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Inspire Policy Making with Territorial Evidence

DIGISER

Digital Innovation in Governance and Public
Service Provision

Annex 1.5 Narrative feedback to cities // April 2022

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FINAL REPORT //

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Abbreviations

API	Application Programming Interface
DESI	Digital Economy and Society Index
DIGISER	Digital Innovation in Governance and Public Service Provision
DIGISURVEY	The survey deployed during DIGISER with 255 respondent cities
DPSVI	Digital Public Value Service Index
EAB	European Advisory Board
EDCI	European Digital City Index
EIF	European Interoperability Framework
ESPON	European Spatial Planning Observation Network
EU	European Union
EU ODP	European Union Open Data Portal
FUA	Functional Urban Areas
GDC	Green Digital Charter
GDP	Gross Domestic Product
GDPpc	Gross Domestic Product per Capita
GDPR	General Data Protection Regulation
ICC	Intelligent City Challenge
ICT	Information and Communications Technology
KPI	Key Performance Indicator
LAU	Local Administrative Units
LEA	Learning Technology Accelerator
NUTS	Nomenclature of Territorial Units for Statistics
OASC	Open and Agile Smart Cities
OECD	Organisation for Economic Co-operation and Development
OGD	Open Government Data
PA	Public Administration
PCP	Pre-Commercial Procurement
Q_	Question (in Digiser Survey)
R&D	Research and Development
SAB	Scientific Advisory Board
SAG	Scientific Advisory Group
SDGs	Sustainable Development Goals
SEM	Structural Equation Modelling
SI	Service area Index
T-LL	Triple-Loop Learning
ToR	Terms of Reference
UNDP	United Nations Development Programme
Reference Sample	It refers to 156 cities intended to be the best approximation attainable that could be considered as representative of the variety of European cities.

1 Introduction

This Annex to the Final Report of DIGISER (D4) reports the underpinning concepts and the work carried out by the research team of the Politecnico di Milano on the narrative feedback developed for providing DIGI-survey respondents with city profiles tailored on their performances.

In detail:

- **Chapter 1 DPSVI data model** situates the city profiles within the DIGISER project. In particular, it describes the data challenge that public administrations need to face, highlighting its multi-level relevance in the current public sector landscape.
- **Chapter 2 Dynamic narrative feedback as city profiles** presents how the narrative feedback as a city profile can support PAs to better address the data understanding challenge. It focuses on the scope and aim of the narrative approach that generates dynamic narratives from sets of data, explaining how data is converted into comprehensible and contextualised information, assisting PAs and their teams and departments in accessing and interpreting data related to their performance in terms of digitization procedures. The chapter also reports on the methodology used to build the city profiles from the dataset of the more than 230 cities, describing the components, features, and output of the narrative approach to data interpretation.
- **Chapter 3 City profiles** depicts the various types of information provided by the city profiles, showing how the narrative feedback provides, firstly, a contextualisation of the data in a broader landscape of reference, providing specific information; secondly, performances translated into a semantic form, and lastly recommendations and possible directions for future actions. Finally, it reports on the testing of the narrative feedback conducted providing policymakers with the city profile and the feedback collected through a qualitative survey investigating the three dimensions of understanding data, awareness raised, and support to orient future action.
- **Chapter 4 Concluding remarks** drafts considerations about the narrative's potential usefulness as a decision support tool that instructs PAs on possible changes to consider to better capitalise its resources and improve the public sector, its governance, and service provision.
- **Chapter 5 Examples anonymised** presents two full anonymised city profiles.

1.1 DPSVI data model

For the purpose, the narrative feedback relies on the dataset collecting the specific answers and on the set of composite indicators developed on the basis of the DIGISER conceptual model for capturing and synthetically report on the performance of cities in their digital transition and their ability to orient such transition to create public value, as explained in previous deliverables.

As one of the main outputs of DIGISER, the Digital Public Service Value Index (DPSVI) is a multi-level composite index. The index is nourished by primary data gathered through the DIGISurvey as an ad hoc survey aimed at collecting multilevel and multidimensional data Europe wide. Participating in the data collection, cities provided a relevant base of data and knowledge that can be used to analyse and interpret specific phenomena by computing the data gathered according to the DIGISER conceptual framework. Data is combined and computed in a system of composite indicators which contribute to give a synthetic assessment of the cities' performance in relation to digital transformation as a complex phenomena.

1.2 The data challenge

More than ever, the role and relevance of data in policy design, implementation, and evaluation cannot be overstated ([Verstraete et al., 2021](#); [Aragona & De Rosa, 2019](#); [van Veenstra & Kotterink, 2017](#)). However, data for policy-making as a field of inquiry is characterised by an inherently multidisciplinary nature. In this domain, the current literature on public policies stresses the presence of limits and barriers due to data comprehension, interpretation, and operationalization ([Oliver et al., 2014](#); [Concilio & Pucci, 2021](#)).

This opens up relevant challenges, since public Administrations (PAs) are growingly asked to rely on data to be better informed (data-informed) in the development of strategies and guidelines for revising their governance and procedures. To orient its strategies and deliver decision-making, PAs need to be aware of their own behaviours and performances, especially in terms of level of digital service innovation maturity and degree of proneness to change, as also discussed in the previous deliverables ([Brynskov et al., 2021](#); [Meerman et al., 2021](#)).

Data-informed decision making can contribute to orient the PAs' actions linking current needs to available approaches, technologies, and trends. As such, it is grounded on a broad and deep understanding of the contextual situation in which the public sector operates and of the PA's performance ([van Veenstra & Kotterink, 2017](#); [Veale et al., 2018](#)). Moreover, data is a potentially powerful means for enabling reflexive practices within PAs, aiding them in the identification of policy and organisational gaps and constraints. However, current research streams question the public sector's ability to effectively use technology and data for public policy and administration. When it comes to exploring the possibilities of data-driven policymaking, there are numerous obstacles and challenges to face, ranging from the ability to actually adopt innovative technologies to the use and exploitation of data and data-driven techniques for public policy – being them open data ([Zuiderwijk & Hinnant, 2019](#)) or big data ([Mureddu et al., 2020](#); [Klievink et al., 2017](#)).

Ultimately, data-informed decision making implies data understanding, which entails the barrier of data interpretation and translation that prevents the conversion of data into useful knowledge ([Alvarenga et al., 2020](#)). The problem of digital literacy and digital education in the public sector is obviously significant in this picture. Several EU countries still present digital skills and competency gaps ([Datta et al., 2020](#); [Van Der Linden et al., 2021](#)). Consequently, the intrinsic complexity of the subject investigated and the documented lack of competences act as current obstacles to an effective understanding and exploitation of data.

2 Dynamic narrative feedback as city profiles

Given this premise, within the DIGISER project it has been investigated the role that design could play to support PAs to better address the data understanding challenge. The state of the art reports the presence of various visualisation tools aiding decision-making activities and processes ([Dimara et al., 2021](#); [Vila et al., 2018](#)), namely multidimensional visualisations to manage and visualise data in various manners, including treemaps, interactive querying, device for ranking attribute priorities obtaining weighted summary scores. Nevertheless, the focus is primarily on visual analytics and often requires the level of knowledge of data analytics, hence generating a barrier to access to data itself.

2.1 Scope and aim

Better strategies and policies can be informed by effective metrics and intelligible data. They can drive and support organisations in their development, fostering digital transformation and encouraging the scaling of digital innovation at various levels. In this framework, data-driven and data-informed decision making is fundamental, but it comes with the obstacles and barriers so far presented. To answer this challenge, a **narrative approach** that generates dynamic narratives from sets of data has been designed. The result are **city profiles** that aim is assisting public officials in accessing and interpreting data related to the PAs' performance in terms of digitization procedures.

The narrative approach addresses the need to convert data into comprehensible and contextualised information, shaping data into semantic feedback. Given the scope of the narrative device, it employs calculated and standardised ideal-typical data.

Table 1 presents an overview of the indicators of the DPSVI with a concise explanation of the meaning attributed to each indicator.

Code	Label	Description
I1	DIGITAL SERVICE INNOVATION MATURITY	It explores the degree of penetration and maturity of technical and organisational innovation in public service delivery
I1_1	Digital maturity	It assesses the level of digitalization of the public authority, intended not only as shift toward digital technologies, but also encompassing the related organisational change, namely the delivery of innovative public services
I1_1_1	Digitization	It focuses on the degree of digitization of pre-existing internal procedures either ancillary or directly related to public service delivery
I1_1_2	Innovative technologies	It explores the degree of adoption of innovative technologies (AI, blockchain, wearables, etc.)
I1_1_3	Advanced methods and principles	It analyses the level of consistency of methods and principles used to increase the digitalization level of the public authority
I1_2	Level of service embedding	It indicates the extent to which the innovation of services is pervasive and has already generated changes
I1_2_1	Scaling deep	It indicates the extent to which the innovation of services is pervasive and has already generated changes in the local context, at societal level
I1_2_2	Scaling out	It indicates the extent to which the innovation of services has already generated changes either by replicating successful innovations from other contexts or exported elsewhere the innovations experimented locally

I1_2_3	Scaling up	It indicates the extent to which the innovation of services is pervasive and has already generated changes within the organisation of the public authority
I2	PRONENESS TO CHANGE	It assesses the inclination or readiness of the public authority to change and alter its behaviour, vision, procedures, and its preparedness to integrate and amplify innovations
I2_1	Change management	The capacity of public administrations to put in play a set of actions, norms, policies, and tools either to proactively support innovation in digital service development and provision, or to increase its capacity to detect and adopt innovation dynamics developed in different contexts (within the context, or towards or from other contexts).
I2_1_1	Context empowerment	It measures the effectiveness of the strategies, developed by the public authority, to ensure impacts of innovation within in the local context, at societal level, e.g. instillation of cultural values oriented to innovation and change; encouragement for the development of sustainable relationships
I2_1_2	Replication and diffusion	It measures the effectiveness of the strategies developed to ensure replicability in other contexts to the innovations experimented locally, so to impact a larger number of citizens or communities
I2_1_3	Organizational readiness	It measures the effectiveness of the strategies developed to ensure impacts of innovation within the organisation of the public authority
I2_2	Innovation governance	It refers to the way in which the public authority uses transversal administrative processes (data management, societal engagement, public procurement, capacity building) as a leverage to promote cross-sectoral digital innovation
I2_2_1	Data management	It assesses the innovation capacity of data management strategies used by the public organisation
I2_2_1_1	Data Platform	It assesses the features of the data platform and the consistency between data management strategy and its underlying technical infrastructure
I2_2_1_2	Data Use	It explores, from an operational perspective, how data are used by the public administration for the purposes of evaluation and monitoring, delivery, and anticipation and planning.
I2_2_1_3	Data Strategy	It investigates whether the definition and the embrace of governance models effectively set appropriate and favourable conditions for data-driven, data-informed, or data-aware decisions and services for creating public value.
I2_2_1_4	Open Data	It provides an overview of the degree of application of open data principles, practices, and framework, that are meant to improve performance and efficiency of government services in general
I2_2_1_5	Big Data	It refers to the capacity of the city to generate, manage and use big data
I2_2_2	Procurement	It assesses the level of digitalization of the public procurement processes within the public authority and their orientation to digital innovation
I2_2_3	Societal engagement	It provides an overview of the intensity and level of digitalization of societal engagement policies, and their impact on public service design and innovation
I2_2_3_1	Co-creation	It gives the level of involvement of the citizens in service design and innovation

I2_2_3_2	E-participation	It refers to the level reached by the municipality in involving citizens and/or communities through digital platforms
I2_2_3_3	Social Media Presence	It provides information about how pervasive is the communication via social media by the municipality
I2_2_4	Institutional capacity	It refers to the institutional capacity of the public authority in relation to the experimentation and consolidation of digital innovation
I2_2_4_1	Innovation strategy	It provides information about the agenda setting and pursuing capacity in relation to digital innovation strategies
I2_2_4_2	Proneness to experiment	It analyses the readiness to experiment new organisational settings and methods within the public authority
I2_2_4_3	Skills	It assesses the availability, within the public authority, of skills as key to the management of digital innovation

Table 1 - Composite indicators of DPSVI and their description

Therefore, the indices and data of the analytical model (Table 1) feed semi-automated narratives as semantic interpretations of data. Shaped as a structured description, each narrative feedback is tailored to each of the public authorities that answered the DIGISER survey. By design, it exploits the answers provided and their computation into indices and sub-indices to provide PAs with a city profile that informs about its specific performances on the multiple dimensions mapped by the conceptual framework while situating its practices in the broader scenario of digital innovation in the public sector. Each data is regarded as valuable for informing future tactics and strategies. As a result, the narrative description goes beyond returning numbers, being instead a complex interpretation that dynamically connects multi-level indexes, raw data, and contextual information through descriptive sentences.

Each narrative feedback as a city profile is automatically built relying on the following methodology.

2.2 Methodology

The concept of narrative feedback as a dynamic narrative was developed using the complex dataset of DIGISER and tested in its robustness on its more than 230 records.

The narrative feedback is created by linking data from a dataset with semantic translation. Data is employed as a variable in the construction of narratives, being returned with descriptive categories connected with value scales to enable semantic interpretations. The system is based on (1) a **narrative text** that contextualises data in the broader context of reference, (2) a **dataset** as data source, (3) a **protocol** that defines the segmentation of data into ranges, their values values, and the high-level meaning attributed to them, (4) an **interpretative table** associating data values with interpretations, and defining the operations to be performed, and ultimately (5) a **python script** that systematises all of the previous elements, elaborates them, and outputs them as a city profile.

Figure 1 shows the five components also in terms of features and output produced.

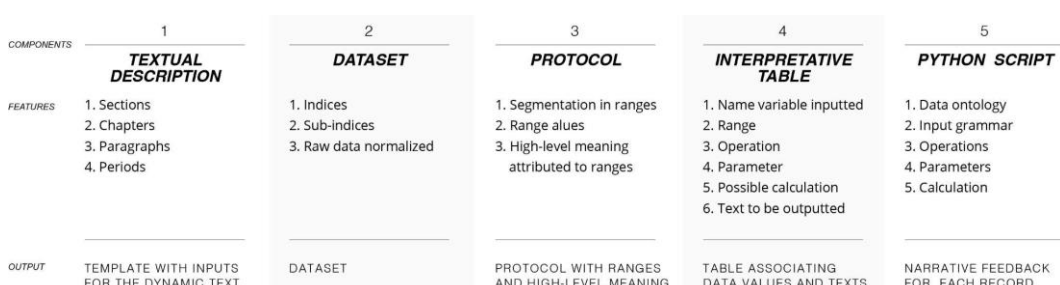


Figure 1 - The narrative feedback components, features, and output.

In the following each component is explained in detail:

1. **Textual description.** It is this text used to generate the narrative feedback for all the cities that answered the DIGISER survey. The text is based on the DPSVI structure, and in particular to the conceptual model (Brynskov et al., 2021; Meersman et al., 2021). There are two main sections, mirroring the two main areas of investigation of *Proneness to Change* (I2) and *Digital Service Innovation Maturity* (I1). Each of them develops through its sub-indices as chapters and their components, being them scores, relevant puntual data, or further sub-indices, as paragraphs and periods. The textual description unfolds its discourse situating knowledge and data translated into graspable and understandable information within the broader context of digital innovation in the public sector, pursuing the higher scope of supporting PAs in further developing their literacy on digital innovation in the public sector. The argument, its relevance, features, and composite aspects are introduced in each section, chapter, and paragraph. The discourse then articulates reporting on the performances as provided by the multi-level indices, sub-indices, and raw data, as well as presenting possible directions of innovation to consider. The city profile takes the form of a dynamic textual template which periods change depending on how well the PA performs. As shown in Figure 2, the text includes variables which are identified by the grammar `{{ var_name }}` which serves the function of an input text that once elaborated (see points 2 and 4) is substituted with an output in the narrative feedback (see point 5). The text also contains *if/else* operations to call out the text be provided according to a given requisite (positive value of a variable, flag on checkbox).

ADVANCED METHODS AND PRINCIPLES

Digital transformation is radically affecting service delivery practices, and advanced approaches raised citizens' expectations regarding the access to information. In parallel, they are encouraging the public authority to progressively rely on standards and shared solutions for an open governance, in order to encourage an optimised management and re-use of resources. This dimension analyses the consistency of the methods and principles used to increase and better orient digitalisation in the public sector. `{{ Name }}` has a `{{ var1_1_3 }}` capacity to embed and make use of methods and principles for sustaining its digital innovation. Concerning this, effective strategies regard the sharing of digital solutions, services or products with other public authorities. `{{ Name }}` `{{ var2_5a_11_1_3 }}` propensity towards importing and adopting solutions developed from other public authorities, while it `{{ var2_5b_11_1_3 }}` the digital solutions it develops. The tenders for procuring innovative solutions are instructed `{{ var3_8_11_1_3 }}` open standard and open source requirements.

`{%- if IFvar3_8_11_1_3 -%}`

`{%- if flagQ_ID134 -%}`

Preferring open standards and open-source solutions feeds forward-looking practices of data sharing and data re-usability.

`{%- endif -%}`

`{%- if flagQ_ID135 -%}`

The employment of open-source software reflects and sustains the attitude for open collaboration. Leading to the participation in online and collective development; a practice that facilitates public trust in the software.

`{%- endif -%}`

`{%- else -%}`

`{{ Name }}` may consider the use of open standards and open source solutions, since it encourages data sharing and data re-usability, while the use and contribution to develop open-source software can increase public trust in the software.

`{%- endif -%}`

Interoperability as the ability of services to communicate among each other is crucial to make services more sustainable and even seamless. However, a set of good practices need to be implemented: from the use of standards for data and sharing collection, to the availability of information in multiple languages and procedural transparency. In this regard, `{{ Name }}` `{{ var5_4_11_1_3 }}` interoperable digital solutions or services.

To further streamline operations exploiting EU-wide services available on the market, public administrations need to consider the provision of cross-border and cross-sectoral public services.

Figure 2 - The introduction of the paragraph "Advanced Methods and Principles" (I1.1.3), showing the descriptive text and use of variables in action

2. **Dataset.** The dataset contains all DIGISER indices, sub-indices, and a subset of especially significant raw data normalised, namely answers to specific questions, as data to be translated into the narrative feedback. Normalised punctual data might be binary data or discrete scale numbers. Indices and sub-indices are analogue scale values. Being it mapped on *ideal-typical behaviours* defined *a priori*, based on the best possible behaviour as observed in the literature, the PAs' performances are indeed measured on indices with a scale from 0 to 1, where 0 is the worst behaviour possible, and 1 is the best.
3. **Protocol.** It defines the segmentation of the values, and the attribution of adjectives according to specific ranges. The performance is segmented into ranges that can contain from 3 to 6 levels (Figure 3). Each range is associated with value scales and descriptive categories, namely high-level typologies of adjectives providing clusters of meanings to consider when defining the textual descriptions to be associated with ranges. A judgement on a scale of 3 values can be made in terms of slightly (low value), rather (medium value), and significantly (high value). A judgement on a scale of 6 values can be made in terms of not (value is zero) or rarely (very low value), limitedly (low value), regularly (medium value), extensively (medium-high value), and completely (very high value).

Segments	Ranges	From	To	Score value range	Typology of adjective
3	R1	0	0.35	low value	cautiously negative adjective
	R2	0.35	0.68	medium value	median to averagely positive adjective
	R3	0.68	1.1	high value	positive adjective
4	R1	0	0.05	low value	cautiously negative adjective
	R2	0.05	0.35	medium-low value	mildly negative adjective
	R3	0.35	0.68	medium-high value	positive adjective
	R4	0.68	1.1	high value	very positive/remarkable adjective
5	R1	0	0.05	low value	negative adjective
	R2	0.05	0.35	medium-low value	mildly negative adjective
	R3	0.35	0.68	medium value	mildly positive adjective
	R4	0.68	0.85	medium-high value	positive adjective
	R5	0.85	1.1	high value	very positive/remarkable adjective
6	R1	0	0.05	very low value	negative adjective
	R2	0.05	0.17	low value	cautiously negative adjective
	R3	0.17	0.35	medium-low value	mildly negative adjective
	R4	0.35	0.68	medium value	mildly positive adjective
	R5	0.68	0.85	medium-high value	positive adjective
	R6	0.85	1.1	high value	very positive/remarkable adjective

*Values are distributed between 0 and 1, considering the behaviours of all the PA which answered

Figure 3 - The protocol defining the segmentation of the values in ranges, attributing them to clusters of adjectives

4. **Interpretative table.** Indices, sub-indices, and raw data are identified as variables depicting the performances and behaviours of PAs. To go beyond numbers, data and ranges of data are translated into descriptive texts. Following the DIGISER conceptual and analytical models, the spectrum of the PA performances is examined so as to be split in a number of meaningful performance ranges. To transform data into understandable information, the score of multi-level indices and normalised raw are associated with ranges of responses. Each range is accompanied by descriptive texts that situate the data as information into the broader discourse. Values on analogue or discrete scales are divided into ranges of 3 to 6 segments. The number of ranges is calculated with attention, considering the specific questions/indices, their relevance, and its potential to be unfolded in a rich description. The protocol specifies the ranges that can be used and their span, and is consistently applied granting methodological robustness to the process, as well as methodological consistency and narrative coherence across indices and data. Different operations are then activated depending on the data and its typology (dummy, discrete scale, analogue scale):
 - Binary: data is binary (dummy variable);
 - Value: data is equal, greater, or minor to a certain value;
 - Range: data belongs to a range;
 - Flag: flag on a specific checkbox.

The result is a new dataset "Var_Narrative" in which each variable is identified by a unique identifier (called as input text `{{var_name}}` in the textual description), ranges, operation and parameters, potential calculations, and a text (output for the narrative feedback – see point 5).

Figure 4 recalls the example of Figure 2 showing the interpretative table that leads to associate variables with textual description. When the text presents the input `{{ var1_1_3 }}`, depending on the specific Index score value of a public administration, the output will be *limited* if between the score is between 0 and 0.35 excluded, *good* if between 0.35 included, to 0.68, or *significant* if from 0.68 excluded to 1.1, so to include the full value of 1.

Paragraph = L3	Period = L4	I.#	Q.#	Name Var	Data typology	Operation	FROM	TO	Need	Text_Period
							Par1	Par2		
Digital maturity	Advanced methods and principles	I.1.3		var1_1_3	Index score	range	0	0.35	0	limited
Digital maturity	Advanced methods and principles	I.1.3		var1_1_3	Index score	range	0.35	0.68	0	good
Digital maturity	Advanced methods and principles	I.1.3		var1_1_3	Index score	range	0.68	1.1	0	significant
Digital maturity	Advanced methods and principles	I.1.3	2.5a	var2_5a_1_1_3		range	0	0.05	0	seems not to have a
Digital maturity	Advanced methods and principles	I.1.3	2.5a	var2_5a_1_1_3		range	0.05	0.35	0	has a limited
Digital maturity	Advanced methods and principles	I.1.3	2.5a	var2_5a_1_1_3		range	0.35	0.68	0	has an average
Digital maturity	Advanced methods and principles	I.1.3	2.5a	var2_5a_1_1_3		range	0.68	1.1	0	has a significant
Digital maturity	Advanced methods and principles	I.1.3	2.5b	var2_5b_1_1_3		range	0	0.05	0	seems not yet to export nor share
Digital maturity	Advanced methods and principles	I.1.3	2.5b	var2_5b_1_1_3		range	0.05	0.35	0	seldom exports and shares
Digital maturity	Advanced methods and principles	I.1.3	2.5b	var2_5b_1_1_3		range	0.35	0.68	0	often exports and shares
Digital maturity	Advanced methods and principles	I.1.3	2.5b	var2_5b_1_1_3		range	0.68	1.1	0	largely exports and shares
Digital maturity	Advanced methods and principles	I.1.3	2.5c	var2_5c_1_1_3		range	0	0.05	0	does not seem to opt
Digital maturity	Advanced methods and principles	I.1.3	2.5c	var2_5c_1_1_3		range	0.05	0.35	0	seems to rarely opt
Digital maturity	Advanced methods and principles	I.1.3	2.5c	var2_5c_1_1_3		range	0.35	0.68	0	frequently opts
Digital maturity	Advanced methods and principles	I.1.3	2.5c	var2_5c_1_1_3		range	0.68	1.1	0	mostly opts
Digital maturity	Advanced methods and principles	I.1.3	4.3	var4_3_1_1_3		binary	1		0	positive
Digital maturity	Advanced methods and principles	I.1.3	4.3	var4_3_1_1_3		binary	0		0	limited
Digital maturity	Advanced methods and principles	I.1.3	3.8	var3_8_1_1_3		range	0	0.05	0	not yet considering
Digital maturity	Advanced methods and principles	I.1.3	3.8	var3_8_1_1_3		range	0.05	1.1	0	considering
Digital maturity	Advanced methods and principles	I.1.3	4.4	var4_4_1_1_3		binary	1		0	sustains
Digital maturity	Advanced methods and principles	I.1.3	4.4	var4_4_1_1_3		binary	0		0	seems not interested in sustaining
Digital maturity	Advanced methods and principles	I.1.3	4.5	var4_5_1_1_3		value	==	1	0	already uses
Digital maturity	Advanced methods and principles	I.1.3	4.5	var4_5_1_1_3		value	==	0.5	0	plans to implement
Digital maturity	Advanced methods and principles	I.1.3	4.5	var4_5_1_1_3		value	==	0	0	seems not yet planning to implement
Digital maturity	Advanced methods and principles	I.1.3	5.5	var5_5_1_1_3		value	==	1	0	applies
Digital maturity	Advanced methods and principles	I.1.3	5.5	var5_5_1_1_3		value	==	0.5	0	is planning to apply
Digital maturity	Advanced methods and principles	I.1.3	5.5	var5_5_1_1_3		value	==	0	0	does not seem to apply
Data management	Advanced methods and principles	I.1.3	5.4	var5_4_1_1_3		binary	1		0	is already adopting
Data management	Advanced methods and principles	I.1.3	5.4	var5_4_1_1_3		binary	0		0	is not yet adopting

Figure 4 - The variables presented in the excerpt of Figure 2 followed by their typology, operation to be performed, parameters, eventual need of calculation, and text period as textual output to be returned in the textual description

5. **Python script.** The python script is a set of codes putting together the elements described in the previous points. It computes the parameters provided and elaborates the textual descriptions. In particular, whenever the script encounters a variable `{{ var_name }}`, it recognises it as an input to trigger a chain of operations, described in the following:
 - a. For each city, the script searches the corresponding values in the dataset "Data_Narrative" with all indices, sub-indices, and normalised raw data;
 - b. It identifies the score or value associated with the variable inputted;
 - c. It searches the dataset "Var_Narrative" finding the variable inputted in the textual description
 - d. It reads the operation to run
 - e. It identifies the value or the range it belongs to
 - f. It runs eventual computations
 - g. Finally, it provides the text description associated with the specific value or range as output.

The script runs these operations for all the records of the dataset, namely all the PAs that answered the DIGISURVEY questionnaire.

Further elaborating on the example of Figure 2, and considering the interpretative table in Figure 4, when operating on a record from the dataset, the script goes through the textual description containing the variables. When the script encounters `{{ var1_1_3 }}`, it seeks in the *Name var* column of the dataset of the Interpretative table records associated with the equal to `{{ var1_2_3 }}`. It is then instructed on the operation to run, the ranges to consider, and eventual calculations to perform. Therefore, according to the Index score of that city, the script returns what is written in the column *Text_Period*. Ultimately, the script exports a file with the city profile as a narrative feedback for each record of the dataset.

3 City profiles

To tackle the challenge of assisting policymakers and PA in making better decisions, the city profile is built as a narrative feedback that combines the semantic restitution of data with the contextualization of information in the domain of reference, finally integrating recommendations and possible directions for future actions (Figure 5). For illustrative purposes, in Figure 5 the various types of information provided are highlighted in different colours, showing the periods devoted to contextualising and providing general information; the periods presenting data in a semantic form; and the periods providing recommendations and possible directions for future actions identified as relevant for the city to consider. It is then evident the presence of some if-else and flags which contain sentences which are outputted just if the city satisfies the given criteria; or give another sentence in case the criteria is not met.

ADVANCED METHODS AND PRINCIPLES

Digital transformation is radically affecting service delivery practices, and advanced approaches raised citizens' expectations regarding the access to information. In parallel, they are encouraging the public authority to progressively rely on standards and shared solutions for an open governance, in order to encourage an optimised management and re-use of resources. This dimension analyses the consistency of the methods and principles used to increase and better orient digitalisation in the public sector. **{{ Name }}** has a **{{ var1_1_3 }}** capacity to embed and make use of methods and principles for sustaining its digital innovation. Concerning this, effective strategies regard the sharing of digital solutions, services or products with other public authorities. **{{ Name }}** **{{ var2_5a_1_1_3 }}** propensity towards importing and adopting solutions developed from other public authorities, while it **{{ var2_5b_1_1_3 }}** the digital solutions it develops. The tenders for procuring innovative solutions are instructed **{{ var3_8_1_1_3 }}** open standard and open source requirements.

— contextualisation and general information

— data turned into narrative feedback

{%- if IFvar3_8_1_1_3 -%}

{%- if flagQ_ID134 -%}

Preferring open standards and open-source solutions feeds forward-looking practices of data sharing and data re-usability.

{%- endif -%}

{%- if flagQ_ID135 -%}

The employment of open-source software reflects and sustains the attitude for open collaboration. Leading to the participation in online and collective development; a practice that facilitates public trust in the software.

{%- endif -%}

{%- else -%}

{{ Name }} may consider the use of open standards and open source solutions, since it encourages data sharing and data re-usability, while the use and contribution to develop open-source software can increase public trust in the software.

{%- endif -%}

— recommendations and possible directions

Interoperability as the ability of services to communicate among each other is crucial to make services more sustainable and even seamless. However, a set of good practices need to be implemented: from the use of standards for data and sharing collection, to the availability of information in multiple languages and procedural transparency. In this regard, **{{ Name }}** **{{ var5_4_1_1_3 }}** interoperable digital solutions or services.

To further streamline operations exploiting EU-wide services available on the market, public administrations need to consider the provision of cross-border and cross-sectoral public services.

Figure 5 - An example of the textual description highlighting the different typologies of information provided.

Figure 6 shows the same excerpt presented before as applied to a city – anonymised for the illustrative purpose.

ADVANCED METHODS AND PRINCIPLES

Digital transformation is radically affecting service delivery practices, and advanced approaches raised citizens' expectations regarding the access to information. In parallel, they are encouraging the public authority to progressively rely on standards and shared solutions for an open governance, in order to encourage an optimised management and re-use of resources. This dimension analyses the consistency of the methods and principles used to increase and better orient digitalisation in the public sector. **CityNR** has a **good** capacity to embed and make use of methods and principles for sustaining its digital innovation. Concerning this, effective strategies regard the sharing of digital solutions, services or products with other public authorities. **CityNR seems not to have** propensity towards importing and adopting solutions developed from other public authorities, while it **seems not to export nor share** the digital solutions it develops. The tenders for procuring innovative solutions are instructed **considering** open standard and open source requirements. Preferring open standards and open-source solutions feeds forward-looking practices of data sharing and data re-usability. **CityNR** may consider the use of open standards and open source solutions, since it encourages data sharing and data re-usability, while the use and contribution to develop open-source software can increase public trust in the software. Interoperability as the ability of services to communicate among each other is crucial to make services more sustainable and even seamless. However, a set of good practices need to be implemented: from the use of standards for data and sharing collection, to the availability of information in multiple languages and procedural transparency. In this regard, **CityNR is not yet adopting** interoperable digital solutions or services. To further streamline operations exploiting EU-wide services available on the market, public administrations need to consider the provision of cross-border and cross-sectoral public services. Finally,

— contextualisation and general information

— data turned into narrative feedback

— recommendations and possible directions

Figure 6 - Excerpt of the narrative feedback applied to an anonymised city, with the different typologies of information provided highlighted.

3.1 Preliminary validation with policymakers and feedback

The concept and model of dynamic narratives were validated involving one of the cities that replied to the DIGISER survey. The name of the city will not be revealed due to the disclosure permission and policies through which data were acquired. As a result, the narrative input is anonymized, but it is based on real facts from the city that was tested. The city profile was tested on a narrative extract providing feedback on the level of *Digital Maturity* of the PA. The scope of the investigation is assessing the ability of the city profile as a narrative feedback to provide multi-level and operational knowledge to PAs, reinforcing their self-awareness and contributing in orienting policymaking.

Given this scope, the city profile section on *Digital Maturity* was extracted and given to three unity managers from various departments with acknowledged expertise in building local digital strategy plans and consulting on the digital service provision of the PA, across its various service domains. For the investigation, the extract was provided together with data visualisations.

The qualitative survey focused three main topics:

1. **Understanding** – It enquires on the extent to which the narrative feedback contributes to the translation of data into actionable information, being graspable by multiple units and departments and individuals with varying data literacy level and subject matter expertise. Ultimately, it explores its intelligibility and usability as is, namely without being accompanied by other typologies of data restitution, such as visualisations.
2. **Awareness** – It enquires to what extent the narrative feedback encourages the PA to reflect on its performances and possibilities, pointing out its strengths and potentialities, limits and needs, soliciting context-aware understanding.
3. **Support to action** – It enquires its usefulness in suggesting possible actions to take and diverse digital innovation actions, also transversally to the different divisions of the PA.

The feedback gathered confirms that the semantic translation contributes to thoughtfully describing the city profile, being fairly informative and promising in terms of support to action. Respondents agreed in stating that the narrative approach enables the conversion of data into accessible, understandable information.

The narrative feedback resulted understandable and clear, with an orientation to operationalisation. It was also confirmed the hypothesis that departments with high data expertise may gain more limited benefits from the narrative interpretation. As a consequence, it also emerged that its use across departments of the PA may be influenced. Nethertheless, the design-enabled translation is recognised to help overcome differences due to domain-specific languages, serving as a potential bridge between sectors and service areas. The feedback is analogue in regard with the narrative effectiveness in aiding data comprehension by individuals with varying degrees of data literacy. However, respondents stated that the narrative feedback should be supplemented with other kinds of data restitutions such as data visualisations and extracts.

The investigation then looked at the ability of narrative feedback to improve (self-)awareness of current or potential PA behaviours and performances, encouraging self-reflection. The city profile is recognised as matching that of their PA, coherently assessing its strengths and potential. On the other hand, it is acknowledged as discreetly able to reveal limits and needs in terms of *Digital Maturity*, fairly supporting awareness on the context of reference. Moreover, the specific focus on the topic may have influenced the results. Ultimately, the city profile is successfully recognised as able to provide a place-specific contextualisation of the different dimensions of the PA's performance, allowing decision-makers and technical operators for a better comprehension of options not yet considered or implemented.

Finally, the investigation assesses the effectiveness of narrative feedback in guiding policy actions and assisting decision-making processes. The response verifies the city profile's usefulness for orienting the policy development, identifying it as helpful in recommending possible actions and changes to consider. It emerged as particularly significant the suggestion towards the adoption of open-standards and open-source solutions, methods and approaches for enhancing the end-user's trust in digital technology, and the inputs for increasing accessibility across the PA service areas.

4 Concluding remarks

The city profile as a semantic interpretation of data has been designed to move beyond a numerical restitution for contributing and easing data understanding.

According to the DIGISER conceptual framework ([Meersman et al., 2021](#)), the objective of the profile is threefold, contributing to understanding data, triggering reflection and self-reflection, and feeding public action.

The narrative feedback value in increasing PAs' ability to grasp the complicated dynamics, raising awareness of the larger context is confirmed. The city profile emerges indeed as a comprehensive profile able to discuss the PA's various dimensions, attitudes, and performances, in a unique report, using an approach and language that can be easily accessible by the different sector areas and departments.

Especially the contribution to policymaking is highlighted as its potential to raise awareness of the larger environment in which choices are generated and executed, as well as increase PAs' comprehension of complicated dynamics. Although more testing is needed to fully assess the proposed methodology's potential use and application, the narrative feedback does return a comprehensive profile that weaves together in a single document the PA's various dimensions, attitudes, and performances, being easily understandable by multi-level actors and cross-sector areas. To meet this condition, the profile specifically avoids jargon and highly-specialised terminology, in favour of a multidisciplinary language. Possible positive implications are a contribution to mitigating the silo-mentality, offering data interpretations that are by design meant to be cross-departmental and cross-unit. Ultimately, situating data within a broader landscape and presenting data integrated with contextual information is meant to favour reflective processes, while also pointing at possible directions for tackling current limitations and maximising the strengths. Going beyond the creation and reinforcement of self-awareness, this feature is particularly relevant in terms of suggesting possible changes to better manage and exploit the possibilities of digital transition in the organisation and its infrastructure.

This direction follows the trend of providing PAs with insights for reflection. Indeed, the DIGISurvey itself followed the structure of the DIGISER conceptual and analytical models, which identified learning and reflection as core activity. Following the threefold structure of the models, the sections of the survey progressively zero in on the multiple dimensions that PAs should consider when reflecting on their digital transformation activities and planning their future actions – see DIGISER Inception and Interim Reports ([Meersman et al., 2021](#); [Brynskov et al., 2021](#)). In line with this approach, the city profile as a narrative feedback is designed to further encourage self-awareness, potentially enabling decision makers to move a step forward towards digital innovation in governance and public service provision.

Moreover, providing PAs with accessible knowledge is especially relevant in terms of feeding decision-making, boosting policymakers' comprehension and capacity to operationalise information. Providing clear and contextualised feedback on present and potential behaviours is a key step to elicit better awareness of current activities and orient recommendations for improving digital innovation.

The main contribution behind the city profile is indeed its ability to instruct PAs on how possible changes for better capitalise its resources and therefore improving the public sector, its governance, and service provision. Such understanding extends to organisational transformation. Providing constructive and operational feedback, PAs are invited to reflect and build on it to plan changes in the medium and long term.

5 Examples anonymised

For illustrative purposes, two cities with opposite behaviours on the semiotic squares – see Methodology in Deliverable D4 – in terms of Digital Service Innovation Maturity and Proneness to Change have been identified, and their full city profiles are reported below.

As explained, Semiotic squares identify the city performances associating them with ideal-typical profiles, that characterise each cartesian quadrant. The anonymous cities selected for the illustrative purpose, are respectively situated in the first (City202) and third squares (City75). The selection of two cities with opposite behaviours is meant to point out to what extent city profiles change depending on the performances, showing how the narrative returns the variety of behaviours and activities through its unfolding, across the different dimensions of the DPSVI – namely all the indices and sub-indices.

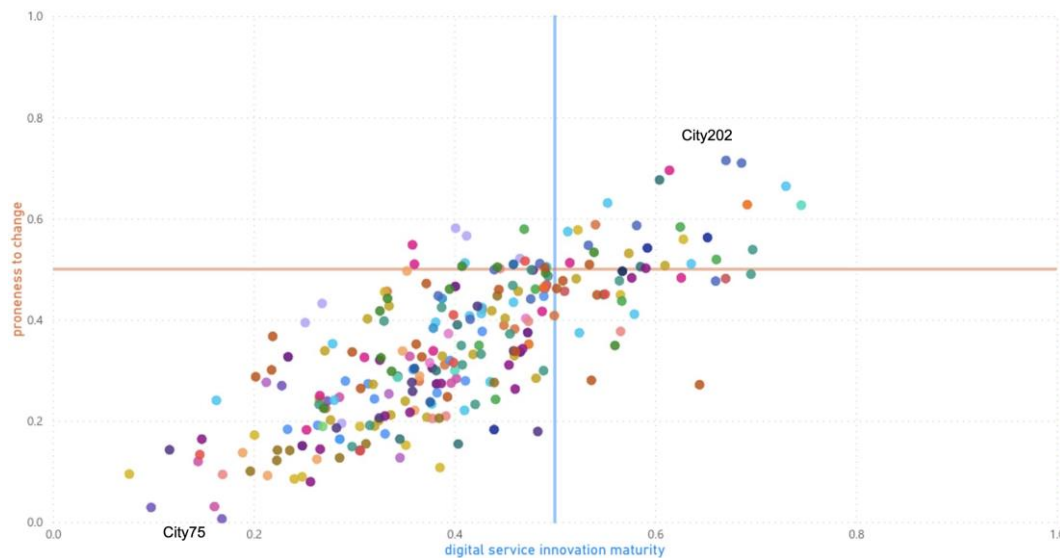


Figure 7 - The two anonymised cities situated in the broader picture of the DPSVI, using Digital Service Innovation Maturity and Proneness to Change as axes.

The following boxes contain the full city profiles of the two cities anonymised.

With regard to the Semiotic squares, City202 is located in the first square, which identifies the behaviours of Transformative Pioneers. The city profile that emerges reflects indeed the features of a public administration that is innovative and aware, as well as prone to change. As a consequence, the narrative mirrors the behaviour of a city with high levels of technical and digital-enabled organisational innovation in public service provision and delivery, where digital technologies are largely integrated in the governmental modernisation and innovation strategies. Moreover, the profile also depicts a city that is aware and ready to actively support multi-level changes to address and face the digitisation challenges.

On the other hand, City75 presents the profile of a city with a low level of innovation and awareness, but also proneness to change. Indeed the profile that emerges is that of a city that is conservative and unaware of digital innovation and transformation possibilities, while being also reluctant to change. The profile also attests a low degree of penetration and maturity of technical and organisational innovation, underlying a certain resistance to revise its behaviours or attitudes towards organisational or technological innovation.

City202

DIGISER is an Espo Project that sets out to analyse the transformation of the public sector and its service provision through digital innovation by taking into consideration the diversity of the European territory in terms of socio-economic, cultural and environmental endowments in different cities (espon.eu/DIGISER).

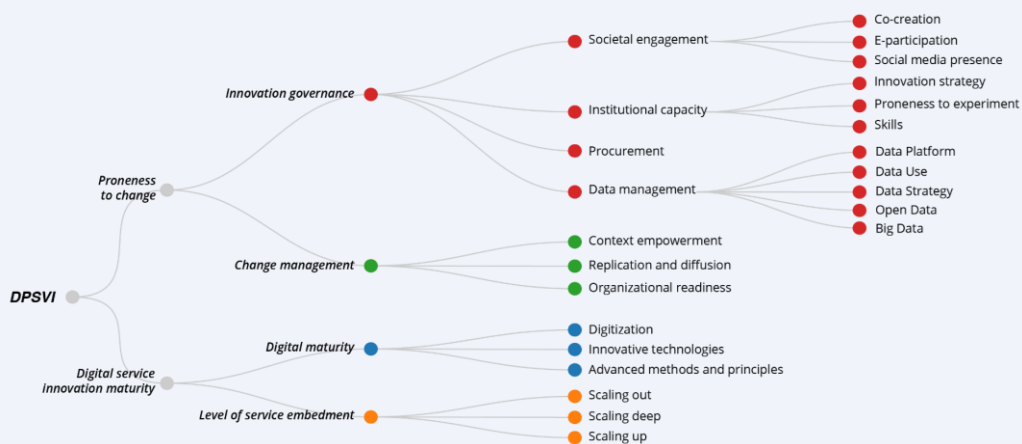
DIGISER develops the *Digital Public Service Value Index (DPSVI)* as one of its main outputs. It is a multi-level composite index that investigates the multidimensional digital transition processes occurring in the public sector, and aims at helping cities to improve their digitalisation effort. The project reached out to more than 230 cities across Europe that provided their data by filling a survey built on the DPSVI model developed within the project – and described in the deliverable available at the espon.eu/DIGISER page.

The *Digital Public Service Value Index* is conceptualised focussing on two main components: *Proneness to change* and *Digital service innovation maturity*.

Proneness to change is described analysing the propension towards the two dimensions of *Innovation governance* and *Change management*. *Digital service innovation maturity* is described through the *Digital maturity* and the *Level of service embedment* of the public authority.

Participating in the data collection, cities provided a relevant base of data and knowledge, on which to build for supporting future development, fostering digital transformation and encouraging the scaling of digital innovation at various levels. To support cities in situating their performances in the broader landscape, it has been developed a narrative approach that generates city profiles as semantic narratives. This city profile translates the values of the indices, sub-indices, and answers to specific questions provided by the public authority into a descriptive interpretation. It relies on the data provided by the cities for capturing and synthetically reporting on their performance in terms of digital transition and on their ability to orient such transitions to create public value. The public authority performances are mapped on ideal-typical behaviours defined *a priori*. Based on the best possible behaviour as observed in the literature, the city performances are measured on indices with a scale from 0 to 1, where 0 is the worst behaviour possible, and 1 is the best.

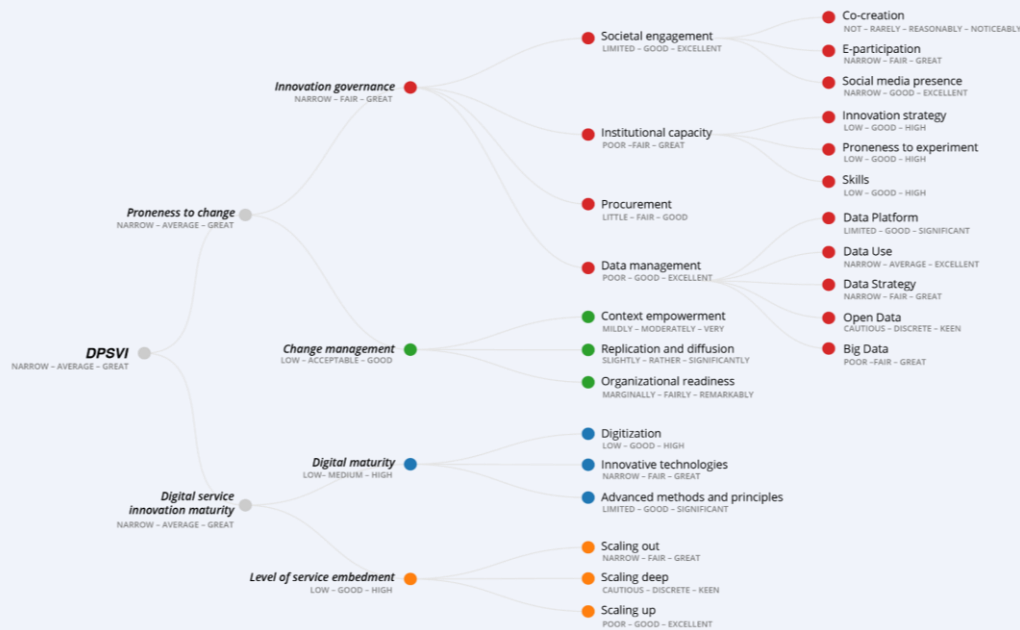
The following schema summarises the *Digital Public Service Value Index* and its multi-level components.



The values considered are computed following an ideal-typical analysis, where the focus favours an absolute assessment of the performances rather than a relative comparison. Indeed, the coding and standardisation of indices and answers are such that values 0 and 1 are attributed an absolute meaning, namely the lowest and highest possible performance that a public authority may stage. Indices and sub-indices as aggregation of data are produced through a standard weighted-averaging procedure. Consequently, the narrative feedback describes how **City202** is situated in respect to the behaviours and performances of the other public authorities that responded to the survey.

From a methodological perspective, data are associated with textual descriptions. When the data described is a value in a discrete or analogue scale from 0 to 1, the narrative output associates score ranges with texts relying

on a protocol that defines the segmentation of values. In general, low values are associated with cautiously negative adjectives; medium values with median to averagely positive adjectives; high values with positive adjectives. Given this premise, the schema below shows the segments and attributes associated with each index and sub-index.



Given this premise, **City202** has an overall **average** digital transitional capacity.

In the following, the report provides narrative feedback about the constitutive elements analysed, mapped, and computed to calculate the *Digital Public Service Value Index*.

PRONENESS TO CHANGE

Proneness to change relates to the capacity of public administrations to deal with change for engaging in digital innovation and supporting innovation pathways through transitional dynamics. Nurtured by a transition management perspective, it encompasses different levels:

- the strategic level in terms of problem structuring and the definition of long-term goals related to specific and urgent societal challenges;
- the tactical level, referring to agenda-setting, partnership development, and networking;
- the operational level, related to actual experimentation and implementation of innovative policies, practices, and tools.

City202 has an overall **great** proneness to change, stating its inclination or readiness to change and alter its behaviour, vision, procedures, and its preparedness to integrate and amplify innovations. *Proneness to change* contains two dimensions: *Innovation governance* and *Change management*, which are explored in the following.

INNOVATION GOVERNANCE

Innovation governance refers to the way in which the public authority uses transversal administrative processes as levers to promote cross-sectoral digital innovation. The dimension is looked through four lenses: societal engagement, institutional capacity, public procurement, and data management, which are explored in the following.

City202 has an overall **great** level of innovation governance.

SOCIETAL ENGAGEMENT

Societal engagement measures how the public authority entails and encourages the active participation of different actors and stakeholders in public decision-making processes, and their partaking in co-design and co-creation activities to generate public value. It considers the public administration's commitment to implement innovative bottom-up initiatives encouraging the inclusion of society in developing innovation in a more transparent, interactive, and responsive way. Consequently, it provides an overview of the intensity and level of digitalisation of societal engagement initiatives, and their impact on public service design and innovation.

City202 has an overall **good** commitment to involve and communicate with its citizens.

Co-creation

Co-creation refers to citizens' participation in devising public services with the purpose of tackling societal challenges, better aligning to the goals of the different actors involved and meeting social demands. As such, it concerns the attitude and capacity of the public authority to effectively plan the active participation of citizens in conceiving, designing, and developing services and innovative solutions. In this regard, **City202 noticeably involves** citizens in co-creation activities, and **provides impressive opportunities** to engage citizens in (open) data initiatives. Moreover, it adopts a citizen-centric approach when planning new services or updating existing ones with **a remarkable** involvement of minorities. Among the purposes that spur **City202** to collaborate with the local ecosystem, there is indeed the aim of co-creating services and outcomes with business and citizens. Finally, data about the use of the service **is largely exploited** to design or improve the digital service offer.

E-participation

E-participation stands for electronic participation, and it refers to ICT-supported participation in processes which involve citizens and government. Among the others, it denotes the inclusion of all stakeholders in democratic decision-making processes. Particularly, e-participation entails engaging citizens at different levels by digitalising processes such as co-creation, public consultations, debates, petitions, and voting. Moreover, it also considers the outreach of participatory services such as crowdfunding, crowdsourcing, and crowdmapping.

City202 has a **great** level of involvement of the citizens reached by the municipality via digital channels. It **uses a significant number of** platforms to actively engage with citizens, reaching out to a percentage of the involved population that is **above 5%**. Ultimately, **City202 engages** citizens in producing data through initiatives such as crowdsourcing, crowdmapping, or citizen science activities.

Social media presence

Over time, social media and their platforms have evolved from being a means for regularly engaging with small circles of close-by persons to one of the most common and primary forms of communication. Their inherent features significantly encourage users to go beyond engagement, sharing their opinions on civic and political issues.

Concerning its presence on social media, **City202 manages its own official page or profile**. In its most successful institutional social media profile, it used **5 channels** to reach out to the population. This considered, the level of *Social media presence* is **excellent**.

INSTITUTIONAL CAPACITY

Institutional capacity is strongly related to transformation drivers, organisational ones included, influencing the adoption and management of digital technologies. It entails both training and educational activities put in play to enhance the digital skills of civil servants. Moreover, it affects the proneness of public administrations to enhance and mobilise their organisational and technological resources through the adoption of ICT technologies or the modification of internal rules and procedures. *Institutional capacity* considers therefore dimensions as *Innovation strategies*, *Proneness to experiment*, *Skills* and competences related to both digital management and information, and communication technology. In this regard, **City202** has an overall **fair** capacity to experiment and consolidate digital innovation.

Innovation strategy

Digital innovation or digital transformation strategies are intended to encourage faster and better ways to perform, better exploiting technology for processing and computing, increasing accessibility to information, speeding up procedures, making them automated and reducing errors. **City202** has a **high** orientation to innovation.

City202 has published but needs to renew a digital innovation strategy, which **is a joint strategy with other cities**, and **is linked** to regional, national or European regulatory frameworks, strategies, directives.

There is a **Chief Digital Officer, internal or shared with other public authorities**, coordinating the implementation of the digital innovation strategy, with **some budget dedicated**.

In terms of funding sources for digital innovation, the public authority **reaches out to a proper amount of funds**. Moreover, **City202** has a **dedicated ICT team supporting one or more departments and services**; it **encourages** the use of Free/Libre and Open Source Software (FLOSS).

Proneness to experiment

Being prone to innovate and experiment is a key factor of value creation for the public sector, contributing to increasing public administrations' competitiveness and welfare. The predisposition and openness to experiment, to conduct public research and development expenditure, and to invest in technological innovation impact on the level of innovativeness of an organisation, determining its ability to reach more desirable outputs and outcomes.

City202 has a **good** level of readiness to experiment new organisational settings and methods relevant for supporting digital innovation. **City202 supports innovation** by funding public procurement procedures (Pre-Commercial Procurement or Public Procurement of Innovative Solutions) with internal resources.

Taking into account the propensity towards considering and implementing new technologies, transversally to the service areas, there is a **good** attitude towards the application of AI technology, and a **discrete** tendency to apply IoT. Moreover, **City202** has a **small** propensity towards the adoption of blockchain, is **slightly** prone to apply wearable technology, and has a **still small** capacity to adopt robotics.

A fundamental role is then played by ecosystems of innovation, such as living labs, civic hackerspaces, and makerspaces, as spaces where the encounter of actors with various competences and scholarship paves the way for capacity building and knowledge transfer. Such ecosystems have the ability to engage and actively mobilise actors, assets, and relationships shaping a supportive and empowering space for innovation where communities collaborate to generate, test and scale solutions to answer societal challenges. **City202** shows its proneness to experiment by establishing environments that set favourable conditions for enabling proficuous interactions, boosting innovation to various extents.

Ultimately, **City202** collaborates with the local ecosystem for testing innovative solutions.

Skills

Digital skills are central in the digital transformation of the public sector, playing a fundamental role in the management of digital innovation within the public authority. **City202** has a **good** availability of skills key to the management of digital innovation.

The digitalization of the public sector puts growing attention on the acquisition of open-source software as well as on the publishing of all the developed software in open source. Reusing software prevents duplication of expenditures, encouraging the consolidation of more mature and shared solutions. The ability to advance existing shared software rather than aiding the diffusion of lock-in solutions or the purchase of licences helps a sustainable common growth, reducing information asymmetries among public administrations. In this regard, the IT set-up of **City202 offers** the possibility to implement open source alternatives, and ICT training to its employees **is provided with various courses on basics, management of data and complex digital service infrastructures, and specialised platforms**.

Advancing this reasoning, **City202 does not have** an in-house e-procurement platform, which shows the public authority's capacity to develop and/or manage a tool to autonomously support the sale and purchase of supplies, commodities, technology or services, without the support of an outsourced service. Public procurement for purchasing innovative digital services or goods needs to take into account and exploit the potentials of digital technologies. While instructing tenders, **City202 includes** requirements related to open standards/APIs and specific technical specifications, in addition to possible data sharing agreements. The inclusion of these requirements contributes to counter proprietary software and the restrictive copyright licensing it entails, favouring accessibility, sharing and re-usability of data.

PROCUREMENT

Procurement refers to techniques, structured methods, and means used to streamline an organisation's procurement process and achieve desired results while saving cost, reducing time, and building win-win supplier relationships. It is one of the main demand-side innovation policies to adopt innovative goods and services. In this sense, **City202** has **good** innovation proneness toward the development and application of public procurement processes.

The municipality runs Pre-Commercial Procurement with **its own resources** in addition to standard procurement procedures, and it runs Public Procurement of Innovative Solutions (PPI) with **its own resources** in addition to standard procurement procedures. Then, **City202 seems not to procure** innovative digital services and goods together with other public authorities, for example through Joint Procurement.

It mainly chooses such procedures because they allow to reduce administrative expenses, since the work for the authorities involved in preparing and carrying out one tender rather than several is substantially reduced; moreover, they represent a very effective way of encouraging the market for more environmentally sound products and services. Such procedures allow public authorities to be compliant to solutions and standards adopted by other related public institutions.

Then, **City202** instructs tenders **not yet including** requirements of open standards/APIs and specific technical specifications, the use of Free/Libre Open Source Software.

For the development of innovative solutions, **City202 cannot** rely on an e-procurement platform, favouring strategic purchasing, ensuring higher control on procedures, increased flexibility and conformity to policies. The presence of an e-procurement platform enables the public authority to autonomously find, buy and manage the expenses for goods and services entirely online, supporting the management and definition of supplier policies while offering a greater level of transparency in the system.

DATA MANAGEMENT

Data is one of the most valuable resources in today's societies, economies, and governments, leveraging multi-level development. Coherently, effective data management strategy is becoming more and more an imperative towards better public services. Data is a powerful asset to guide governments to better design and tailor their processes of public service delivery. In this regard, **City202 has a good** data collection, management, and use capacity.

The fast evolution of technologies continuously offers novel opportunities towards digital government, as well as towards transparency and openness. The production and access to data, services, and contents play a relevant role in digital transformation and maturity processes. They are enabled and facilitated, for example, by the presence of data platforms, the adoption of strategies for data use and reuse, and the presence of open data principles common to several governmental institutions. Accordingly, *Data management* is explored through five dimensions: *Data platform*, *Data use*, *Data strategy*, *Open data*, and *Big data*.

Data platform

A data platform is a software platform used to manage and publish on the web the data collected and generated by public authorities or by different stakeholders of the city ecosystem, as for example public agencies, businesses, citizens or other organisations. The presence of a data platform mirrors an attention towards data sharing on the one side, and data management on the other. Indeed, the data platform can have functions that allow advanced data management, analysis, and visualisation. **City202 has a good** capacity of managing and sharing data among multiple stakeholders. It **uses** a data platform to collect, manage, publish and share data. City202 has a centralised data platform with limited or no documentation available supporting the access and use. Limited real-time and static data available in a range of formats, while static data are refreshed at suitable intervals. The quality control of data is limited. Moreover, data platform can also go beyond data collection, allowing additional functions. In particular, data analysis, supporting sense-making of data; data visualisations, for example through dashboard; favouring at different levels the understanding of data. In terms of provision, data is collected by the public authority, from national public administrations, from regional public administrations, from utility companies, and is integrated and managed in the platform. Such data is **consistently** gathered throughout different service areas.

Data use

Data is recognised as a strategic asset that can be leveraged to pursue public value. From an operational perspective, data can be employed for purposes, among the others, of evaluation and monitoring, delivery, and anticipation and planning. *Data use* explores this dimension observing how data are used by the public administration. **City202 has an average** ability to exploit data in this direction.

City202 applies the once-only principle in its services, positively impacting the usability of services with the possibility to ensure that citizens, institutions, and companies only have to provide certain standard information once. With regard to data management, **City202 adequately encourages** data re-use, and data **does not seem to be** re-used to create new services or solutions. Ultimately, data about the use of the service is gathered **and**

it is mainly used to design or improve the digital service offer, and end-users' evaluations on services are regularly used to improve or update the services provided.

Data strategy

The use of data for public services can provide more efficient, effective and trustworthy service provision. Hence the relevance of defining and embracing governance models setting appropriate and favourable conditions for data-driven, data-informed, or data-aware decisions and services for creating public value. **City202** has a fair ability to strategically plan the use and features of data.

It applies a data governance strategy for standardised real-time and/or static city data. In the direction of increasing usability and reusability of data, enhancing the ability of tools to automatically find and use data, in addition to supporting its reuse by individuals it is partially applying the FAIR principles, and has already developed an interoperability framework or strategy for advancing data sharing.

Finally, the recognition of the monetary value of data and big data pave the way to financial and economic arrangements and agreements, and occasionally even allow capturing revenue streams. In this regard, **City202** has a limited quantity of business models supported by the Data Platform.

Open data

The *Open data* dimension measures the ability of the public authority to adopt and operationalise principles and framework for open data that are meant to improve performance and efficiency of government services in general. In this regard, **City202** has a discrete approach.

The term open data, or Open Government Data identifies the information collected, produced, or paid by the public bodies and made freely available for re-use for any purpose, under licences which specify the terms of use. By sharing their datasets under open licences, public institutions are improving the availability of datasets for citizens, associations, innovators, and other stakeholders. **City202** has a very high accessibility level of data, and it adopts at least one creative common licence to openly publish its data, allowing reuse without limitations, or at the condition that appropriate credit is given to the creator of the dataset, and changes made are indicated.

Open data is ruled by principles and framework built on the fundamental pillars of transparency, reproducibility, and reusability. The advantages of open data are numerous, ranging from greater public administration efficiency to private sector economic growth to increased social welfare. To favour good data management and stewardship for integration and reuse of published data by the community, and beyond it, to apply sharing principles also to the algorithms, tools, workflows, and the overall pipelines that led to that data, **City202** applies FAIR principles, granting a very high degree of accessibility.

City202 seems not yet to be adopting a data governance strategy that holistically manages the collection, storing, and sharing of city-related data. Such a strategy would allow data to be automatically standardised and validated, also promoting innovative data collection mechanisms such as crowdsourcing and sensing for predictive modelling. Ultimately, it should provide multiple stakeholders with integrated access.

Increased efficiency in public service operations and delivery can be gained through cross-sector data sharing. Easier and improved access to information, resources, and expertise can favour the economical sustainability of service provision, allowing for the development of innovative services and the introduction of new business models. In this regard, **City202 limitedly exchanges data** among its service areas, departments, or units. Moreover, various stakeholders can be actively encouraged to use and re-use available data to various extents. From the creation of partnerships, challenges, hackathons and other open innovation practices, to forming selected partnerships with other public or private stakeholders. A possibility that **City202 is adequately pursued, showing good capacity to encourage data re-use.**

Ultimately, more transparent and accessible information can favour social welfare. Encouraging the development of an open, trustworthy data ecosystem can empower both people and the public sector to make better decisions using data while managing possible harmful impacts. Collaboration, participation, and social innovation are indeed all aided by open data, leading to the benefit of society. In this direction, **City202** engages citizens in open data initiatives.

Big data

The potential of big data in the public sector is enormous. Governmental daily activities such as those related to the management of social benefits, the collection of taxes, national health and education systems, traffic monitoring, and the issuing of official documents generate vast amounts of data. Furthermore, sensors can collect massive amounts of data. Such data can be used for creating more efficient and effective policies, for prediction

of behaviours or events, such as crime or fires. *Big data* specifically observes the attitude of the public administration towards the use and production of big data, and their relation to service areas, and finally the presence of agreements for their production or purchase from third parties. In this regard, **City202** has a **great** capacity to generate, manage and use Big Data. It **has** access to big data through agreements with third parties, and it **is** using or producing Big Data, which **is largely produced** by service provision. **City202** has a **very limited** usage in service analytics. Moreover, real-time big data **is mostly used** for service provision and **seems not to be published** on the Urban Data platform with related analytics.

Finally, real-time big data **is largely used** in its own service provision, and **it seems not to be** used for analytics.

CHANGE MANAGEMENT

Change management refers to the capacity of public administrations to put in play a set of actions, norms, policies, and tools either to proactively support innovation in digital service development and provision, or to increase its capacity to detect and adopt innovation dynamics developed in different contexts. The notion implicitly acknowledges that innovation can originate either within the institution or within specific service domains. Accordingly, it relies upon the capacity of the organisation to adapt its procedures adjusting to internal and external circumstances, and to create spaces for other agents to engage in processes of governance innovation. Moreover, it is relevant the capacity to include and implement innovative bottom-up initiatives in a strategic way, considering and coordinating different levels of governance that nurtures new interactions and cycles of learning. Encouraging a knowledge economy that spreads across university, industry, government, civic society, and environment, favours the development of a rooted orientation to innovation.

In measuring the inclination or readiness of the public authority to evolve and alter its behaviour, vision, procedures, and its preparedness to integrate and amplify innovations, three key features are examined:

- *Context empowerment*, as the capacity to apply logics of replication and dissemination, increasing the quantity of people or communities impacted;
- *Replication and diffusion*, as the capacity to impact relationships, cultural values and beliefs, since change is deeply rooted in people, relationships, communities and cultures; and
- *Organisational readiness*, as the capacity to change at the level of policy, rules and laws.

Looking at these three features together, it is possible to gain an understanding of the complex, complementary and systemic nature of the strategies involved in advancing large and multi-level structural change. Strategies which require flexibility, adaptiveness, and proneness to learning while being context-aware and context-sensitive.

In general, **City202** has **an acceptable** effectiveness in managing strategies implemented to ensure impacts within the organisation, in the context, as well as towards and from other contexts. In the following the three scaling mechanisms are explored, showing how together they provide relevant insights on the socio-technical implication of digital innovation and transition, as well as on the multi-layered changes, transformations, learning dynamics underlying its implementation.

CONTEXT EMPOWERMENT

Context empowerment refers to the ability of the public authority to instil cultural values oriented to innovation and change and encourage the development of sustainable relationships among the actors of the local ecosystem. In this regard, **City202** is **very** effective in developing strategies able to trigger innovation within the local context, both at a social and cultural level.

City202 is directly involved in ecosystems for innovation together with other actors of the quadruple helix, namely academia, industry, public sector and civic society by **involving a remarkable variety of** organisations among living labs, fab labs, civic and hackerspaces, maker spaces, incubators, and research and technology centres as spaces where interactions among different actors favour innovation, capacity building and also knowledge transfer. Such ecosystems have the capacities to adopt and improve innovative solutions developed in, by, and for other contexts, as well as to exporting solutions in logic of replication and diffusion.

Moreover, to various extents, **City202** collaborates with the local ecosystem for widening the digital literacy by providing education and training to local stakeholders and actors; promoting the ecosystem (creation of new firms and support to industry growth); guaranteeing large adoption of digital public services; improving trust, security and accountability; ultimately keeping the organisations embroiled in the innovation loop.

In addition, **City202 adopts** a citizen-centric approach, ensuring the inclusion of citizens when planning new services or updating existing ones. The attitude of engagement that is also mirrored by the adoption of multilingual options in the service provision and delivery. The linguistic barrier is unquestionably one of the most critical barriers to access to public services for migrants, resulting in an obstacle to exercise their rights and contributing to social exclusion.

REPLICATION AND DIFFUSION

Replication and diffusion is related to the ability to replicate and disseminate innovation, succeeding in the attempt to impact a larger number of citizens or communities. This mechanism lies on the fact that innovations developed by one public body can grow and be adopted by other public organisations, facilitating a digital innovation on a broader scale. A digital innovation strategy can indeed be instructed with different governance policies, from a strategy covering a single public administration, to a joint strategy serving multiple cities, also going beyond the county borders. In this perspective, **City202 is significantly** effective in developing strategies that ensure replicability in other contexts of solutions experimented locally.

Specific strategies can be put in place to manage digital innovation, also considering the possibility to cover more administrations in the attempt of sharing solutions and benefitting from expertises otherwise not present within the body. In this regard, the governance of the innovation strategy of **City202** covers only one public administration. In this regard, the governance of the innovation strategy of **City202** extends beyond the border of its administration with a joint strategy for the entire Metropolitan area. In this regard, the governance of the innovation strategy of **City202** extends beyond the border of its administration with a joint strategy for multiple cities in the Country. In particular, **City202 greatly** benefits from importing and adopting solutions developed by other public authorities, and it takes **large** advantages from exporting and sharing digital solutions developed to other public authorities. In addition, **City202 makes great** use of digital solutions designed and developed in cooperation with other public authorities. These strategies can be aided by participation in larger networks, which encourage exchange of resources and solutions. In this respect, **City202 plays a leading role** in networks of cities sharing operational digital solutions or open source code(s) at a local, regional, national and/or international level. Moreover, **City202** collaborates with the local ecosystem and formalises agreements with its different actors, creating more connected and efficient ecosystems able to sustain mechanisms of scaling, encourage innovation and stimulate cooperation among multi-level actors at the different scales of local, regional, and national. In terms of development and maintenance, **City202 applies** the Standard for Public Code, which is a set of criteria that support public organisations providing policy makers, city administrators, developers and vendors with guidance for enabling successful reuse of open source code(s) and software developed by other public administrations.

Moreover, to deliver better services, especially exploiting technological advancements, a further relevant dimension regards the ability to develop solutions in cooperation with other public authorities, transversally to its services, **which are seldom secured** by combining the procurement actions of two or more contracting authorities.

City202 seems not to rely upon a Chief Digital Officer to better support the replication and dissemination of innovation by leading the strategic management of digital policies.

City202 is engaged in ecosystems of innovation where knowledge and know-how are shared among the actors of the so-called *quadruple helix*, namely academia, industry, public sector and civic society. Ecosystems of innovation are loosely interconnected networks where various entities coexist creating an active flow of knowledge and information, resources, technologies, and skills. Ecosystems of innovation such as digital innovation hubs and EU policy labs allow for experimenting with innovative solutions originally developed in, by, and for other contexts, as well as to export their solutions, in a logic of replicability and diffusion. The ecosystem of innovation of **City202 includes digital innovation hubs or policy labs**.

In this framework, to various extents, **City202** collaborates with the local ecosystem for formalising agreements with other innovation ecosystem actors.

ORGANISATIONAL READINESS

Organisational readiness refers to the institutional capacity to change for better including and nurturing digital innovation in the public sector, leading the way to greater impact that impacts on law and policy. It is based on the fact that the digital transformation of the public services impacts the public authority and requires adaptation, adjustment and renovation of its organisational structure. To support and manage innovative service development and provision, public authorities need to master digitalisation and innovation governance processes. As such, digital transformation is a driver of change that is bound to long-term organisational change within public sector organisations. Considering this mechanism, **City202 is fairly** prone to facilitate digital innovation through organisational changes and restructuring.

In seeking to achieve digital service innovation, the public sector needs to embrace a holistic view of innovation to effectively navigate the unceasing changing technological landscape. The presence of a digital innovation strategy indicates the readiness of the public authority to face the challenge and better orient its efforts. In this regard, **City202 has already published a digital innovation strategy, but it needs renewal.** Moreover, among the most relevant aspects playing a crucial role in effectively driving and supporting innovation, there is the presence and acquisition of adequate digital skills that underpins continuous learning and progress within the organisation, securing the ability to dynamically leverage and steadily include technological novelties and advances. To support this and bring skills and expertise within the public administration, joint procurements can be used to activate contracts among authorities, leading to sharing resources among different organisations. A practice that **City202 is not yet exploiting.** In such a direction, where overcoming a siloed mentality is a fundamental premise, a relevant role is played by policies and practices for managing, sharing, using and reusing data. **City202 seems not to encourage** data sharing and reuse, ICT platform sharing, cooperation among teams from different service areas, and collaborative service design with incentives.

City202 has the tendency to interact and synergize with the local ecosystem, **already involving different actors of the quadruple helix.**

This proves that **City202** already has motivation, general organisational capacity, and intervention-specific capacities for considering and involving the local ecosystem. Such an interaction allows better facing existing challenges for the benefit of the society – including the green, digital, and social transitions. Among the purposes for collaboration: guaranteeing complementary education and training to public employees; affecting policy making for innovation; getting support for innovation procurement; testing innovative solutions in the public authority; co-creating city services and outcomes with business and citizens; the result is a cooperative attitude that contributes to an effective change.

Further exploring this dimension, when planning new services or updating existing ones, **City202 adopts** a citizen-centric approach. It allows the public authority to better understand and answer with its service provision to the needs of citizens, identifying real needs as starting points for targeted and more effective service-delivery improvements. The adoption of a citizen-centric approach, in fact, requires a relevant organisational and decision-making effort.

DIGITAL SERVICE INNOVATION MATURITY

Digital technologies are deeply affecting people's lives in general, and how people interact with public infrastructures in particular. These technologies, their growing availability and performances, the wide use of data, the wide offer of services provided by a large variety of actors are reshaping the value supply chain of public service and the associated concept of public good. Given this premise, *Digital service innovation maturity* focuses on the degree of penetration and maturity of technical and organisational innovation in public service delivery, analysing to what extent the creation and implementation of digital innovations can lead advancement in technological infrastructuring, and bring changes in the structures, practices, values and culture of public administrations. Therefore, *Digital service innovation maturity* analyses on the one side the dimensions of the *Digital maturity* of a public administration, and on the other, its *Level of service embedment*.

City202 has an overall **average** degree of penetration and maturity of technical and organisational innovation in public service delivery. In the following, the two dimensions of *Digital maturity* and *Level of service embedment* are explored.

DIGITAL MATURITY

In this context, *Digital maturity* mainly attains to the extent to which public administrations embrace new digital technologies and deliver innovative public services. It considers the distinction between mature and emerging technologies, acknowledging that the latter play a relevant role in describing the extent to which the public authority is challenged while developing new services. Digital maturity assesses the level of digitalisation of the public authority, intended not only as a shift toward digital technologies, but also encompassing the related organisational change. In this regard, **City202** has a **medium** level of digital maturity.

Digital maturity is approached by looking at three specific but interdependent dimensions:

- *Digitisation* focuses on the degree of converting information and pre-existing internal procedures of either ancillary or directly related to public service delivery into a digital format;
- *Innovative technologies* explores the degree of adoption of innovative technologies (AI, blockchain, wearables, etc.);
- *Advanced methods and principles* analyses the level of consistency of methods and principles used to increase the digitalisation level of the public authority.

DIGITISATION

Among the most important barriers to digital transformation and innovation is the presence of unshared information and knowledge about how to manage structural and cultural barriers. A siloed-mentality often stalls digital transformation and innovation by maintaining know-how and expertise within departments or units, limiting or impeding collaboration, integration, and optimal exploitation of resources. Moreover, it causes gaps and inefficiencies that have an impact on both governments and citizens. Data sharing can largely contribute to overcome such an isolation attitude that nurtures legacy system silos by opening up for broader and cross-sector applications. Digitalisation processes can support overcoming rigid organisational arrangements, favouring the sharing of knowledge within the institution and steering its digital endeavours strategically.

Digitalising services helps governments and public authorities meet citizens' expectations towards improved efficiency and resilience. The benefits lie in the fact that digital interactions diminish efforts for both citizens and public authorities, being less time-consuming and reducing administrative burden. However, to create seamless and satisfying experiences, public authorities need to undergo a challenging process of transformation. In light of this reasoning, it is considered the degree of digitisation of pre-existing internal procedures either ancillary or directly related to public service delivery. In this regard, **City202** has a **high** level of digitisation.

Overall, the services provided by **City202** across its service areas are **largely** digitalised. In particular:

- **No service area seems to provide digital services, preventing citizens the possibility to interact remotely and autonomously with the public authority;**
- **Across all service areas, digital services are provided for internal use only, requiring citizens to physically reach the public authority for the fulfillment of all services;**
- **All service areas provide digitized ancillary services (e.g., booking, payment, unique access point), giving a complete possibility to fulfill them remotely;**
- **Some service areas deliver the majority of its service digitally, favouring accessibility by allowing remote interaction.**

In the following the service provision of **City202** by service areas is compared with the value that occurs most frequently (mode) in the overall population observed:

- In the area of general services or administration, for **City202 the majority of the service provided are fully delivered digitally;** in the overall population **the majority of the ancillary services are digitized;**
- In the area of building and spatial planning services, for **City202 the majority of the ancillary services are digitized;** in the overall population **the majority of the services provided by the sector is digital only internally to the public administration;**
- In the area of culture and leisure, for **City202 the majority of the ancillary services are digitized;** in the overall population **the majority of the ancillary services are digitized;**
- In the area of education, for **City202 the majority of the ancillary services are digitized;** in the overall population **the majority of the services provided by the sector is digital only internally to the public administration;**
- In the area of healthcare, for **City202 the majority of the ancillary services are digitized;** in the overall population **the majority of the services provided by the sector is not digital;**

- In the area of order and safety, for **City202 the majority of the ancillary services are digitized**; in the overall population **the majority of the services provided by the sector is digital only internally to the public administration**;
- In the area of social and welfare services, for **City202 the majority of the service provided are fully delivered digitally**; in the overall population **the majority of the services provided by the sector is digital only internally to the public administration**;
- In the area of transport and mobility, for **City202 the majority of the ancillary services are digitized**; in the overall population **the majority of the ancillary services are digitized**;
- In the area of utilities, for **City202 the majority of the ancillary services are digitized**; in the overall population **the majority of the ancillary services are digitized**.

In the case of services provided both offline and online, **almost all users opt** for digital solutions. The following reports for each service area the detail on how many users chose the digital option when available:

- **A majority** in the area of general services or administration of **City202**. **"A majority"** is the value that occurs mostly in the overall population;
- **A majority** in the area of building and spatial planning of **City202**. **"A majority"** is the value that occurs mostly in the overall population;
- **A majority** in the area of culture and leisure of **City202**. **"A majority"** is the value that occurs mostly in the overall population;
- **A majority** in the area of education of **City202**. **"A majority"** is the value that occurs mostly in the overall population;
- **A majority** in the area of healthcare of **City202**. **"Not applicable"** is the value that occurs mostly in the overall population;
- **A majority** in the area of order and safety of **City202**. **"Not applicable"** is the value that occurs mostly in the overall population;
- **A majority** in the area of social and welfare services of **City202**. **"A minority"** is the value that occurs mostly in the overall population;
- **A majority** in the area of transport and mobility of **City202**. **"A majority"** is the value that occurs mostly in the overall population;
- **A majority** in the area of utilities of **City202**. **"A majority"** is the value that occurs mostly in the overall population.

A further element that increases the accessibility to services is their provision in multiple languages; a feature that consents to overcome or mitigate the language barrier, supporting a wider audience. In this regard, **City202 already provides automated translations in various languages relying on** free, easy, and secure translation tools, as for instance CEF eTranslation by the European Commission, consenting to overcome or mitigate the language barrier. The level of digital maturity is indeed also proven by the ability to embed innovative technologies to provide better services.

INNOVATIVE TECHNOLOGIES

The introduction and effective adoption of innovative technologies such as AI, blockchain, wearables, and so on, provide institutions with higher transformative potential. Most Countries are taking action to stimulate the use of innovative technologies in their public services. In this regard, **City202 has a narrow** degree of adoption of such technologies. Focusing on their planning or implementation in public services, **City202 is limitedly** considering AI technology, is **moderately** considering IoT, is **limitedly** considering blockchain, is **very shortly** considering wearable technology, and is **limitedly** considering robotics.

When it comes to managing the digital transformation, another relevant innovative technology is data modelling, as the process of examining datasets to derive conclusions from the information they contain.

Across its whole service areas, **City202 slightly** employs integrated data modelling functions, such as Local Digital Twins or similar, to visualise policy scenarios, and **rarely** uses it to predict policy impacts. Moreover, a **limited** use of such technology is made to evaluate policy options. Finally, in respect of the monitoring of policy impacts, the integrated data modelling function finds **a high** degree of adoption.

Based on the reasoning presented above, **City202 has planned the integration of** the Data Platform with data modelling functions for real-world experience, such as Local Digital Twins or similar. By producing a virtual representation of assets, processes and systems as models where entities are related to data as well as to their context, data modelling functions require a supportive organisational culture, together with adequate institutional capacities, such as data analytics and machine learning skills to govern the simulation models and turn data into useful knowledge.

ADVANCED METHODS AND PRINCIPLES

Digital transformation is radically affecting service delivery practices, and advanced approaches raised citizens' expectations regarding the access to information. In parallel, they are encouraging the public authority to progressively rely on standards and shared solutions for an open governance, in order to encourage an optimised management and re-use of resources. This dimension analyses the consistency of the methods and principles used to increase and better orient digitalisation in the public sector. **City202** has a **significant** capacity to embed and make use of methods and principles for sustaining its digital innovation. Concerning this, effective strategies regard the sharing of digital solutions, services or products with other public authorities. **City202 has a significant** propensity towards importing and adopting solutions developed from other public authorities, while it **largely exports and shares** the digital solutions it develops. The tenders for procuring innovative solutions are instructed **considering** open standard and open source requirements. Preferring open standards and open-source solutions feeds forward-looking practices of data sharing and data re-usability. City202 may consider the use of open standards and open source solutions, since it encourages data sharing and data re-usability, while the use and contribution to develop open-source software can increase public trust in the software. Interoperability as the ability of services to communicate among each other is crucial to make services more sustainable and even seamless. However, a set of good practices need to be implemented: from the use of standards for data and sharing collection, to the availability of information in multiple languages and procedural transparency. In this regard, **City202 is already adopting** interoperable digital solutions or services.

To further streamline operations exploiting EU-wide services available on the market, public administrations need to consider the provision of cross-border and cross-sectoral public services. Interoperability is a crucial aspect of digital innovation, allowing to harmonise, share, and integrate solutions among different institutions. To sustain and enhance interoperability at the EU level, the Commission dedicated spending programmes, such as the ISA² programme and the Connecting Europe Facility (CEF) Digital Building Blocks. Finally, when it comes to the design and development of digital solutions, an added value derives from uptaking solutions developed by other public authorities and including strategies to synergise with other initiatives. **City202 mostly opts** for successful partnerships, namely cooperating with other public authorities, sharing intellectual capital and skills for a common goal. As a result, interoperability contributes to reducing redundancy and better exploiting innovation present in the EU landscape.

Moreover, **City202** has a **positive** attitude towards the use of open source software, and it **sustains** its IT department in implementing alternatives. In addition, it **already uses** standards for public code, which can be considered as an investment in public infrastructure. The adoption of such standards for public code reflects the capacity of the public authority to favour the development and maintenance of software and policy together, towards higher quality services that are more cost effective, encourage reuse and sharing among public organisations, with less risk and more control.

In addition to this, **City202 applies** the once-only principle in its services, which is an e-government concept intended for ensuring citizens, institutions, and companies a one-time only provision of certain standard information to the public authorities and administrations. This is another method for favouring re-use and exchange of data, reducing the administrative burden on citizens and businesses.

LEVEL OF SERVICE EMBEDMENT

The *Level of service embedment* reflects the role played by the service in driving changes in public authorities. In this context, three scaling mechanisms are relevant and return a specific view on how organisations can effectively embed innovation in their service provision. In short:

- *Scaling out* indicates the public authorities' ability either in replicating successful service innovation from different contexts or in exporting innovative solutions experimented locally;
- *Scaling deep* reflects to what extent service innovation is widespread and ultimately able to foster behavioural and operational changes in the local context;
- *Scaling up* assesses the reach of public authorities' intrinsic innovative potential in terms of service development.

City202 has a **high** capacity to embed innovation in its service provision.

SCALING OUT

Scaling out reflects the public authority's capacity to replicate and transfer innovation, becoming a driver to the adoption/replication/exportation of innovative solutions and services respectively by/in/to other public organisations, either in case such solutions have been entirely and autonomously developed, or in case they are the result of a process of continuous improvement. In this respect, specific and dedicated experiences of sharing and collaborative networks play a crucial role, allowing public authorities to access a large variety of services and related solutions opportunities.

City202's attitude towards such a mechanism is **fair**. The dimension of *Scaling out* is also related to the ability of the public authority to effectively and actively support and incentivise data re-use, going beyond the exploitation within the public organisation. This can occur at multiple levels by defining selected partnerships with other public or private stakeholders. An attitude that **City202 already presents**, which is also reflected by the fact that it **does not seem to be** sharing data which is then re-used to create new services or solutions. In the frame of sharing digital solutions with other entities, **City202** embraces the practice of exporting and sharing what develops to other public authorities, in a logic of knowledge sharing.

SCALING DEEP

Scaling deep concerns the extent to which digital innovation has been integrated into service development resulting in actual adoption by users. This orientation comes with a level of changes in practices and behaviours that public authorities need to undergo in order to make service innovation effective in reaching the societal domain. This dimension is therefore related to the concept of context readiness, meaning that the public administration can effectively offer services able to answer context-related needs.

In this regard, **City202** has a **keen** capacity to embed digital innovation in services in a pervasive way, which generates changes in the local context, at the societal level. Relevant in this sense is the digital provision of services. Transversally to its service areas, **City202 provides the possibility to access services both offline and online, and the digital option is fairly choice. This attests an average ability to digitally implement service solutions.**

The scaling deep mechanism especially manifests by sharing data as potential knowledge and new practices with learning communities, facilitating and encouraging distributed learning through platforms and participatory approaches. **City202 already presents** such an attitude, which is expressed by actively encouraging stakeholders to use available data, for example through the creation of open challenges, hackathons and other innovation practices. Speaking of that, **City202 is already engaging citizens in (open) data innovation initiatives, also aimed at data production through, for example, crowdsourcing, crowdmapping, citizen science initiatives.**

SCALING UP

Scaling up refers to how the embedment of digital innovation into services implies organisational change, requiring organisational structures modifications, and revision of previous routines, practices, and even policies. To reach and guarantee an autonomous supply and provision of such services, public administrations have to undergo a process of adaptation and renewal. *Scaling up* reflects the degree and extent of completion of such a process.

City202's attitude towards such a mechanism is **excellent**.

This mechanism implies that innovative solutions and approaches are codified in organisational policies and institutions, hence impacting the institution at higher levels.

Over the years, the public sector enacted reforms to prioritise digitalisation aiming at enabling greater efficiency and effectiveness, investing considerable resources to encourage the adoption of practices able to make services

more responsive to citizens' needs. In this direction, the attempt to grant citizens with a wider accessibility to services can be supported by the adoption of a multilingual service provision, which **City202 averagely integrates by presenting multilingual options in some of its service interfaces.**

Moreover, citizens can be also empowered by having access to Open Data. This also includes the possibility to ask governments to increment the public datasets, providing more accurate information. **City202** shows to highly consider citizens' demand for datasets in addition to the ones already provided, demonstrating a great level of responsiveness towards requests from the context. In the changing data context, data are relevant means for assessing and measuring performance in service areas as well as to drive their development. These data can be provided directly by service users, often in real time, and they can be used for orienting the improvement of service delivery. In this direction, **City202 impressively collects** data or end-users' evaluations about the use of services aiming at using them for the design or improvement of the service, hence revealing its proneness to exploit relevant data in the service development.

Opening up and engaging in collaborations with other service areas to favour innovation, however, requires organisational and administrative changes. **City202 has largely been** committed to this practice.

City202 has largely been engaged in this typology of change that already underwent through the redesign of some administrative and/or organisational processes, which is now effective and being just maintained. Moreover, concerning the simplification of bureaucratic/administrative functions, changes **have been implemented and are currently being maintained.** In particular, digital innovation to enhance better collaborations implies changes that have been **implemented** as far as it concerns joining forces with other public service areas. Finally, the collaboration is **in progress** concerning the cooperation with non-public ones.

City75

DIGISER is an Espon Project that sets out to analyse the transformation of the public sector and its service provision through digital innovation by taking into consideration the diversity of the European territory in terms of socio-economic, cultural and environmental endowments in different cities (espon.eu/DIGISER).

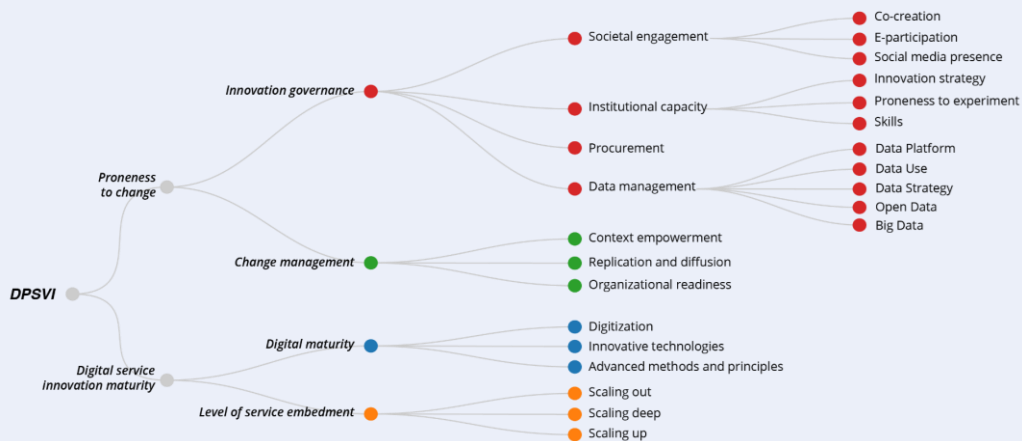
DIGISER develops the *Digital Public Service Value Index (DPSVI)* as one of its main outputs. It is a multi-level composite index that investigates the multidimensional digital transition processes occurring in the public sector, and aims at helping cities to improve their digitalisation effort. The project reached out to more than 230 cities across Europe that provided their data by filling a survey built on the DPSVI model developed within the project – and described in the deliverable available at the espon.eu/DIGISER page.

The *Digital Public Service Value Index* is conceptualised focussing on two main components: *Proneness to change* and *Digital service innovation maturity*.

Proneness to change is described analysing the propension towards the two dimensions of *Innovation governance* and *Change management*. *Digital service innovation maturity* is described through the *Digital maturity* and the *Level of service embedment* of the public authority.

Participating in the data collection, cities provided a relevant base of data and knowledge, on which to build for supporting future development, fostering digital transformation and encouraging the scaling of digital innovation at various levels. To support cities in situating their performances in the broader landscape, it has been developed a narrative approach that generates city profiles as semantic narratives. This city profile translates the values of the indices, sub-indices, and answers to specific questions provided by the public authority into a descriptive interpretation. It relies on the data provided by the cities for capturing and synthetically reporting on their performance in terms of digital transition and on their ability to orient such transitions to create public value. The public authority performances are mapped on ideal-typical behaviours defined *a priori*. Based on the best possible behaviour as observed in the literature, the city performances are measured on indices with a scale from 0 to 1, where 0 is the worst behaviour possible, and 1 is the best.

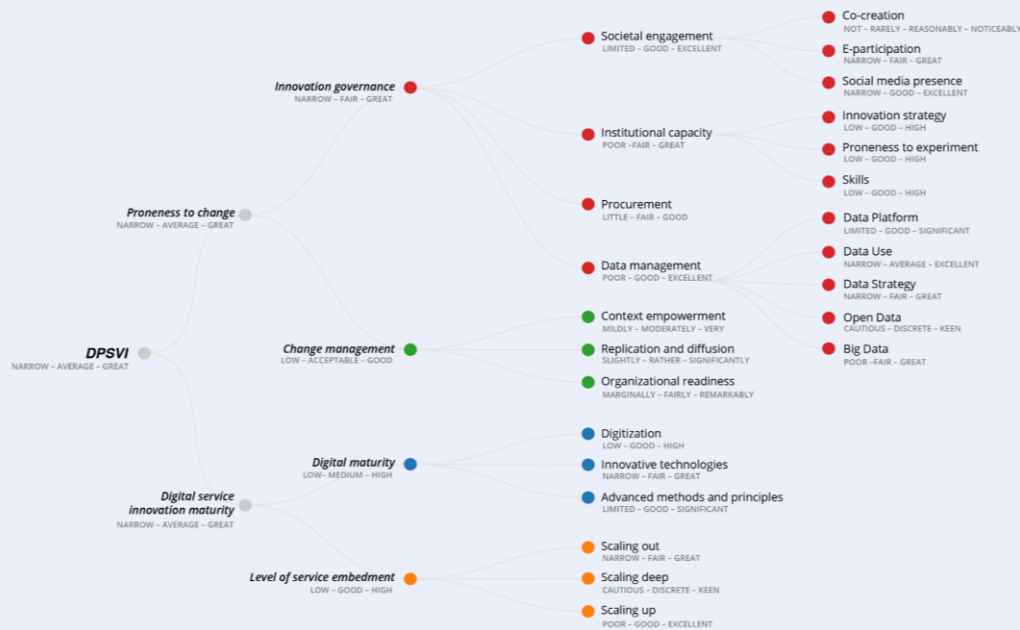
The following schema summarises the *Digital Public Service Value Index* and its multi-level components.



The values considered are computed following an ideal-typical analysis, where the focus favours an absolute assessment of the performances rather than a relative comparison. Indeed, the coding and standardisation of indices and answers are such that values 0 and 1 are attributed an absolute meaning, namely the lowest and highest possible performance that a public authority may stage. Indices and sub-indices as aggregation of data are produced through a standard weighted-averaging procedure. Consequently, the narrative feedback describes how **City75** is situated in respect to the behaviours and performances of the other public authorities that responded to the survey.

From a methodological perspective, data are associated with textual descriptions. When the data described is a value in a discrete or analogue scale from 0 to 1, the narrative output associates score ranges with texts relying

on a protocol that defines the segmentation of values. In general, low values are associated with cautiously negative adjectives; medium values with median to averagely positive adjectives; high values with positive adjectives. Given this premise, the schema below shows the segments and attributes associated with each index and sub-index.



Given this premise, **City75** has an overall **narrow** digital transitional capacity.

In the following, the report provides narrative feedback about the constitutive elements analysed, mapped, and computed to calculate the *Digital Public Service Value Index*.

PRONENESS TO CHANGE

Proneness to change relates to the capacity of public administrations to deal with change for engaging in digital innovation and supporting innovation pathways through transitional dynamics. Nurtured by a transition management perspective, it encompasses different levels:

- the strategic level in terms of problem structuring and the definition of long-term goals related to specific and urgent societal challenges;
- the tactical level, referring to agenda-setting, partnership development, and networking;
- the operational level, related to actual experimentation and implementation of innovative policies, practices, and tools.

City75 has an overall **narrow** proneness to change, stating its inclination or readiness to change and alter its behaviour, vision, procedures, and its preparedness to integrate and amplify innovations. *Proneness to change* contains two dimensions: *Innovation governance* and *Change management*, which are explored in the following.

INNOVATION GOVERNANCE

Innovation governance refers to the way in which the public authority uses transversal administrative processes as levers to promote cross-sectoral digital innovation. The dimension is looked through four lenses: societal engagement, institutional capacity, public procurement, and data management, which are explored in the following.

City75 has an overall **narrow** level of innovation governance.

SOCIETAL ENGAGEMENT

Societal engagement measures how the public authority entails and encourages the active participation of different actors and stakeholders in public decision-making processes, and their partaking in co-design and co-creation activities to generate public value. It considers the public administration's commitment to implement innovative bottom-up initiatives encouraging the inclusion of society in developing innovation in a more transparent, interactive, and responsive way. Consequently, it provides an overview of the intensity and level of digitalisation of societal engagement initiatives, and their impact on public service design and innovation.

City75 has an overall **limited** commitment to involve and communicate with its citizens.

Co-creation

Co-creation refers to citizens' participation in devising public services with the purpose of tackling societal challenges, better aligning to the goals of the different actors involved and meeting social demands. As such, it concerns the attitude and capacity of the public authority to effectively plan the active participation of citizens in conceiving, designing, and developing services and innovative solutions. In this regard, **City75 seems to not yet involve** citizens in co-creation activities, and **seems to not yet provide opportunities** to engage citizens in (open) data initiatives. However, it does not adopt a citizen-centric approach when planning new services or updating existing ones. The co-creation of services and outcomes with business and citizens is not yet one of the reasons that spur **City75** to collaborate with the local ecosystem. Finally, data about the use of the service **seems not yet to be exploited** to design or improve the digital service offer.

E-participation

E-participation stands for electronic participation, and it refers to ICT-supported participation in processes which involve citizens and government. Among the others, it denotes the inclusion of all stakeholders in democratic decision-making processes. Particularly, e-participation entails engaging citizens at different levels by digitalising processes such as co-creation, public consultations, debates, petitions, and voting. Moreover, it also considers the outreach of participatory services such as crowdfunding, crowdsourcing, and crowdmapping.

City75 has a **narrow** level of involvement of the citizens reached by the municipality via digital channels. It **seems not to use any** platforms to actively engage with citizens. Ultimately, **City75 seems not to engage** citizens in producing data through initiatives such as crowdsourcing, crowdmapping, or citizen science activities.

Social media presence

Over time, social media and their platforms have evolved from being a means for regularly engaging with small circles of close-by persons to one of the most common and primary forms of communication. Their inherent features significantly encourage users to go beyond engagement, sharing their opinions on civic and political issues.

Concerning its presence on social media, **City75 manages its own official page or profile, and is present on a limited number of channels**. In its most successful institutional social media profile, it used **one channel** to reach out to the population. This considered, the level of *Social media presence* is **good**.

INSTITUTIONAL CAPACITY

Institutional capacity is strongly related to transformation drivers, organisational ones included, influencing the adoption and management of digital technologies. It entails both training and educational activities put in play to enhance the digital skills of civil servants. Moreover, it affects the proneness of public administrations to enhance and mobilise their organisational and technological resources through the adoption of ICT technologies or the modification of internal rules and procedures. *Institutional capacity* considers therefore dimensions as *Innovation strategies*, *Proneness to experiment*, *Skills* and competences related to both digital management and information, and communication technology. In this regard, **City75** has an overall **poor** capacity to experiment and consolidate digital innovation.

Innovation strategy

Digital innovation or digital transformation strategies are intended to encourage faster and better ways to perform, better exploiting technology for processing and computing, increasing accessibility to information, speeding up procedures, making them automated and reducing errors. **City75** has a **low** orientation to innovation.

City75 does not seem to have formally approved and published a digital innovation strategy.

There **is not a Chief Digital Officer** coordinating the implementation of the digital innovation strategy, with **no dedicated budget assigned**.

In terms of funding sources for digital innovation, the public authority **reaches out to a proper amount of funds**. Moreover, **City75** has **a dedicated ICT team supporting one or more departments and services**; it **does not seem to encourage** the use of Free/Libre and Open Source Software (FLOSS).

Proneness to experiment

Being prone to innovate and experiment is a key factor of value creation for the public sector, contributing to increasing public administrations' competitiveness and welfare. The predisposition and openness to experiment, to conduct public research and development expenditure, and to invest in technological innovation impact on the level of innovativeness of an organisation, determining its ability to reach more desirable outputs and outcomes.

City75 has a **low** level of readiness to experiment new organisational settings and methods relevant for supporting digital innovation. **City75 does not seem to support innovation** by funding public procurement procedures (Pre-Commercial Procurement or Public Procurement of Innovative Solutions) with internal resources.

Taking into account the propensity towards considering and implementing new technologies, transversally to the service areas, there is **a short** attitude towards the application of AI technology, and **a cautious** tendency to apply IoT. Moreover, **City75** has **a small** propensity towards the adoption of blockchain, is **slightly** prone to apply wearable technology, and has **a still small** capacity to adopt robotics.

A fundamental role is then played by ecosystems of innovation, such as living labs, civic hackerspaces, and makerspaces, as spaces where the encounter of actors with various competences and scholarship paves the way for capacity building and knowledge transfer. Such ecosystems have the ability to engage and actively mobilise actors, assets, and relationships shaping a supportive and empowering space for innovation where communities collaborate to generate, test and scale solutions to answer societal challenges. However, **City75** does not seem to have such environments where favourable conditions are set and enable proficuous interactions, boosting innovation to various extents.

Ultimately, **City75** does not seem to collaborate with the local ecosystem for testing innovative solutions, missing an important occasion for experimentation with multiple actors.

Skills

Digital skills are central in the digital transformation of the public sector, playing a fundamental role in the management of digital innovation within the public authority. **City75** has a **low** availability of skills key to the management of digital innovation.

The digitalization of the public sector puts growing attention on the acquisition of open-source software as well as on the publishing of all the developed software in open source. Reusing software prevents duplication of expenditures, encouraging the consolidation of more mature and shared solutions. The ability to advance existing shared software rather than aiding the diffusion of lock-in solutions or the purchase of licences helps a sustainable common growth, reducing information asymmetries among public administrations. In this regard, the IT set-up of **City75 does not seem to offer** the possibility to implement open source alternatives, and ICT training to its employees **seems not to be provided**.

Advancing this reasoning, **City75 does not have** an in-house e-procurement platform, which shows the public authority's capacity to develop and/or manage a tool to autonomously support the sale and purchase of supplies, commodities, technology or services, without the support of an outsourced service. Public procurement for purchasing innovative digital services or goods needs to take into account and exploit the potentials of digital technologies. While instructing tenders, **City75 does not include** requirements related to open standards/APIs and specific technical specifications, and the use of Free/Libre Open Source Software (FLOSS). However it may take into account possible data sharing agreements. The inclusion of these requirements contributes to counter proprietary software and the restrictive copyright licensing it entails, favouring accessibility, sharing and re-usability of data.

PROCUREMENT

Procurement refers to techniques, structured methods, and means used to streamline an organisation's procurement process and achieve desired results while saving cost, reducing time, and building win-win supplier relationships. It is one of the main demand-side innovation policies to adopt innovative goods and services. In

this sense, **City75** has **little** innovation proneness toward the development and application of public procurement processes.

The municipality does not run Pre-Commercial Procurement (PCP), and it does not run Public Procurement of Innovative Solutions (PPI). Then, **City75 seems not to procure** innovative digital services and goods together with other public authorities, for example through Joint Procurement.

There are several arguments in favour of stipulating joint procedures, both horizontally with similar cities, and vertically with higher-level institutions, such as: lowering prices, since combining purchasing activities leads to economies of scale; reducing administrative expenses, since the work for the authorities involved in preparing and carrying out one tender rather than several is substantially reduced; reaching out to skills and expertise external to the administration, pooling them between the authorities. Moreover, they represent a very effective way of encouraging the market for more environmentally sound products and services. Such procedures allow public authorities to be compliant to solutions and standards adopted by other related public institutions.

Then, **City75** instructs tenders **including** requirements of open standards/APIs and specific technical specifications, the use of Free/Libre Open Source Software.

For the development of innovative solutions, **City75 cannot** rely on an e-procurement platform, favouring strategic purchasing, ensuring higher control on procedures, increased flexibility and conformity to policies. The presence of an e-procurement platform enables the public authority to autonomously find, buy and manage the expenses for goods and services entirely online, supporting the management and definition of supplier policies while offering a greater level of transparency in the system.

DATA MANAGEMENT

Data is one of the most valuable resources in today's societies, economies, and governments, leveraging multi-level development. Coherently, effective data management strategy is becoming more and more an imperative towards better public services. Data is a powerful asset to guide governments to better design and tailor their processes of public service delivery. In this regard, **City75** has **poor** data collection, management, and use capacity.

The fast evolution of technologies continuously offers novel opportunities towards digital government, as well as towards transparency and openness. The production and access to data, services, and contents play a relevant role in digital transformation and maturity processes. They are enabled and facilitated, for example, by the presence of data platforms, the adoption of strategies for data use and reuse, and the presence of open data principles common to several governmental institutions. Accordingly, *Data management* is explored through five dimensions: *Data platform*, *Data use*, *Data strategy*, *Open data*, and *Big data*.

Data platform

A data platform is a software platform used to manage and publish on the web the data collected and generated by public authorities or by different stakeholders of the city ecosystem, as for example public agencies, businesses, citizens or other organisations. The presence of a data platform mirrors an attention towards data sharing on the one side, and data management on the other. Indeed, the data platform can have functions that allow advanced data management, analysis, and visualisation. **City75** has **a limited** capacity of managing and sharing data among multiple stakeholders. It **does not use** a data platform to collect, manage, publish and share data. **City75** does not have a data platform, hindering the opportunity of data-related innovation. An open Integrated data platform allows aggregation and pre-processing and offers to multiple stakeholders access to datasets. Going beyond data collection, it can favour at different levels the understanding of data, also across different service areas.

Public administrations have the opportunity to promote innovation and economic progress by making their public datasets available online. The development of data platform as an open and interoperable technological infrastructure for the distribution of data provides increased transparency, encouraging more aware decision making processes. At various scales, it offers better possibilities for tackling local urban societal and environmental challenges.

Data use

Data is recognised as a strategic asset that can be leveraged to pursue public value. From an operational perspective, data can be employed for purposes, among the others, of evaluation and monitoring, delivery, and

anticipation and planning. *Data use* explores this dimension observing how data are used by the public administration. **City75** has a **narrow** ability to exploit data in this direction.

City75 seems not to apply the once-only principle in its services, positively impacting the usability of services with the possibility to ensure that citizens, institutions, and companies only have to provide certain standard information once. With regard to data management, **City75 seems not to encourage** data re-use, and data **does not seem to be** re-used to create new services or solutions. Ultimately, data about the use of the service is gathered **but it is not yet** used to design or improve the digital service offer, and end-users' evaluations on services **seem not to be used** to improve or update the services provided.

Data strategy

The use of data for public services can provide more efficient, effective and trustworthy service provision. Hence the relevance of defining and embracing governance models setting appropriate and favourable conditions for data-driven, data-informed, or data-aware decisions and services for creating public value. **City75** has a **narrow** ability to strategically plan the use and features of data.

It **collects but does not regularly share data among its service areas**. In the direction of increasing usability and reusability of data, enhancing the ability of tools to automatically find and use data, in addition to supporting its reuse by individuals it **does not seem to be applying** the FAIR principles, and **has not yet developed and seems not to plan** an interoperability framework or strategy for advancing data sharing.

Finally, the recognition of the monetary value of data and big data pave the way to financial and economic arrangements and agreements, and occasionally even allow capturing revenue streams. In this regard, **City75** has **no business model that seems to be** supported by the Data Platform.

Open data

The *Open data* dimension measures the ability of the public authority to adopt and operationalise principles and framework for open data that are meant to improve performance and efficiency of government services in general. In this regard, **City75** has a **cautious** approach.

The term open data, or Open Government Data identifies the information collected, produced, or paid by the public bodies and made freely available for re-use for any purpose, under licences which specify the terms of use. By sharing their datasets under open licences, public institutions are improving the availability of datasets for citizens, associations, innovators, and other stakeholders. **City75** has a **low** accessibility level of data, and it adopts **non-commercial creative common licences, limiting the reuse of data published to non-commercial purposes, independently from the possibility to create derived data**.

Open data is ruled by principles and framework built on the fundamental pillars of transparency, reproducibility, and reusability. The advantages of open data are numerous, ranging from greater public administration efficiency to private sector economic growth to increased social welfare. To favour good data management and stewardship for integration and reuse of published data by the community, and beyond it, to apply sharing principles also to the algorithms, tools, workflows, and the overall pipelines that led to that data, **City75 seems not to apply** FAIR principles, granting a **low** degree of accessibility.

City75 seems not yet to be adopting a data governance strategy that holistically manages the collection, storing, and sharing of city-related data. Such a strategy would allow data to be automatically standardised and validated, also promoting innovative data collection mechanisms such as crowdsourcing and sensing for predictive modelling. Ultimately, it should provide multiple stakeholders with integrated access.

Increased efficiency in public service operations and delivery can be gained through cross-sector data sharing. Easier and improved access to information, resources, and expertise can favour the economical sustainability of service provision, allowing for the development of innovative services and the introduction of new business models. In this regard, **City75 seems to not or rarely exchange data** among its service areas, departments, or units. Moreover, various stakeholders can be actively encouraged to use and re-use available data to various extents. From the creation of partnerships, challenges, hackathons and other open innovation practices, to forming selected partnerships with other public or private stakeholders. A possibility that **City75 seems not yet to pursue, showing limited capacity to encourage data re-use**.

Ultimately, more transparent and accessible information can favour social welfare. Encouraging the development of an open, trustworthy data ecosystem can empower both people and the public sector to make better decisions using data while managing possible harmful impacts. Collaboration, participation, and social innovation are indeed all aided by open data, leading to the benefit of society. In this direction, **City75** engages citizens in open data initiatives.

Big data

The potential of big data in the public sector is enormous. Governmental daily activities such as those related to the management of social benefits, the collection of taxes, national health and education systems, traffic monitoring, and the issuing of official documents generate vast amounts of data. Furthermore, sensors can collect massive amounts of data. Such data can be used for creating more efficient and effective policies, for prediction of behaviours or events, such as crime or fires. *Big data* specifically observes the attitude of the public administration towards the use and production of big data, and their relation to service areas, and finally the presence of agreements for their production or purchase from third parties. In this regard, **City75** has a **poor** capacity to generate, manage and use Big Data. It **seems not yet to have** access to big data through agreements with third parties, and it **seems not to be** using or producing Big Data. Public authorities can produce Big Data by themselves, or/and have access to Big Data through agreements with third parties, gaining relevant advantages such as analytics and forecasting capacities on urban dynamics and phenomena.

CHANGE MANAGEMENT

Change management refers to the capacity of public administrations to put in play a set of actions, norms, policies, and tools either to proactively support innovation in digital service development and provision, or to increase its capacity to detect and adopt innovation dynamics developed in different contexts. The notion implicitly acknowledges that innovation can originate either within the institution or within specific service domains. Accordingly, it relies upon the capacity of the organisation to adapt its procedures adjusting to internal and external circumstances, and to create spaces for other agents to engage in processes of governance innovation. Moreover, it is relevant the capacity to include and implement innovative bottom-up initiatives in a strategic way, considering and coordinating different levels of governance that nurtures new interactions and cycles of learning. Encouraging a knowledge economy that spreads across university, industry, government, civic society, and environment, favours the development of a rooted orientation to innovation.

In measuring the inclination or readiness of the public authority to evolve and alter its behaviour, vision, procedures, and its preparedness to integrate and amplify innovations, three key features are examined:

- *Context empowerment*, as the capacity to apply logics of replication and dissemination, increasing the quantity of people or communities impacted;
- *Replication and diffusion*, as the capacity to impact relationships, cultural values and beliefs, since change is deeply rooted in people, relationships, communities and cultures; and
- *Organisational readiness*, as the capacity to change at the level of policy, rules and laws.

Looking at these three features together, it is possible to gain an understanding of the complex, complementary and systemic nature of the strategies involved in advancing large and multi-level structural change. Strategies which require flexibility, adaptiveness, and proneness to learning while being context-aware and context-sensitive.

In general, **City75** has a **low** effectiveness in managing strategies implemented to ensure impacts within the organisation, in the context, as well as towards and from other contexts. In the following the three scaling mechanisms are explored, showing how together they provide relevant insights on the socio-technical implication of digital innovation and transition, as well as on the multi-layered changes, transformations, learning dynamics underlying its implementation.

CONTEXT EMPOWERMENT

Context empowerment refers to the ability of the public authority to instil cultural values oriented to innovation and change and encourage the development of sustainable relationships among the actors of the local ecosystem. In this regard, **City75** is **mildly** effective in developing strategies able to trigger innovation within the local context, both at a social and cultural level.

City75 seems not to be directly involved in ecosystems for innovation together with other actors of the quadruple helix, namely academia, industry, public sector and civic society. Ecosystems of innovation can include living labs, fab labs, civic and hackerspaces, maker spaces, incubators, and research and technology centres as spaces where interactions among different actors favour innovation, capacity building and also knowledge transfer. Such ecosystems have the capacities to adopt and improve innovative solutions developed in, by, and for other contexts, as well as to exporting solutions in logic of replication and diffusion.

In addition, **City75 does not seem yet to adopt** a citizen-centric approach; such an approach would ensure the inclusion of citizens when planning new services or updating existing ones. As such it is worth being considered, since it helps public administrations to develop and deliver services which better answer the needs of the community. The attitude of engagement that is also mirrored by the adoption of multilingual options in the service provision and delivery. The linguistic barrier is unquestionably one of the most critical barriers to access to public services for migrants, resulting in an obstacle to exercise their rights and contributing to social exclusion.

REPLICATION AND DIFFUSION

Replication and diffusion is related to the ability to replicate and disseminate innovation, succeeding in the attempt to impact a larger number of citizens or communities. This mechanism lies on the fact that innovations developed by one public body can grow and be adopted by other public organisations, facilitating a digital innovation on a broader scale. A digital innovation strategy can indeed be instructed with different governance policies, from a strategy covering a single public administration, to a joint strategy serving multiple cities, also going beyond the county borders. In this perspective, **City75 is slightly** effective in developing strategies that ensure replicability in other contexts of solutions experimented locally.

Specific strategies can be put in place to manage digital innovation, also considering the possibility to cover more administrations in the attempt of sharing solutions and benefitting from expertises otherwise not present within the body. In particular, **City75 marginally** benefits from importing and adopting solutions developed by other public authorities, and it takes **few** advantages from exporting and sharing digital solutions developed to other public authorities. In addition, **City75 seems not to make yet** use of digital solutions designed and developed in cooperation with other public authorities. These strategies can be aided by participation in larger networks, which encourage exchange of resources and solutions. In this respect, **City75 plays a limited role** in networks of cities sharing operational digital solutions or open source code(s) at a local, regional, national and/or international level. However, **City75** does not yet collaborate with the local ecosystem for formalising agreements with its different actors. Such collaboration would support the creation of more connected and efficient ecosystems able to sustain mechanisms of scaling, encouraging innovation and stimulating cooperation among multi-level actors at the different scales of local, regional, and national. In terms of development and maintenance, **City75 does not seem to apply** the Standard for Public Code, which is a set of criteria that support public organisations providing policy makers, city administrators, developers and vendors with guidance for enabling successful reuse of open source code(s) and software developed by other public administrations.

Moreover, to deliver better services, especially exploiting technological advancements, a further relevant dimension regards the ability to develop solutions in cooperation with other public authorities, transversally to its services, **however, they do not seem to be secured** by combining the procurement actions of two or more contracting authorities.

City75 seems not to rely upon a Chief Digital Officer to better support the replication and dissemination of innovation by leading the strategic management of digital policies.

City75 seems not to be engaged in ecosystems of innovation where knowledge and know-how are shared among the actors of the so-called *quadruple helix*, namely academia, industry, public sector and civic society. Ecosystems of innovation are loosely interconnected networks where various entities (e.g., companies, associations) coexist creating an active flow of knowledge and information, resources and technologies, capabilities and skills. Ecosystems of innovation such as digital innovation hubs and EU policy labs allow for experimenting with innovative solutions originally developed in, by, and for other contexts, as well as to export their solutions, in a logic of replicability and diffusion.

In this framework, **City75** may benefit from collaborating with the local ecosystem for formalising agreements with other innovation ecosystem actors.

ORGANISATIONAL READINESS

Organisational readiness refers to the institutional capacity to change for better including and nurturing digital innovation in the public sector, leading the way to greater impact that impacts on law and policy. It is based on the fact that the digital transformation of the public services impacts the public authority and requires adaptation, adjustment and renovation of its organisational structure. To support and manage innovative service development and provision, public authorities need to master digitalisation and innovation governance processes. As such, digital transformation is a driver of change that is bound to long-term organisational change within public sector organisations. Considering this mechanism, **City75 is marginally** prone to facilitate digital innovation through organisational changes and restructuring.

In seeking to achieve digital service innovation, the public sector needs to embrace a holistic view of innovation to effectively navigate the unceasing changing technological landscape. The presence of a digital innovation strategy indicates the readiness of the public authority to face the challenge and better orient its efforts. In this regard, **City75 seems not to have yet formally approved and published a digital innovation strategy**. Moreover, among the most relevant aspects playing a crucial role in effectively driving and supporting innovation, there is the presence and acquisition of adequate digital skills that underpins continuous learning and progress within the organisation, securing the ability to dynamically leverage and steadily include technological novelties and advances. To support this and bring skills and expertise within the public administration, joint procurements can be used to activate contracts among authorities, leading to sharing resources among different organisations. A practice that **City75 is not yet exploiting**. In such a direction, where overcoming a siloed mentality is a fundamental premise, a relevant role is played by policies and practices for managing, sharing, using and reusing data. **City75 seems not to encourage** data sharing and reuse, ICT platform sharing, cooperation among teams from different service areas, and collaborative service design with incentives.

City75 has the tendency to interact and synergize with the local ecosystem, **not yet involving actors of the quadruple helix, which may increase multi-level and multi-stakeholder collaboration**.

City75, however, is not directly involved in ecosystems for innovation with other actors of the quadruple helix. Although high motivation, general organisational capacity, and intervention-specific capacities are required for involving the local ecosystem, such an interaction pays back with relevant knowledge and values, and can lead to better face existing challenges for the benefit of the society – including the green, digital, and social transitions.

Further exploring this dimension, when planning new services or updating existing ones, **City75 does not seem to adopt** a citizen-centric approach. Such an approach would make the public authority better able to understand and answer with its service provision to the needs of citizens, identifying real needs as starting points for targeted and more effective service-delivery improvements. The adoption of a citizen-centric approach, in fact, requires a relevant organisational and decision-making effort.

DIGITAL SERVICE INNOVATION MATURITY

Digital technologies are deeply affecting people's lives in general, and how people interact with public infrastructures in particular. These technologies, their growing availability and performances, the wide use of data, the wide offer of services provided by a large variety of actors are reshaping the value supply chain of public service and the associated concept of public good. Given this premise, *Digital service innovation maturity* focuses on the degree of penetration and maturity of technical and organisational innovation in public service delivery, analysing to what extent the creation and implementation of digital innovations can lead advancement in technological infrastructuring, and bring changes in the structures, practices, values and culture of public administrations. Therefore, *Digital service innovation maturity* analyses on the one side the dimensions of the *Digital maturity* of a public administration, and on the other, its *Level of service embedment*.

City75 has an overall **narrow** degree of penetration and maturity of technical and organisational innovation in public service delivery. In the following, the two dimensions of *Digital maturity* and *Level of service embedment* are explored.

DIGITAL MATURITY

In this context, *Digital maturity* mainly attains to the extent to which public administrations embrace new digital technologies and deliver innovative public services. It considers the distinction between mature and emerging technologies, acknowledging that the latter play a relevant role in describing the extent to which the public authority is challenged while developing new services. Digital maturity assesses the level of digitalisation of the public authority, intended not only as a shift toward digital technologies, but also encompassing the related organisational change. In this regard, **City75** has a **low** level of digital maturity.

Digital maturity is approached by looking at three specific but interdependent dimensions:

- *Digitisation* focuses on the degree of converting information and pre-existing internal procedures of either ancillary or directly related to public service delivery into a digital format;
- *Innovative technologies* explores the degree of adoption of innovative technologies (AI, blockchain, wearables, etc.);
- *Advanced methods and principles* analyses the level of consistency of methods and principles used to increase the digitalisation level of the public authority.

DIGITISATION

Among the most important barriers to digital transformation and innovation is the presence of unshared information and knowledge about how to manage structural and cultural barriers. A siloed-mentality often stalls digital transformation and innovation by maintaining know-how and expertise within departments or units, limiting or impeding collaboration, integration, and optimal exploitation of resources. Moreover, it causes gaps and inefficiencies that have an impact on both governments and citizens. Data sharing can largely contribute to overcome such an isolation attitude that nurtures legacy system silos by opening up for broader and cross-sector applications. Digitalisation processes can support overcoming rigid organisational arrangements, favouring the sharing of knowledge within the institution and steering its digital endeavours strategically.

Digitalising services helps governments and public authorities meet citizens' expectations towards improved efficiency and resilience. The benefits lie in the fact that digital interactions diminish efforts for both citizens and public authorities, being less time-consuming and reducing administrative burden. However, to create seamless and satisfying experiences, public authorities need to undergo a challenging process of transformation. In light of this reasoning, it is considered the degree of digitisation of pre-existing internal procedures either ancillary or directly related to public service delivery. In this regard, **City75** has a **good** level of digitisation.

Overall, the services provided by **City75** across its service areas are **slightly** digitalised. In particular:

- **Just few service areas seem not to provide digital services, granting fair remote interaction with the public authority;**
- **Few service areas seem to provide digital access to services only for internal use, permitting a reasonable remote fulfillment of such services;**
- **No service area seems to provide digitized ancillary services (e.g., booking, payment, unique access point) limiting the possibility to fulfill them remotely;**
- **No service area seems to deliver the majority of its service digitally.**

In the following the service provision of **City75** by service areas is compared with the value that occurs most frequently (mode) in the overall population observed:

- In the area of general services or administration, for **City75 the majority of the services provided by the sector is digital only internally to the public administration;** in the overall population **the majority of the ancillary services are digitized;**
- In the area of building and spatial planning services, for **City75 the majority of the services provided by the sector is digital only internally to the public administration;** in the overall population **the majority of the services provided by the sector is digital only internally to the public administration;**
- In the area of culture and leisure, for **City75 the majority of the services provided by the sector is not digital;** in the overall population **the majority of the ancillary services are digitized;**
- In the area of education, for **City75 the majority of the services provided by the sector is not digital;** in the overall population **the majority of the services provided by the sector is digital only internally to the public administration;**
- In the area of healthcare, for **City75 the majority of the services provided by the sector is not digital;** in the overall population **the majority of the services provided by the sector is not digital;**

- In the area of order and safety, for **City75 the majority of the services provided by the sector is digital only internally to the public administration**; in the overall population **the majority of the services provided by the sector is digital only internally to the public administration**;
- In the area of social and welfare services, for **City75 the majority of the services provided by the sector is not digital**; in the overall population **the majority of the services provided by the sector is digital only internally to the public administration**;
- In the area of transport and mobility, for **City75 the majority of the services provided by the sector is digital only internally to the public administration**; in the overall population **the majority of the ancillary services are digitized**;
- In the area of utilities, for **City75 the majority of the services provided by the sector is digital only internally to the public administration**; in the overall population **the majority of the ancillary services are digitized**.

In the case of services provided both offline and online, **almost all users opt** for digital solutions. The following reports for each service area the detail on how many users chose the digital option when available:

- **A minority** in the area of general services or administration of **City75**. **"A majority"** is the value that occurs mostly in the overall population;
- **Not applicable** in the area of building and spatial planning of **City75**. **"A majority"** is the value that occurs mostly in the overall population;
- **Not applicable** in the area of culture and leisure of **City75**. **"A majority"** is the value that occurs mostly in the overall population;
- **Not applicable** in the area of education of **City75**. **"A majority"** is the value that occurs mostly in the overall population;
- **Not applicable** in the area of healthcare of **City75**. **"Not applicable"** is the value that occurs mostly in the overall population;
- **Not applicable** in the area of order and safety of **City75**. **"Not applicable"** is the value that occurs mostly in the overall population;
- **Not applicable** in the area of social and welfare services of **City75**. **"A minority"** is the value that occurs mostly in the overall population;
- **A minority** in the area of transport and mobility of **City75**. **"A majority"** is the value that occurs mostly in the overall population;
- **A minority** in the area of utilities of **City75**. **"A majority"** is the value that occurs mostly in the overall population.

A further element that increases the accessibility to services is their provision in multiple languages; a feature that consents to overcome or mitigate the language barrier, supporting a wider audience. In this regard, **City75 is not yet providing automated translations to other languages. It may be relevant considering automated translations enabled by** free, easy, and secure translation tools, as for instance CEF eTranslation by the European Commission, consenting to overcome or mitigate the language barrier. The level of digital maturity is indeed also proven by the ability to embed innovative technologies to provide better services.

INNOVATIVE TECHNOLOGIES

The introduction and effective adoption of innovative technologies such as AI, blockchain, wearables, and so on, provide institutions with higher transformative potential. Most Countries are taking action to stimulate the use of innovative technologies in their public services. In this regard, **City75 has a narrow** degree of adoption of such technologies. Focusing on their planning or implementation in public services, **City75 is not yet** considering AI technology, is **very shortly** considering IoT, is **very shortly** considering blockchain, is **not yet** considering wearable technology, and is **not yet** considering robotics.

When it comes to managing the digital transformation, another relevant innovative technology is data modelling, as the process of examining datasets to derive conclusions from the information they contain. However, **City75** does not have a Data Urban Platform which can give access to integrated data modelling functions, such as Local Digital Twins or similar, which can provide access to virtual representations of assets, processes and systems. Integrating data modelling can define and order consistent, high quality, structured data for policy scenario visualisations, policy impact prediction and monitoring, or for evaluating policy options. When available, however, the presence of data modelling functions requires a favouring organisational culture, together with data analytics and machine learning skills to govern the simulation models and gain knowledge from it.

ADVANCED METHODS AND PRINCIPLES

Digital transformation is radically affecting service delivery practices, and advanced approaches raised citizens' expectations regarding the access to information. In parallel, they are encouraging the public authority to progressively rely on standards and shared solutions for an open governance, in order to encourage an optimised management and re-use of resources. This dimension analyses the consistency of the methods and principles used to increase and better orient digitalisation in the public sector. **City75** has a **limited** capacity to embed and make use of methods and principles for sustaining its digital innovation. Concerning this, effective strategies regard the sharing of digital solutions, services or products with other public authorities. **City75 seems not to have a** propensity towards importing and adopting solutions developed from other public authorities, while it **seems not yet to export nor share** the digital solutions it develops. The tenders for procuring innovative solutions are instructed **considering** open standard and open source requirements. City75 may consider the use of open standards and open source solutions, since it encourages data sharing and data re-usability, while the use and contribution to develop open-source software can increase public trust in the software. Interoperability as the ability of services to communicate among each other is crucial to make services more sustainable and even seamless. However, a set of good practices need to be implemented: from the use of standards for data and sharing collection, to the availability of information in multiple languages and procedural transparency. In this regard, **City75 is not yet adopting** interoperable digital solutions or services.

To further streamline operations exploiting EU-wide services available on the market, public administrations need to consider the provision of cross-border and cross-sectoral public services. Finally, when it comes to the design and development of digital solutions, an added value derives from uptaking solutions developed by other public authorities and including strategies to synergise with other initiatives. **City75 does not seem to opt** for successful partnerships, namely cooperating with other public authorities, sharing intellectual capital and skills for a common goal. As a result, interoperability contributes to reducing redundancy and better exploiting innovation present in the EU landscape.

Moreover, **City75** has a **limited** attitude towards the use of open source software, and it **seems not interested in sustaining** its IT department in implementing alternatives. In addition, it **seems not yet planning to implement** standards for public code, which can be considered as an investment in public infrastructure. The adoption of such standards for public code reflects the capacity of the public authority to favour the development and maintenance of software and policy together, towards higher quality services that are more cost effective, encourage reuse and sharing among public organisations, with less risk and more control.

In addition to this, **City75 does not seem to apply** the once-only principle in its services, which is an e-government concept intended for ensuring citizens, institutions, and companies a one-time only provision of certain standard information to the public authorities and administrations. This is another method for favouring re-use and exchange of data, reducing the administrative burden on citizens and businesses.

LEVEL OF SERVICE EMBEDMENT

The *Level of service embedment* reflects the role played by the service in driving changes in public authorities. In this context, three scaling mechanisms are relevant and return a specific view on how organisations can effectively embed innovation in their service provision. In short:

- *Scaling out* indicates the public authorities' ability either in replicating successful service innovation from different contexts or in exporting innovative solutions experimented locally;
- *Scaling deep* reflects to what extent service innovation is widespread and ultimately able to foster behavioural and operational changes in the local context;
- *Scaling up* assesses the reach of public authorities' intrinsic innovative potential in terms of service development.

City75 has a **low** capacity to embed innovation in its service provision.

SCALING OUT

Scaling out reflects the public authority's capacity to replicate and transfer innovation, becoming a driver to the adoption/replication/exportation of innovative solutions and services respectively by/in/to other public organisations, either in case such solutions have been entirely and autonomously developed, or in case they are the result of a process of continuous improvement. In this respect, specific and dedicated experiences of sharing and collaborative networks play a crucial role, allowing public authorities to access a large variety of services and related solutions opportunities.

City75's attitude towards such a mechanism is **narrow**. The dimension of *Scaling out* is also related to the ability of the public authority to effectively and actively support and incentivise data re-use, going beyond the exploitation within the public organisation. This can occur at multiple levels by defining selected partnerships with other public or private stakeholders. An attitude that **City75 does not present yet, identifying possible room for improvement**, which is also reflected by the fact that it **does not seem to be** sharing data which is then re-used to create new services or solutions. In the frame of sharing digital solutions with other entities, **City75** does not yet embrace the practice of exporting and sharing what develops to other public authorities, not exploiting mechanisms of knowledge sharing.

SCALING DEEP

Scaling deep concerns the extent to which digital innovation has been integrated into service development resulting in actual adoption by users. This orientation comes with a level of changes in practices and behaviours that public authorities need to undergo in order to make service innovation effective in reaching the societal domain. This dimension is therefore related to the concept of context readiness, meaning that the public administration can effectively offer services able to answer context-related needs.

In this regard, **City75** has a **cautious** capacity to embed digital innovation in services in a pervasive way, which generates changes in the local context, at the societal level. Relevant in this sense is the digital provision of services. Transversally to its service areas, **City75 provides the possibility to access services both offline and online. However the digital option is little choice, showing the need of further improvement.**

The scaling deep mechanism especially manifests by sharing data as potential knowledge and new practices with learning communities, facilitating and encouraging distributed learning through platforms and participatory approaches. **City75 seems not yet to present** such an attitude, which is expressed by actively encouraging stakeholders to use available data, for example through the creation of open challenges, hackathons and other innovation practices. Speaking of that, **City75 seems not yet to engage citizens in (open) data initiatives.**

SCALING UP

Scaling up refers to how the embedment of digital innovation into services implies organisational change, requiring organisational structures modifications, and revision of previous routines, practices, and even policies. To reach and guarantee an autonomous supply and provision of such services, public administrations have to undergo a process of adaptation and renewal. *Scaling up* reflects the degree and extent of completion of such a process.

City75's attitude towards such a mechanism is **poor**.

This mechanism implies that innovative solutions and approaches are codified in organisational policies and institutions, hence impacting the institution at higher levels.

Over the years, the public sector enacted reforms to prioritise digitalisation aiming at enabling greater efficiency and effectiveness, investing considerable resources to encourage the adoption of practices able to make services more responsive to citizens' needs. In this direction, the attempt to grant citizens with a wider accessibility to services can be supported by the adoption of a multilingual service provision, which **City75 averagely integrates by presenting multilingual options in some of its service interfaces.**

Moreover, citizens can be also empowered by having access to Open Data. This also includes the possibility to ask governments to increment the public datasets, providing more accurate information. **City75** seems not yet able to take citizens' demand for datasets in consideration, demonstrating an improvable level of responsiveness towards requests from the context. In the changing data context, data are relevant means for assessing and measuring performance in service areas as well as to drive their development. These data can be provided directly by service users, often in real time, and they can be used for orienting the improvement of service delivery. In this direction, **City75 does not collect** data or end-users' evaluations about the use of services aiming at using

them for the design or improvement of the service, hence revealing its proneness to exploit relevant data in the service development.

Opening up and engaging in collaborations with other service areas to favour innovation, however, requires organisational and administrative changes. **City75 has not been** committed to this practice.

City75 has not been engaged in this typology of change.

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