies with internet website [%]	Conduct a survey with local Industry Associations	Increase 50% the number of companies with website	End of 2025	Monitoring web presence of local companies

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Scope	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational Objective 3.2	Creation of new job opportunities	(6.1) Number of employees in digital companies and evaluate the digital maturity of companies	Conduct a survey with local Industry Associations	Increase by 30% the “digital employees” and digital maturity level	End of 2025	Monitoring digital employment statistics in local companies
Operational Objective 4.1	Promotional campaigns of Guimarães’ digital future	(7.1) Number of events in digital art	Conduct a survey with local Arts & Events Institutions	Increase by 30% the number of digital art events	End of 2024	Monitoring local events licenses and art initiatives
Operational Objective 4.2	Development of digital services throughout the community of Guimarães	(8.1) Number of e-services offered by the city	5	20	End of 2025	Monitoring the number of public local e-services, offered by de municipality or NGOs

3. Strategy outputs

Scope	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
Activity 1.1.1: Guimarães Municipality Intelligent Systems Division (ISD)	Collaborate with other divisions and relevant players to coordinate city digital and smart cities' projects and actions	Monitoring indicator 1.1 ISD establishment Monitoring indicator 1.2 Number of actions identified, and number of actions successfully achieved	Indicator 1.2: 5 actions successfully achieved	Indicator 1.1: 2018 (creation) Indicator 1.2: 2018 to 2022	Legal documents of the Division. Operational data
Activity 1.1.2: Connected City	Provide a wide range of wireless networks (wifi and 5G testbed technology, LiFi NBIOT/LoraOne to businesses, university and community	Monitoring indicator 2.1: Number of 5G antennas implemented Monitoring indicator 2.2: % of region coverage	Indicator 2.1: 10 5G antennas Indicator 2.2: 25% of innovation district region coverage	2020-2024	Operational data
Activity 1.1.3: Guimarães DTPP Integrated Ticketing System	Dematerialise and integrate 4 cities public transportation ticketing system that will allow citizens to go by bus, train or other ways of transport, using the same ticket and paying only the travelled route independently of the number of shipments	Monitoring indicator 4.1: % of dematerialisation processes	Indicator 4.1: 60%	2019-2021	Operational data
Activity 1.1.4: Cooperative Streets	Aggregate and make available all the mobility and transport digital information, making it available to the National Access Point	Monitor 11.1: Implementation of the operational platform for mobility data Monitor 11.2: Number of integrated mobility verticals	Indicator 11.1: 1 platform developed Indicator 11.2: 4	2019-2024	Operational data

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Scope	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
Activity 1.2.1: Guimarães + Intelligent	Develop an open platform for knowledge and interchanging where access to digital projects' description, replicability, open data, real time data will be provided	Monitoring indicator 3.1: Number of projects and datasets available	Indicator 3.1 12 projects available +25% datasets	2019-2020	Online survey
Activity 1.2.2: Open Data Plan	Develop an open data plan	Monitor 7.1: Open data plan development	Indicator 7.1: Open data plan developed	2019-2021	Legal documents
Activity 1.2.3: Digital Municipality & Governance	Digitally transform city processes and services	Monitor 6.1: Number of services and processes digitalised	Indicator 6.1: 20 services and processes digitalised	2018-2028	Operational data
Activity 2.1.1: Digital Sprout Program	Conduct awareness campaigns to ensure a continuous dissemination across city stakeholders and social layers about the importance of digital technologies, training and their adoption	Monitor indicator 5.1: Number of actions taken	Indicator 5.1: 10 actions	2020-2028	Online survey and legal documents Monitoring digital initiatives licenses
Activity 3.1.1: I9g	Implement a quadruple helix model project to provide the creation of an industrial base incubator, requalification, training and retention of high academic skills, and the transfer of knowledge from universities to industry	Monitor 9.1: Number of unemployed people to re-qualify Monitor 9.2: Number of employees from companies to be re-qualified: 2000 Monitor 9.3: Number of patents to be filed: 30 Monitor 9.4: Number of highly qualified jobs to be created in companies and RTDI entities	Indicator 9.1: 500 Indicator 9.2: 2000 Indicator 9.3: 30 Indicator 9.4: 500 Indicator 9.5: EUR 100 million	2020-2025	Operational data

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Scope	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
		Monitor 9.5: Increase in exports			
Activity 4.1.1: I2G – Immersion In Guimarães	Develop a tool for visitants to fully “immerge” in Guimarães in three different dimensions: getting to know the culture, getting to know the nature, and getting to know the people through its community	Monitor 8.1: Number of tourists using this service	Indicator 8.1: % 25 of satisfied tourists	2019-2021	Number of applications installed Level of satisfaction
Activity 4.1.2: GRID	Digitally transform Guimarães, by developing digital transformation actions not only to public services but also enabling new and existing private local businesses, challenging Guimarães World Heritage historic centre, requiring tackling special constraints and limitations of a medieval built environment	Monitor 10.1: Number of companies created Monitor 10.2: Number of jobs created directly Monitor 10.3: City’s unemployment rate Monitor 10.4: Businesses contracted to provide city services which have data openly available Monitor 10.5: Percentage of labour force employed in the ICT sector Monitor 10.6: Number of higher education degrees in STEM per 100.000 population: Monitor 10.7: % of municipal datasets available to the public	Indicator 10.1: 104 Indicator 10.2: 419 Indicator 10.3: 4,95% Indicator 10.4: +25% Indicator 10.5: 7,18% Indicator 10.6: +1212 Indicator 10.7: 60% Indicator 10.8: 50%	2021-2026	Operational data

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Scope	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
		Monitor 10.8: % of city services accessible online			
Activity 4.1.3 Binaural Concerts - Guimarães Jazz	Promote an interface between digital technology and performing arts, proposing the realisation of a musical performance using binaural sound technology, within the framework of the Guimarães Jazz Festival	Monitor 12.1: Number of people attending and % of satisfaction	Indicator 12.1: 1000 persons and 80% of satisfaction	September 2019 – November 2019	Survey and Level of satisfaction

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Appendix IV: Stakeholders consulted

NAME	ORGANISATION
Alexandre	Youth Association
Ana Maria Silva	Highschool Liceu de Guimarães
Ana Lima	Center for Computer Graphics
Ana Maria Silva	Escola Secundária Martins Sarmiento, Diretor and Professor
Ana Paula Amorim	DigitalSign, CTO
António Borges	Vimágua, Diretor
Antonio Quintao	AMAVE
Bruno Batista	VIMAPONTO, CTO
Carlos Guimarães	Escola Secundária Martins Sarmiento, Professor
Daniel Pinto	Vitrus, Diretor
Delfina Soares	United Nations University, Head of UNU-EGOV Operational Unit
Eduardo Bacelar Pinto	Bosch/ University of Minho Interface
Filipe Frederico	MILK DESIGN, CEO
Filipe Leite	OS FREDERICOS, CEO
Filipe Vilas Boas	ACIG (Guimarães Comercial and Industrial Association), President
Gabriela Nunes	Technical Director of the Association for the Development of Local Communities
Guilherme Herculano	Guimarães Hotel
Henrique Santos	University of Minho, Associate Professor – Systems Information Department
João Moutinho	Center for Computer Graphics, Urban and Mobile Computing Unit Coordinator
Jorge Cristino	Circulo de Arte e Recreio, President
Juliana Teixeira	Center for Computer Graphics
Luis Martins	Siemens
Lurdes Fernandes	AJEG (Guimarães Young Businessmen Association), President
Marta Coutada	Fraterna Association

NAME	ORGANISATION
Marta Coutada	Sol do AVE, President
Marta Mota Prego	City of Guimarães, Head of Economic Development Division, Guimarães Marca, TECPARK, LABPC, PEV FACTORY, Head of EDD
Miguel Rodrigues	CJR
Nuno Cunha	Quadrilátero Urbano, Executive Director
Patrícia Ferreira	City of Guimarães, Education Division
Patrícia Gomes	Polytechnic Institute of Cávado and Ave
Paulo Cruz	Instituto de Desgin de Guimarães, President
Paulo Pereira	University of Minho, Full Professor – Civil Engineering Department
Pedro Teixeira	City of Guimarães, Intelligent Systems Division
Ricardo Costa	City of Guimarães Deputy Mayor
Ricardo Machado	City of Guimarães, Head of Intelligent Systems Division
Ricardo Silva	CIM AVE, Economic Division
Rogério Mota	CWAY, CEO
Rui Herculano	Herculano e Pimenta
Sérgio Gonçalves	City of Guimarães, Aid to Deputy Mayor
Telma	Wepub, CEO

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