DT Story + DT Solution Template

**This template embodies the information architecture underlying the core components of the DT4Regions platforms: DT stories and DT solutions.
The main purpose of this document is to help platform authors articulate and publish their digital transformation challenges and solutions on the DT4Regions platform under the "DT Book" module. It also aims to guide the definition of the structure of the form for the DT4Regions award submissions.**

Regione Emilia-Romagna

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Executive Summary

This template embodies the information architecture underlying the core components of the DT4Regions platforms: DT stories and DT solutions.

The primary purpose of this document is to help platform authors articulate and publish their digital transformation challenges and solutions on the DT4Regions platform under the "DT Book" module. The standardisation of the structure of these contents would facilitate their categorization and improve their searchability in conformity with the FAIR principles, and enhance communication and interactions among users.

The structure of DT stories and DT solutions presented in this document follows the data model defined in the Data Management Plan (DMP) (Emilia Romagna Region, 2022) already discussed with WP3 during the platform's design. Some other information reported in this document is taken from the DMP, as well. This document will be attached to the just-cited DMP as supplementary material in the Appendix Section.

It also aims to guide the definition of the structure of the form for the DT4Regions award submission of candidatures.

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Content

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Motivation

The goal of the DT4REGIONS project is to engender a critical mass of regional governments and officers actively involved with public services in order to produce network economies where the utility increases with the number of data consumers. Nevertheless, it is well known that for such communities to emerge, it is necessary to begin with content and services that the users can gather around and flourish. Therefore, the Project devotes substantial effort into generating, organising, and distributing already existing tools, services, and datasets, focusing on the concrete research questions rather than the technical solutions. In this context, a storytelling approach would allow for effective communication. Thus, we have identified as the platform's building blocks the challenges or business needs faced by the public administrations, which can be addressed by adopting AI and big data technologies. These blocks, which we call DT stories in view of their narrative structure, define the main components displayed on the platform website, under the DT Book module (Emilia Romagna Region, 2022).

What is a DT story?

A DT story represents an identified opportunity for value creation through digital transformation. It may be described as a set of problems to tackle or specific strategic objectives to achieve by implementing innovative practices, such as AI technologies or Big Data. Thus, it should be formulated as a change in existing processes: what are we striving to attain through digital transformation? Which organisational change would we like to manage using AI solutions or Big Data?

The primary purposes of publishing a DT story are:

- increasing awareness about existing business needs and requirements of public administrations to facilitate the alignment of development work,
- calling on the entire internet community to help address specific business needs,
- building communities of institutions which face similar challenges.

The components of a DT story are:

1. Title
2. Author
3. City or Region associated with the Author
4. Country of the Author
5. Category (single)
6. Themes (multi)
7. Status (open or closed)
8. Description (incorporates the abstract, strategic objectives, and expected benefits)
9. Resources (name, type, version, labels, URL, license)
10. List of DT Solutions (see the Section DT solution)

Some directions for writing a DT story are illustrated hereafter.

The following principles should be taken into account while writing the description of a DT story:

- **Clarity and conciseness**. The reader should be able to intercept the main problems or business needs of the DT story from the title, the themes, and the abstract. A quick look at the first lines of the description would allow the platform users to determine the problem's relevance and similarity to their own scenarios and thus identify common needs.
- **Generality**. It should not present contextual factors unless needed to specify the strategic objectives or expected benefits. Too many constraints could discourage potential contributors from publishing their DT solutions if they think they can partially tackle the challenge described in the DT story. In contrast, a more general description would be more inclusive and stimulate the flourishing of communities of practice.
- **Technological neutrality**. It should focus on functional needs and not impose specific technical implementations or products, in order to minimise the technological dependencies.

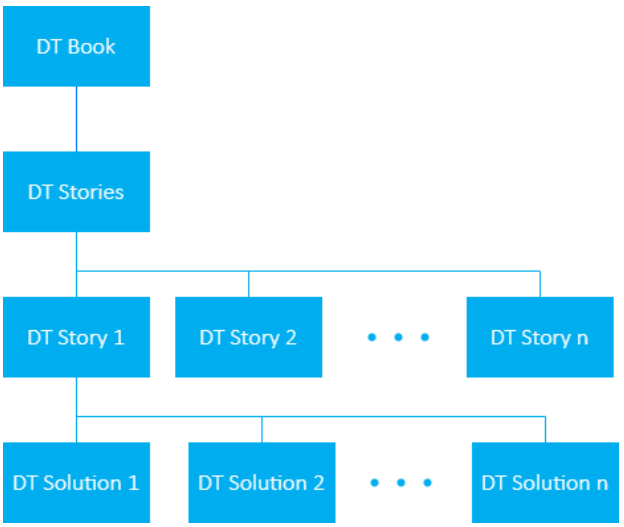
One of the core components of a DT story is the list of associated DT solutions. This section aims at:

- assisting public administrations in hunting and selecting the solutions that best suit their needs,
- encouraging public administrations to use common pools of resources when developing or procuring similar solutions.

A DT story may be an **open challenge** if it lacks a well-established solution. In this case, an author can solely publish a DT story without a DT solution with the aim of asking the community for help in endorsing the issues they are facing. On the other hand, if some solution has already been implemented, the author could publish, together with the DT story, a DT solution that describes the tangible resources employed (see the Section DT solution).

The structure

The DT stories will be published by the platform users in the DT Stories submodule, placed under the DT Book module. The following picture illustrates the hierarchical structure of the mentioned components.



Template

The following template would guide the authors in articulating the description of a DT story in all its components. Every part is named and should answer some knowledge goals indicated in the side boxes.

Title *A proper title describes an identified opportunity driven by the digital transformation. It should be concise and grab the attention of the reader.*	
Author	
Country	
Region/City	
Category *Choose from the list*	
Themes *Choose from the list*	
Description (max 500 digits)	
Abstract *Briefly describe the DT story*	
Problem or opportunity (Strategic objectives) *What are the strategic objectives you would like to achieve through digital solutions?* *Does your DT story deal with supporting policymaking, improving service deliveries, or enhancing internal management?*	
Expected benefits *Which are the expected benefits?* *Who are the stakeholders or systems which are envisaged to be impacted?*	

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Resources	
This section includes a set of files which can help address the problem. Examples of resources are: *Data (link to external storage or data services)* *Software (source code or link to open repositories)* *Documentation files (recommended)*	

Example

Intelligent digital workspace in the era of smart working

Author

Regione Emilia-Romagna

Country

Italy

Region or City

Emilia-Romagna Region

Category

Improve internal management

Themes

Regions and cities, Transport, Environment

Description

Abstract

In the last years, but more intensively during the pandemic emergency, the private sector and public administrations have massively implemented smart working and remote work practices.

In this context, the Emilia-Romagna region policymakers wonder how these new working models associated with a more efficient and AI-driven internal management contribute to addressing the strategic objectives defined in the Pact for Work and Climate, the Italian and European Union strategy for climate neutrality and transition towards a new, more environmentally and socially sustainable economy.

Problem or opportunity (Strategic objectives)

In particular, the Emilia-Romagna region would like to increase its quality of administration and staff performance, with a focus on the following commitments:

- Speeding up the environmental transition by promoting more sustainable mobility, reducing private motorised traffic, and fighting buildings' energy waste.
- Adopting good practices and building innovative welfare, such as improving the workers' work-life balance to reconcile work, personal, and family plans.

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The data available to support the development of digital transformation solutions contains personally identifiable information and is not attached to the story:

- The employee registry:
  - Employee_id: identification number in our HR system (0123456789)
  - Birthday: date in DD/MM/YYYY format (12/12/1975)
  - Gender: string indicates gender (M/F/NB)
  - Organisation unit: organisation unit internal code (D032)
  - Smart working flag: flag indicating if the employee has smart working rights (S/N)
  - Workplace_id: office code (BO30)
  - Country, region, province, city, address, zip code: Geographical informations as separated fields (Italia, Emilia-Romagna, BO, BOLOGNA, VIA DELL'INDIPENDENZA 1, 40121)
- The offices registry:
  - Workplace_id: office code as is in employee registry (BO30)
  - Country, region, province, city, address, zip code: Geographical informations as separated fields (Italia, Emilia-Romagna, BO, BOLOGNA, V.LE ALDO MORO 30, 40128)
  - Status: Boolean flag indicates if the office is still available (true/false)

Expected benefits

The main beneficiaries of the actions would be, in the first place, the about 4000 employees and collaborators of the Emilia-Romagna region. Specifically, more flexible forms of labour should contribute to creating a better working environment and, not least, facilitate the activities of vulnerable categories of workers, such as expectant mothers, people with disabilities, and rural inhabitants who are struggling to reach their workplaces. The increase in well-being and optimal use of the public assets would also improve the productivity of the public body, reduce energy consumption and pollution, and hence produce benefits for the entire community. Finally, remote working may support the repopulation of rural villages in the territory.

Resources

- **Name**: Pact for work and climate (Emilia-Romagna)
  Type: Report
  URL: https://www.regione.emilia-romagna.it/pattolavoroeclima/ese-patto-per-il-lavoro-17x24cm_en_web.pdf
  Version: 0.0.0

Labels: EU, climate change, work, environmental transition
License: Publicly available

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What is a DT solution?

A DT solution is a reusable, interoperable, and self-contained set of digital resources and documentation that has proven its value in addressing the business challenges defined in a DT story. From the technical point of view, a DT solution includes an IT service either procured or developed which implements AI technologies applied on datasets of any size, e.g., Big Data, and format (tabular, streams, etc…).

To facilitate the **reuse** of such tools, the publisher of the DT solution is highly recommended to provide readmes, manuals, documentation, and licenses describing how and to which extent the solution can be reimplemented in other contexts. It is also recommended to (e.g., open-source programming frameworks and data formats) with the aim of empowering citizens, businesses, and academics to get involved in the design of new solutions, contribute to service improvement or maintenance, and give feedback about the quality of the system. Finally, the proposed solution should be **interoperable** to enable its integration into other systems. Please refer to the ISA2 (European Commission, 2016) framework for further details on reusability and sharing IT solutions. Providing all these components together should make transparent, open, and democratise the process of obtaining some beneficial results from employing AI technologies and Big Data in the public administration domain.

In short, the following principles should be taken into account while creating a DT solution:

- **Reusability:** the solution should have as few dependencies as possible with other software. A clear and complete documentation together with a usage license should be provided.
- **Interoperability:** the solution should be extendable, scalable, and integrable with other systems.
- **Openness:** open-source technologies and open data should be preferred.

The components of a DT solution are:

1. Title
2. Author
3. Country of the Author
4. City or Region associated with the Author
5. Themes (inherited from the associated DT story)
6. Description (incorporates the abstract, the tactical objectives, the methods, the functional requirements, the results and impact assessment, dependencies and constraints)
7. Resources (name, type, version, labels, URL, license)
8. Disclaimers.

The **description** should focus on how the proposed technologies can assist the public administration in achieving the strategic objectives defined in the DT story. However, a DT solution may not be perfectly tailored to the specific context illustrated in the DT story, neither it is supposed to address the challenges exhaustively. Even a fragmental proposal could be a starting point for the successful achievement of all the goals.

The description is articulated into abstract, tactical objectives, methods, functional requirements, results and impact assessment, and dependencies and constraints.

In the **methods** section, the information about development, implementation, and deployment processes are summarised. The complete and detailed technical documentation should be linked or uploaded into the resources section. It would possibly include all the instructions to deliver the outputs given the data and the software, the background and team portrayal (e.g., the history of the solution, and the info about the development team), and technical specifications describing the services exposed, the core processes, the architecture, and the installation and configuration.

To evaluate the reusability of a DT solution, the **functional requirements** should be specified in the dedicated section. For example, the author should report the costs of customization, deployment, and ownership, such as costs related to acquisition and procurement, licenses, hardware, operation and management, upgrades, support services, training, software scaling, and change management. If any co-creation approach has been adopted, the external subjects engaged in the process should be reported here, as well.

Several barriers may be encountered in reaping the benefits of the solution in the public sector. These include conflicting organisational culture, uncertainty in regulations, insufficiently known impacts, lack of skills or expertise, underdeveloped data governance, and insufficient or low-quality data. Moreover, the solution may be dependent on other software that requires acquiring specific licenses. Thus, limitations and barriers detected in the given context may be listed in the **dependencies and constraints** section**.**

For a public administration to reuse a solution, it should know that it is safe, technically mature and documented enough. Also, although many national and European registries or catalogues of solutions are already available, it is often difficult for public administrations to make a sound decision about which solution to choose because of the poor quality of the description provided. That is why the **resources** section is critical when creating a DT solution. As already mentioned, together with the source code and data, if available, the resource section should contain the technical documentation. These reading materials would possibly follow the rules specified in Annex IV (technical documentation) of the Artificial Intelligence Act (European Commission, 2021), especially if an AI technology is employed. To mention some, these rules require the description of: the methods and steps performed for the development or the integration of the system; the design specifications, the main classification choices, what the system is designed to optimise, and the relevance of the different parameters, the description of the system architecture, the data requirements, assessment of the human oversight measure, and the validation and testing procedures used. The availability of rich documentation not only allows for a detailed investigation of the solution but also offers a strong indication of the solution's maturity and support level. Other essential resources are Intellectual property rights and licensing. They include the formal definition that refers to or describes the licensing mechanism, ownership rights, restrictions, and user responsibilities related to the distribution and reuse of the solution. See https://joinup.ec.europa.eu/collection/eupl/eupl-text-eupl-12 or https://choosealicense.com/ for a comprehensive list of standard open licenses.

Finally, the DT solution would come with **disclaimers** detailing how the risks delivered by the employed technologies have been mitigated. These risks may be related to ethical, social, or environmental implications, such as discriminatory biases, non-explainability or non-accountability of predictive algorithms, job loss, societal fragmentation, and damage to the natural environment; or they may concern legal infringements or security and cybersecurity aspects (e.g., privacy protection if personal or sensitive

data are processed). Examples of such disclaimers can be a declaration of compliance with the GDPR or the results of a trustworthy AI technology assessment.

The other components are briefly described in the following template.

Template

Given the complex structure of a DT solution, similarly to the DT story Section, we provide the following template to guide the writing of a DT solution.

Title *A proper title briefly describes the tactical goals and the approaches used to face the challenges.*	
Author	
Country	
Region/City	
Description (around 3000 digits)	
Abstract *Briefly describe the DT solution.*	
Tactical Objectives *What are the problems the solution is designed to solve?* *How does the solution help tackle the challenge in the DT story?* *What practical goals did you achieve with the solution?*	
Methods *How has the solution been designed and implemented? Outline here all the processes involved.* *What models or technologies have been employed in the solution?* *How has the data been collected?* *What outputs have been delivered? Who can access these deliverables?* *Can your solution be further extended?*	

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What methodologies have been used to test and measure the performance of the system?	
Functional requirements *Which resources in terms of competencies, costs (total cost of ownership), and time are required to deploy or customise the solution?* *Has the solution been co-created with external subjects?* *Have external subjects been engaged in the development or in the implementation of the solution?*	
Results and Impact assessment *Have you achieved all the tactical objectives set? Which other outcomes or findings have you obtained?* *What are the performances of the system?* *What methodologies have you used to conduct an impact assessment? What are the measured or estimated economic, environmental or social impacts?* *Which stakeholders are directly or indirectly affected by the solution outcomes? What are the foreseen effects on these stakeholders?*	
Dependencies and constraints *What barriers have you encountered in your specific context during and after the development or the implementation of the solution?* *Are there any dependencies on other software?*	
Disclaimers *What are the risks coming from the implementation of the solution?*	
Resources *This section includes a set of files needed to deploy the solution.*	

Examples of resources are: *Data (link to external storage or data services)* *Software (source code or link to open repositories)* *Documentation and readme files (recommended)*	

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Example

Identification of the optimal location of co-working spaces using clustering methods

Authors

Andrea Iacobucci, Luca Bonafede, Serena Borsari

Country

Italy

City or Region

Emilia-Romagna Region

Description

Abstract

The proposed solution exploits the potential of the clustering techniques to help the Emilia-Romagna region get insights into the mobility of the collaborators who commute to work and find homogenous areas of workers in terms of their home locations and distance to their workplace.

Tactical Objectives

By identifying the location of workstations that yields the lowest travel times and costs, the solution proposed aims to

- reduce emissions produced by workers who commute to their assigned offices by private cars,
- enhance the work-life balance of the workers, especially those who live far from their current workplaces,
- generate a more efficient use of buildings and other working facilities to reduce energy and space consumption.

Methods

The proposed solution is a three-step process. First, we obtained the location (latitude, longitude) of the employees' homes and the workplace buildings. Secondly, we calculated the distance and driving time between the employee's home and workplace. Based on our policy on smart working permits, we selected only employees more than 15 km away from the assigned workplace, and we performed a cluster analysis with the DBSCAN algorithm to create groups of

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employees based on their density on the regional territory. Finally, we also simulated a reassignment to the closest workplace building for grouped users and calculated the costs and emissions associated with each employee before and after reassignment. What-if scenarios have been generated, and the effect of reallocation in terms of time, costs, and emissions has been measured with a certain degree of approximation.

In order to deliver results to managers and decision-makers, we propose an interactive dashboard to explore where the employees live and how many kilometres they have to go to work, where they work, and where they potentially can work (smart) and measure the effect by simulation. The dashboard also offers a drill-through analysis to support the planning phase of searching for co-working places.

The implementation details can be found in the repository linked in the resources (work in progress).

Functional requirements

Data scientists and geoprocessing experts are involved in carrying out the project in about 6 months.

Results and Impact assessment

Assuming that employees are allowed to work remotely for 49% of the workdays in a year, we estimate a 30% reduction in costs and emissions related to employees who travel to their assigned office. The individual average daily travel time would go from around 40 minutes to 12 minutes, saving about 70 hours per year. Based on internal studies on travel expenses (0.40 € / Km) and co2 emissions (138 g / Km) incurred by employees, the annual per capita savings would be around **€ 1000**, and the amount of CO2 saved would be about **2000 tons**. In a further development, we aim to estimate the efficiency of buildings and make more analyses to optimise the usage of spaces.

Dependencies and constraints

The data on employees is pseudonymised to comply with the GDPR. The source code and all libraries used to create the solution are free-to-use and released with an open-source license, with the exception of the EgeCo georeferencing proprietary software (our internal geoprocessing database service).

The critical aspect of the solution is the lack of information regarding the means of transport used by employees and the availability of workstations within the workplaces. Considering these limitations, costs and emissions are calculated supposing all employees go to work by private car and this is not a realistic picture and is overestimated. On the other hand, if the availability of

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workstations is known, it is possible to improve the simulation phase by assigning employees to new workstations by introducing constraints on the saturation of workplaces.

Dashboard and data contain personally identifiable information of employees and are not available for public access.

Disclaimers

Resources

- **Name**: Github link to notebooks repository;
  Type: Repository
  URL: https://github.com/RegioneER/dt4r.workstationintelligence
  Version: n/a
  Labels: python, Apache Spark (pyspark), geopy, sci-kit learn, cluster, DBSCAN
  License: See LICENSE.md file inside the repository
- **Name**: Open Source Routing Machine
  Type: API
  URL: http://project-osrm.org/
  Version: 0.0.0
  Labels: travel distance, travel duration, routing
  License: BSD 2-Clause “Simplified” License | Choose a License
- **Name**: Solution high-level report (pdf)
  Type: Report
  URL:
  Version: 0.0.0
  Labels: results, methodology, report
  License: The reproduction of documents without the explicit consent of the authors is forbidden.

References

Emilia Romagna Region. (2022, June). *Data Management Plan* (0.7) [Deliverable of the Project DT4Regions] [Digital]. https://docs.google.com/document/d/1Ht1u4bU9A6zkD_hZxRAu322r06eByCRz/edit?usp=sharing&ouid=115895910139246738057&rtpof=true&sd=true

EUROPEAN COMMISSION. (2016). *ISA2 sharing and reuse framework for IT solutions*. https://joinup.ec.europa.eu/collection/sharing-and-reuse-it-solutions/sharing-and-reuse-framework-it-solutions-pdf

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