

Translating data into narratives. Designing semantic interpretations for reflexive policy practices

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ABSTRACT

Today more than ever, it is evident the role that data can play when designing policies. Data not only aids in shaping effective strategies but also fosters reflexive practices within Public Administrations, promoting knowledge management and smarter governance. However, multiple gaps concur to affect data understanding and interpretation, hindering its subsequent translation into policy-valuable information. To address these challenges, the article proposes a two-fold approach: (i) illustrating a narrative approach for building profiles of cities as narrative feedback from sets of data and (ii) investigating their potential as a (self-) evaluation and a decision-making support device. The feedback structure relies on the conceptual model developed for the DIGISER Project, which investigated multidimensional digital transformation processes across European cities. By employing dynamic feedback mechanisms, data from the project dataset is transformed into discursive form. The effectiveness of the approach and its device is validated through a qualitative enquiry on a textual excerpt provided to three different departments of one of the cities that participated in the survey. The study corroborates that designing narrative feedback as semantic interpretations can trigger understanding, (self-)reflection and support policy change, informing policy formulation and facilitating cross-silo interactions across administrative units engaged in digital transformation processes.

Keywords: Data interpretation, Decision-making support device, Dynamic narratives, Digital transformation, Public Sector Innovation, Reflexive (self-)evaluation.

INTRODUCTION

Today more than ever, it is evident that data can play a role when designing, implementing and evaluating public policies (Verstraete et al., 2021; Aragona & De Rosa, 2019; van Veenstra & Kotterink, 2017). While their importance is highlighted in evidence-based approaches (Brunswicker et al., 2019), public policy literature identifies barriers to data understanding, interpretation, and operationalisation (Oliver et al., 2014; Concilio & Pucci, 2021). These challenges, relevant in all policy fields, become crucial in public sector innovation: In developing and implementing their digital strategies, Public Administrations (PAs) still face data-related barriers at several levels, from the individual to the organisational one, with difficulties in rooting data in broader policy discourses and organisational processes. From citizens' engagement to innovative procurement procedures, from public service provision to social media presence: in all these spheres of action, PAs need not only to make sound

decisions but also to reflect on their performance, e.g. in terms of degree of digital service innovation maturity and proneness to change (DIGISER, 2021b, 2021a).

The article explores the contribution of design to support policymakers in facing data interpretation and usage challenges. In particular, it investigates the role of design in translating data into information useful to activate a reflexive practice (Schön, 1983) within and across PA's departments involved in digital transition processes at the city scale. More specifically, the study illustrates and tests a methodological approach for building dynamic narrative feedback from data about public performance in digital transition processes. The main goal is to investigate the capacity of narratives as semantic interpretations to support PAs in their threefold need to understand data, activate (self-)reflection, and nurture public action.

After framing critical issues about data usage and interpretation in decision-making for the digital transition, the article illustrates the methodology employed to design and test the dynamic narrative feedback. The testing phase relies on data collected through the Espon DIGISER Project (DIGISER, 2021b, 2021a), and the DIGISurvey in particular, as a Europe-wide online survey launched to “gather data from cities and municipalities to provide decision-makers with relevant and comparable information on digital transformation in their constituencies and to inspire digital transformation processes”.¹ For illustrative purposes, the research only refers to the outcomes regarding the degree of digital maturity of one of the respondent cities. The study critically examines digital transformation processes, which are conceptualised as “a fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity and redefine its value proposition for its stakeholders” (Gong & Ribiere, 2021, p. 12). To operationalize and observe this concept empirically, it employs innovation in public service delivery and provision as a proxy, aligning with the focus of the DIGISER project.

1. UNDERSTANDING, INTERPRETING, AND OPERATIONALISING DATA FOR THE DIGITAL TRANSFORMATION

1.1. Data *on* and *for* the digital transformation

Digital transition requires not only readiness for technological innovation but also awareness of the actual digital behaviour and activities within the PA. Additionally, understanding the conditions that influence its ability to pro-actively act within digital transformation processes is essential. In this context, data pertaining to the specific PA performance assumes a crucial role, serving to inform and orient digital transformation policies, strategically support the reconfiguration of organisational structures, and enhancing the PA's capacity to act with other actors who are agents of change: citizens through public engagement strategies, and the private sector through public procurement strategies. The impact of digital transformation is far-reaching, affecting nearly every sector and service area of PAs, and is strictly related to knowledge management (Alvarenga et al., 2020; Baskarada & Koronios, 2013). Data concerning the PA's level of digital maturity and proneness to change becomes vital for gaining fundamental insights into its attitudes, performances, and challenges, ultimately influencing not only policy processes and their outcomes but also organisational settings and modes of

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interaction among the broad ecosystem of public and private stakeholders involved in digital transition processes (Ooijen et al., 2019).

From a broad organisational perspective, data-informed decision-making (Chaffey & Wood, 2005) – implying awareness of the current situation and performance (van Veenstra & Kotterink, 2017; Veale et al., 2018) – can play a role in public sector innovation, contributing to developing multi-level and cross-silos actions associating PA's needs to available approaches, technologies, and trends. Data serves as a valuable resource, supporting evidence-based policymaking and driving reflection and learning through action (Concilio & Pucci, 2021, p. 15). Within PAs, data has the potential to enable reflexive practices, acting as a catalyst for policymakers' reflection in- and on-action (Schön, 1983). This reflexive potential is exceptionally high when data pertains to the performance of public organisations. When adequately turned into information, it can support data-informed learning and decision-making processes, aiding in the identification of policy and organisational gaps and limitations, ultimately guiding knowledge management and facilitating smarter governance (Gil-Garcia et al., 2016).

Furthermore, data assumes a strategic role in orienting policies and strategies, allowing decision-makers to better assess the context where decisions are formulated and executed. Data supports and feeds strategic, tactical, and operational decisions in different ways and at different phases of the policymaking process (Concilio & Pucci, 2021, p. 21), thereby contributing to transition management (Loorbach, 2010). At the beginning of the transformation process, data plays a key role in supporting planning activities by providing sector-specific and cross-sector information, supporting action prioritisations and implementation (Matt et al., 2015). As policy development and implementation progress, data continues to play a crucial role by informing policy action across various areas, ranging from urban planning to public service delivery (Thakuriah et al., 2017). Subsequently, in later phases, data can drive the assessment and evaluation of processes and strategies, towards possible revisions and recalibration (Nerima & Ralyté, 2021).

1.2. Information gaps, interpretation challenges, and the role of design

The challenges faced by PAs seeking in adopting a data-oriented approach to progressively better support public service provision and delivery, organisational management and innovation, and policymaking are manifold.ⁱⁱ These challenges pertain to effectively use innovative technologies and data (e.g., open, big, and beyond), integrating data in the policy cycle, and their governance in the context of digital public services (Millard, 2018). Still, significant gaps persist in data understanding and interpretation, hindering their subsequent translation into policy-relevant insights (Alvarenga et al., 2020; Maffei et al., 2020). Such gaps are compounded by the inherently high complexity of digital transformation processes, lack of data-related competencies – particularly in hyper-sectoral technical domains –, and the prevailing silo-mentality and silo-structure within the public sector (Scott, 2020; Hartley & Hesketh, 2015; Catalano et al., 2015). In addition to the aforementioned points, in a picture that is not homogeneous, certainly relevant is the issue of digital literacy and education within PAs. This factor assumes particular significance in contexts where digital skills and competency gaps persist, attesting that public officers have limited digital competence. It is the case of Italy (Catalano et al., 2015; Datta et al., 2020; Van Der Linden et al., 2021), where

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the narrative tool was tested. Furthermore, the successful comprehension of context-dependent processes heavily depends on the capacity to contextualise data interpretation within place-specific meso and macro dynamics (Brunswicker et al., 2019; Pedersen, 2017). The combination of these factors contributes to the creation of ambiguity in the semantic interpretation of data, consequently impacting PA's ability to make data-enabled and effective decisions (Bertot et al., 2016; Maheshwari & Janssen, 2014).

Within this complex context, a persistent challenge lies in the role of design-led approaches (Junginger, 2013; Anderson & Whitford, 2018) in designing decision-making support tools. Notably, considerable attention is dedicated to data visualisation tools (Dimara et al., 2021; Vila et al., 2018) designed to enhance decision-making activities and processes. Multidimensional visualisations are mainly employed due to their ability to display multiple possibilities of data representation to support decision tasks, also multi-attribute. Providing policymakers with such tools allows them to manage and visualise data in various forms, including tree maps or decision trees for visualising hierarchical information (Asahi et al., 1995, 2003), interactive querying with dynamic visual query filters that offer dynamic refinement (Hong et al., 2018; Speier & Morris, 2003), and tailored solutions allowing users to prioritise and rank attribute priorities, visually aggregating them into weighted summary scores (Pajer et al., 2017), even including machine learning algorithms to mitigate biases (Wiśniewski & Biecek, 2021). Despite a consistent body of literature recognizing decision-making as the primary and ultimate purpose of data visualisation (Spence, 2001; Ward et al., 2010), the focus is mainly on understanding visual analytics and concentrates on the demands and challenges faced by data analysts. Still, given the significant gaps outlined, this approach often implicitly assumes the presence of competences and skills required to elaborate and make sense of data. Little is enquired about the duties and challenges that organisational decision-makers face, for instance related to data interpretation and operationalisation, and how support tools that go beyond visualisation could be instrumental in overcoming these obstacles.

Ultimately, exploring specifically the studies on data-driven narrative approaches, a stream of investigation revolves around automating data narratives, wherein narratives serve as containers of information computationally generated from research findings. An illustrative example is the prototype DANA (Garijo & Gil, 2017), which automatically generates data narratives by reporting the methods behind scientific experimentations. These data narratives are automatically computed in textual form, drawing from information stored in datasets, records, workflows, and software registries (Gil & Garijo, 2017). The process leverages computational methods on structured information to accurately report the analyses performed, outputting human-consumable renderings that articulate records and entities in a crisp but accurate set of statements. However, finding correlations and contextualising the data seems to be beyond the scope of current experimentations. Indeed, non-human agents are still unable to efficiently and consistently compute data, beyond the partial understanding of the matter investigated (Mattern, 2017; Concilio & Pucci, 2021).

Consequently, the task at hand involves progressing beyond the mere restitution of data by enhancing it through contextualisation, interpretation, and directionality across various policy and action implementation levels. To contribute to this discourse and support PAs in public service innovation, the article proposes a narrative approach for building narratives as a (self-)evaluation and a decision-making support device. The method seeks to assist public officers and employees in understanding and interpreting data pertaining to PA's performance

in digitalisation processes, effectively translating it into actionable information. As a result, the inherent nature and scope of this challenge situate the research area of this investigation at the intersection of the domains of public sector innovation, policymaking, design and computer science.

2. METHODOLOGY

The concept of the narrative approach as narrative feedback has been developed in the framework of the DIGISER ESPON Project (espon.eu/DIGISER). The project investigates the multidimensional digital transition processes within the public sector across over 250 cities. For the scope, the project conducted a comprehensive European-wide survey to gather first-hand data. The survey is specifically tailored for local public authorities, with a particular focus on municipalities, taking into consideration the inherent variations in the organisational structures of different government units. The survey endeavours to explore diverse facets concerning digital transformation within the context of public authorities. It draws upon the conceptual dimensions identified (and described in Mariani & Bianchi, 2023), namely, (i) Digital maturity, (ii) Level of service embedment, (iii) Change management, and (iv) Innovation governance, together with their respective subdimensions, and seeks to investigate pertinent aspects of digital transformation. The data from the survey have been made openly accessible via the ESPON portal (database.espon.eu/project-data-package/2852), thereby contributing to the broader scholarly discourse and understanding of digital transformation in the realm of local government.

2.1. Narrative feedback development

The main contribution of this article lies in introducing a novel strategy consisting of building city profiles as narrative feedback, which involves translating sets of data into semantic interpretations. The narrative feedback relies on the dataset comprising responses from each city that participated in the questionnaire. Using the specific data of each city, the feedback constructs a unique city profile for each one, offering a personalised assessment of their performance and city-tailored insights. Moreover, each city is moreover discussed against the ideal performance of a city, namely the best behaviour on each specific index and sub-index. This comparative analysis further enhances the evaluation, enabling cities to gauge their progress relative to the benchmark of optimal performance.

Unlike traditional numerical data representations, this approach contextualises data within descriptive categories associated with value scales, facilitating a more understandable and meaningful presentation. The city profiles are designed as narrative feedback by dynamically associating data from a dataset with narrative sentences. Data is used as variables to construct tailored sentences, adhering to descriptive categories associated with value scales. The narrative feedback relies on a system composed of five blocks: (1) a textual description that contextualises data within the broader framework; (2) a dataset as the primary source of data; (3) a protocol that defines the segmentation of data into ranges or values and assigns them high-level meanings; (4) an interpretative table connecting data values with corresponding interpretations, and defining the required operations to perform; and (5) a python script that systematically organises the previous elements, and elaborates them outputting textual descriptions, composing the narrative feedback (Figure 1).

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COMPONENTS	1	2	3	4	5
	TEXTUAL DESCRIPTION	DATASET	PROTOCOL	INTERPRETATIVE TABLE	PYTHON SCRIPT
FEATURES	1. Sections 2. Chapters 3. Paragraphs 4. Periods	1. Indices 2. Sub-indices 3. Raw data normalized	1. Segmentation in ranges 2. Range alues 3. High-level meaning attributed to ranges	1. Name variable inputted 2. Range 3. Operation 4. Parameter 5. Possible calculation 6. Text to be outputted	1. Data ontology 2. Input grammar 3. Operations 4. Parameters 5. Calculation
OUTPUT	TEMPLATE WITH INPUTS FOR THE DYNAMIC TEXT	DATASET	PROTOCOL WITH RANGES AND HIGH-LEVEL MEANING	TABLE ASSOCIATING DATA VALUES AND TEXTS	NARRATIVE FEEDBACK FOR EACH RECORD

Figure 1. Components, features, and output on the ground of the narrative feedback.

The structure of the narrative feedback follows the dimensions identified by the DIGISER conceptual model (DIGISER, 2021b, 2021a), as depicted in Figure 2. The model computes a *Digital Public Service Value Index* by considering two primary factors: the PA’s “proneness to change”, namely the propension towards innovation governance and change management, and its “digital service innovation maturity”, looking at its digital maturity and the level of service embedment. The first-hand data acquired through the European-wide survey are computed in indices and sub-indices. The PAs performances are mapped on ideal-typical behaviours, defined a priori based on the best possible behaviour as observed in the literature, being measured on indices with a scale from 0 (worst behaviour) and 1 (best behaviour).

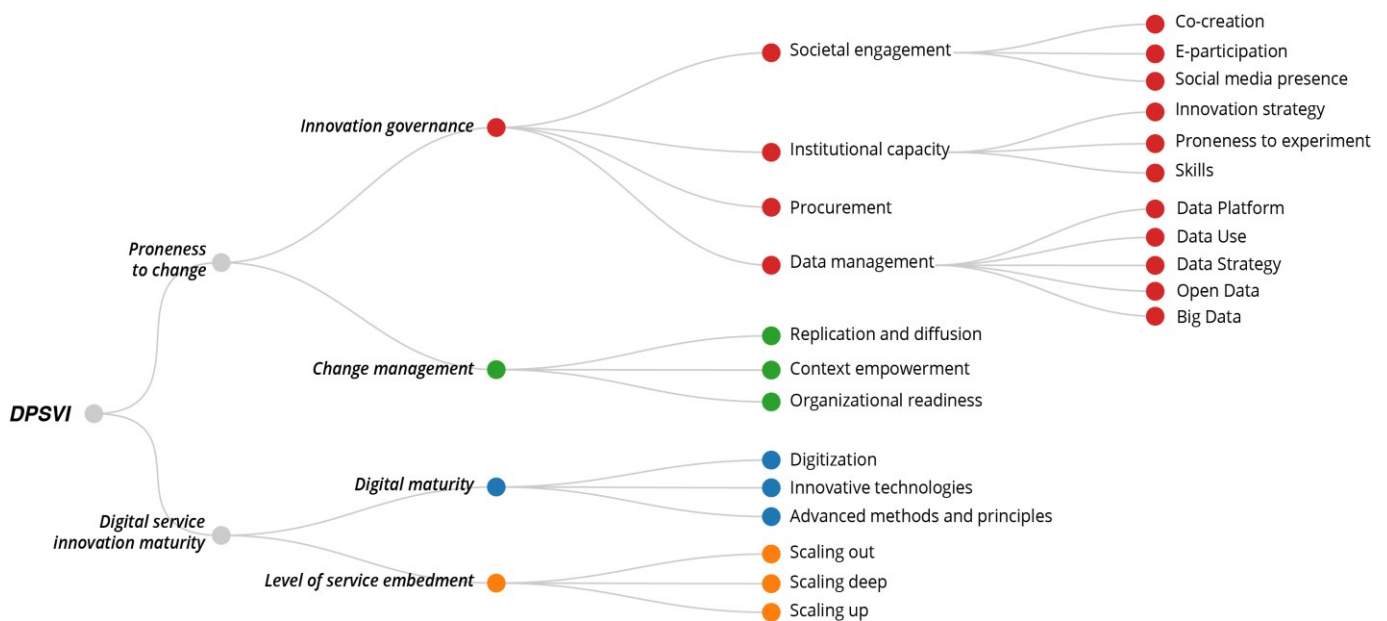


Figure 2. The conceptual model of the Digital Public Service Value Index.

The dimensions of the conceptual model (

Figure 2) have been applied to the dataset to generate city profiles in the form of semantic interpretations. This process involves segmenting the PA’s performance scores on the dimensions of its indices and subindices into ranges with value scales associated with descriptive categories as high-level typologies of adjectives. Scales can encompass from 3 to 6 levels (Figure 3). By leveraging this approach, all the numerical values have been translated into semi-automated narrative feedback, resulting in city profiles tailored for each public authority participating in the data collection.

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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 conceptual model of the Digital Public Service Value Index.

To enhance reflection and decision-making processes, the narrative feedback seamlessly combines the semantic restitution of data with pertinent contextual information, as well as offering valuable recommendations and potential directions for future actions (Figure 4).

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.

— contextualisation and general information

— data turned into narrative feedback

`{%- 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 -%}`

— 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_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 4. An example of the textual description as the basis for the narrative feedback highlighting the different typologies of information it provides.

2.2. Narrative feedback validation

This paper highlighted the critical role played by Public Administration (PA), particularly local public bodies, in driving complex digital transformation processes through the adoption of

guiding principles, promoting cross-sectoral cooperation, and enhancing service innovation (Concilio & Pucci, 2021). However, to effectively carry out these responsibilities, PA requires essential support in (i) understanding data, (ii) activating (self-)reflection towards better awareness, and (iii) nurturing support to action. Based on the questionnaire filled, over 250 city profiles were produced. To validate its efficacy in addressing the threefold requirement of supporting PA, the narrative feedback is tested in one of the cities that participated in the survey, involving three different departments. It is a city of substantial dimensions (above 1 million persons), actively engaged in the development of service and digital innovation strategies. Preliminary outcomes of the DIGISER Project profile the selected city as mildly prone to change, with a good degree of digital service innovation maturity.

The part of the narrative dedicated to “digital maturity” was extracted and shared with decision-makers, local experts and policy consultants engaged in formulating local digital strategic plans, and technical consultants involved in the digital service provision and management across multiple service domains. To facilitate comparison and better comprehension, a corresponding data visualisation depicting digital maturity was provided alongside the narrative. The digital maturity aspect delves into the degree of digitalisation of the public service delivery, encompassing the adoption of innovative digital technologies, and the application of methods and principles supporting PA digitalisation.

A qualitative enquiry investigates the three relevant aspects introduced before:

- 1. Understanding.** This section aims to assess the narrative feedback's level of clarity and comprehensibility. It evaluates how effectively the feedback translates raw data into usable information, enabling its understanding and application by various PA units and individuals with different levels of data literacy and expertise on the subject matter. Additionally, it investigates whether the narrative feedback stands independently as a comprehensible resource without the support of other forms of data restitution – such as visualisations and data extracts.
- 2. Awareness.** The section gathers information on the narrative feedback as a drive for reflection. It investigates the extent to which the city profile aligns with the characteristic of the PA and aids in evaluating its performances by highlighting its strengths, limitations and needs. Moreover, it assesses the narrative feedback's ability to enhance context and situational awareness among decision-makers and technicians.
- 3. Support to action.** The section assesses the extent to which respondents consider the translation of data into narrative feedback as supportive in terms of strategy and policy-building. It investigates whether the narrative feedback offers actionable insights and suggestions for potential courses of action. It examines, for instance, whether the feedback aids in implementing changes, such as revising strategies and actions, supporting diversified digital innovation actions for different divisions in the public administration. Unity managers were additionally asked to provide feedback on the elements they believe would enhance the narrative report's understandability and operationalisation.

3. RESULTS AND DISCUSSION

In accordance with the methodology's structure, this paragraph presents the initial findings in two parts. Firstly, it showcases the narrative feedback as the primary outcome, demonstrating the application of the narrative approach to the selected city while discussing the resulting city profile (paragraph 3.1). Secondly, it elaborates on the results of the qualitative enquiry run to validate the city profile's efficacy as a supportive device for understanding, reflection, and action (paragraph 3.2).

3.1. A city profile: insights on digital maturity

The narrative feedback serves as a container of information that generates descriptive accounts based on data findings. Although the complete city profile covers the entire structure defined by the DIGISER conceptual framework (see

Figure 2), here we report the results specific to the excerpt used for validation, i.e., digital maturity. Figure 5 displays an excerpt from the narrative feedback of the city later used for testing. Following the informative structure reported in Figure 4, , different typologies of information are highlighted in different colours to indicate the segments devoted to contextualisation and providing general information, presenting data in a semantic manner, and offering recommendations and potential directions for future actions.

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 5. Excerpt of the narrative feedback highlighting the different typologies of information.

As previously mentioned, digital maturity refers to the extent to which PAs embrace new digital technologies and deliver innovative public services. It encompasses the distinction between mature and emerging technologies, acknowledging the latter's relevant role in assessing the challenges faced by the public authority while developing new services. In the analytical framework adopted, digital maturity comprises the following dimensions:

- The degree of digitisation of pre-existing internal procedures, either ancillary or directly related to public service delivery;
- The extent of adoption of innovative digital technologies;
- The level of consistency in the methods and principles used to enhance the digitalisation level of the public authority.

In line with the DIGISER conceptual framework, the main results can be summarised as follows.

In terms of *digitisation*, the PA is informed that digitising services enhances efficiency while meeting citizens' expectations, showing benefits in reducing time, effort, and administrative burden. Next, the city is informed to have a high level of digitisation and a moderately digitised attitude across its various service areas. The city has made significant progress in digitization, with a high level of digitization and a moderately digitised attitude across various service areas. However, none of the service areas are fully digitised, which restricts citizens' ability to interact remotely and independently with the public authority. Nevertheless, all service areas offer digitised ancillary services, enabling citizens to fulfil them remotely. Digital access, on the other hand, is allowed only for internal use, requiring citizens to physically reach the public authority for the fulfilment of most of its services. Fundamental is to notice that when services are provided both offline and online, almost all users opt for digital solutions, demonstrating the need to invest further and increase the quality of the digital service provision. Regarding accessibility, the city is advised to consider automated translations to other languages to mitigate language barriers and cater to a broader audience. In this regard, the city is encouraged to explore free and automatic translation tools provided by the European Commission, which can significantly facilitate communication and engagement with diverse linguistic communities.

For what concerns *innovative digital technologies*, the city's adoption of AI, blockchain, wearables, IoT, and robotics is deemed improvable, indicating the potential for further exploration of their transformative capabilities. To fully leverage their potential, the city is encouraged to consider expanding their implementation. In terms of data modelling, the city has made some progress in deriving insights and knowledge from existing datasets. However, the need is highlighted to recognise the significance of increasing the use of devices such as Local Digital Twins for modelling functions for real-world experience, visualising policy scenarios and predicting policy impacts. However, virtual representations of assets, processes and systems as models require a supportive organisational culture and adequate institutional capacities.

Finally, regarding *advanced methods and principles*, the narrative feedback underscores that the city demonstrates a strong capacity to embed and make use of methods and principles for sustaining its digital innovation efforts. Tenders for procuring innovative solutions incorporate open standard and open-source requirements, fostering forward-looking practices of data sharing and re-usability. However, the narrative feedback suggests that more effective strategies should be implemented, importing and sharing solutions with other PAs. It is then highlighted that the city has yet to adopt interoperable digital solutions or services. Hence, it is strongly encouraged to consider such solutions for making services more sustainable and seamless, increasing the availability of information and procedural transparency, also exploiting EU-wide services available on the market.

3.2. A supporting device towards reflection?

The narrative feedback offers a comprehensive semantic restitution of data presented as a city profile. When asked about the contribution of this semantic translation, respondents generally agree that the tool is fairly informative and holds significant potential in terms of supporting action. In this sense, respondents generally confirm that the narrative approach effectively

translate data into accessible, understandable information, thus identifying the semantic translation as a more relevant form of expression for the target audience, i.e. PAs. To validate the ability of the narrative feedback to support PAs towards reflection, it is explored how the city profile contributes to (1) provide better understanding of data, (2) activate (self-) reflection towards better awareness, and (3) nurture support to action.

- 1. Understanding.** The respondents generally exhibit a fair or strong agreement in affirming that the city profile effectively conveys clarity and aids in translating data into actionable information. However, the range of responses is diverse, suggesting potential variations related to the specific excerpt provided (digital maturity) and the respondent's area of expertise. Notably, it becomes evident that respondents from departments where data holds a central role or those possessing a solid background in data usage attribute relatively shorter benefits to the semantic interpretation. Similarly, opinions among respondents differ regarding the potential use of city profiles by various units and departments within the PA.

Nonetheless, there is a widespread recognition that semantic translation is effective in bridging differences among domain-specific jargon, codes, and registers, thereby facilitating inter-sectoral communication. Respondents highlight that the excerpt could be enhanced to provide additional information, thus increasing its efficacy for non-experts, individuals with varying degrees of data literacy and levels of competence in digital maturity. Crucially, there is consensus among all respondents that the city profile effectively disseminates information on specific PA performance to audiences who may not have accessed it otherwise. In particular, all respondents agree that the tool supports subjects from different departments in gaining valuable insights into the PA's digital maturity performance, thereby bolstering institutional capacity building for better use and exploitation of innovative technologies and data. Despite the overall positive response, there is agreement on the benefits of complementing the narrative feedback with other forms of data restitution – such as visualisations and data extracts.

- 2. Awareness.** Respondents concur that the city profile aligns with their PA's characteristics, rendering it fairly valuable for assessing its strengths and potential. However, they display a more cautious stance when evaluating the narrative feedback's capacity to uncover limitations and needs related to the processes analysed, and to support the overall degree of awareness in the reference context. Highlighting a limit of the study, it should be noted that these responses might be influenced by the narrow focus of the narrative feedback on digital maturity. Nevertheless, respondents also acknowledge that the city profile helps contextualise data within place-specific PA performances, thus opening up a deeper understanding of possibilities not yet considered or applied by decision-makers and technical operators.

- 3. Support to action.** Finally, positive feedback attests to the capacity of narrative feedback to orient policy actions and support decision-making processes. Respondents unanimously agree on the city profile's value in suggesting actionable measures to guide policy changes, particularly in improving digital service accessibility across service areas, adopting open standards and open-source solutions, and enhancing end-user's trust in digital technology. Overall, the city profile

is perceived as effective in informing the public sector's institutional capacity to utilise innovative technology and data and embrace data-driven approaches. However, there are reservations about the city profile's ability to encourage diversified digital innovation across different divisions of the PA. While this concern might stem from respondents' specific position in the organisation, it also seems to reflect a general lack of trust in the capacity of the PA to overcome organisational rigidities, e.g. related to the allocation of tasks and the definition of cross-silo collaborative schemes.

4. CONCLUDING REMARKS

The paramount significance of data in contemporary PA cannot be overstated. However, its effective utilisation hinges upon the arduous task of interpretation, presenting a persistent challenge. In this context, the role of designers becomes indispensable as they offer valuable assistance in converting raw data into comprehensible and actionable insights. By bridging the gap between data and meaningful information, designers significantly contribute to enhancing the PA's capacity to grasp pertinent knowledge embedded within the data. This symbiotic collaboration between data and design fosters a deeper and more profound understanding of crucial information, thereby empowering the PA to make informed decisions and devise effective strategies for governance and public policy.

Currently, there is a significant focus on exploring novel interdisciplinary methodologies to harness the potential of data-driven and data-aware policymaking. These endeavours are currently under investigation and experimentation and aim to deliver timely and reliable information (van Veenstra & Kotterink, 2017). In line with this stream of research, the study reports on developing and validating a narrative model to translate data into policy-relevant information.

Within this framework, this study does not intend to assert the superiority of narratives over other methods, but rather to highlight their utility in communicating data to audiences who may not be extensively familiar with indexes and their interpretation. Narratives offer a complementary representation of data, shaped as a semantic interpretation rather than relying solely on numeric reporting. By adopting narratives, data communication becomes more accessible and comprehensible to a broader range of readers. The semantic interpretation, shaped as narrative feedback, goes beyond mere data presentation, contributing to facilitating a comprehensive data understanding of the data and of the underlying data trends and insights. Consequently, it reflects on the role of design in this translation process and how it can support decision-makers. As a result, this exploration into the use of narratives for data communication aims to uncover their potential contributions within scientific discourse, fostering wider dissemination of knowledge and bridging gaps in understanding.

In this framework, the proposed narrative feedback serves a twofold function, working as decision-making support and a (self)evaluation device. Its specific contribution to policymaking lies in its ability to foster awareness of the broader context where decisions are formulated and implemented. While the tool does not guarantee the quality of the information, as it relies on the quality of the collected data, it plays a supporting role by providing an initial common ground for shared reflection among actors with varying digital and sectoral competences.

Although further testing is required to fully assess the potential use and application of the proposed methodology, the narrative feedback yields a comprehensive profile that weaves together various dimensions, attitudes, and performances of the PA concerning digital transformation, also transversally to its sector areas and departments. By avoiding jargon and specialised language, the resulting profile becomes easily intelligible to cross-sector domains and multi-level actors. Building on this, the approach can give a push to overcome a persistent silo-mentality, fostering collaboration and knowledge exchange within the organisation. In addition, by contextualising the PA's behaviours within the broader landscape derived from ideal-typical categories and the performance comparison with other European cities, it encourages reflective processes. This, in turn, hints at directions for addressing weaknesses and further capitalising on organisational strengths. The reflexive dimension inherent in the narrative approach has significant potential to promote and reinforce self-awareness, ultimately encouraging iterative reflection on the digital transition.

In conclusion, the proposed narrative feedback offers a valuable tool for enhancing policymaking by creating a shared understanding of the PA's digital transformation. Although further testing is required, its ability to bridge diverse competences and facilitate self-awareness makes it a promising approach for guiding decision-making processes and fostering a more collaborative and adaptable organisational culture. This study is a methodological contribution to a landscape still resistant to data translation forms that support better understanding and interpretation. The narrative approach seems to partially contribute to closing this gap. A user-friendly provision of data favours the construction of fundamental knowledge assets. The semantic description was recognised as a comprehensible and accessible means for interpreting data, but also able to provide constructive feedback about the topic observed. This, in turn, encouraged reflection, potentially orienting future actions. These opportunities rely on the possibility of going beyond data analysis which requires mastering tools for information management and visualisation (Dimara et al., 2021). The study confirms the need to go beyond the provision of mere numbers, which return little information if not adequately contextualised and understood. Parallel to interactive tools that provide data access, clear benefits are associated with providing organisations with accessible knowledge. The study corroborates that complementary forms of data restitution should be considered to elaborate data in a cohesive and accessible manner, empowering policymakers' understanding and ability to operationalise knowledge. Giving a valuable grasp of the logic and possibilities of organisational transformation, the narrative feedback informs PAs on how the public sector, its governance and service provision can be revised and reshaped to focus its resources better. Providing organisations with constructive and contextualised feedback can effectively support transformation in the medium- and long-term.

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ENDNOTES

ⁱ Michael Murphy, Chair of the ECON commission of the European Committee of the Regions, points out, oascities.org/digiser-digisurvey-launched.

ⁱⁱ Decision making can rely on data to various extents. A data-aware approach entails being aware of current situations and performances while data-driven one implies owning the data needed to predict the results of a specific decision. A data-aware approach is often encouraged, prompting a more comprehensive understanding of data in terms of implications, limitations, and boundaries (Churchill, 2012).

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