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## Market research – Open Data Hub – ePaper Backend – Development

This document concerns market research for the identification of one or more partners that can support NOI S.p.A. in the development of the ePaper Backend tool. The ePaper Backend is a web application that gets from the Open Data Hub the information about events and meetings occurring at NOI Techpark and generates the images to be displayed on the ePaper totems and tags installed at the NOI Techpark.

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## 1. Goal of the market research

This chapter aims to explain in more detail about content included in the market research. This document concerns market research for the identification of one or more partners that can support NOI S.p.A. in the development of the ePaper Backend tool. The ePaper Backend is a web application that gets from the Open Data Hub the information about events and meetings occurring at NOI Techpark and generates the images to be displayed on the ePaper totems and tags installed at the NOI Techpark.

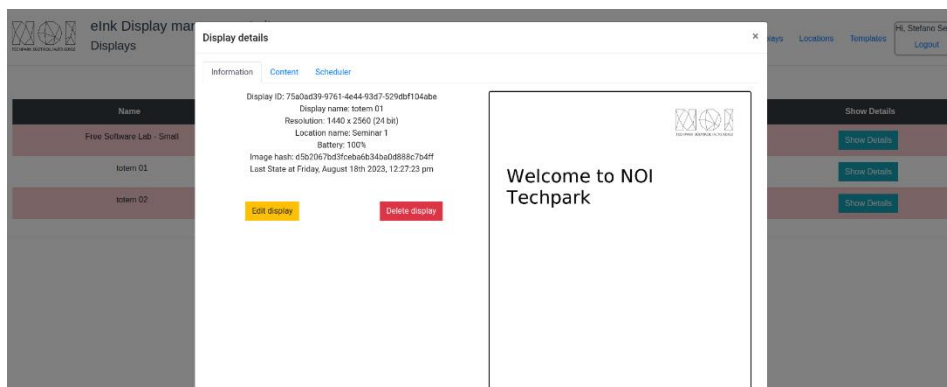
### 1.1 INTRODUCTION

NOI S.P.A. in 2021 developed the first version of ePaper Backend that:

- Gets from the Open Data Hub the information about events taking place at NOI Techpark;
- Generates the images to be displayed on the totem placed in front of the Seminar Room 1 and 2;
- Allows to manage the single totem and to modify the schedule of the content to be displayed on each ePaper display.

The first version of the web component is available at the following link:

<https://epaper.opendatahub.com/login>



**Figure 1:** ePaper backend screenshot.

As described in Figure 1, the main usage of the actual version is to display the information (e.g. title, organizer, start time, end time, etc.) about the event that is taking place in the Seminar Room which is associated to the ePaper Totem.

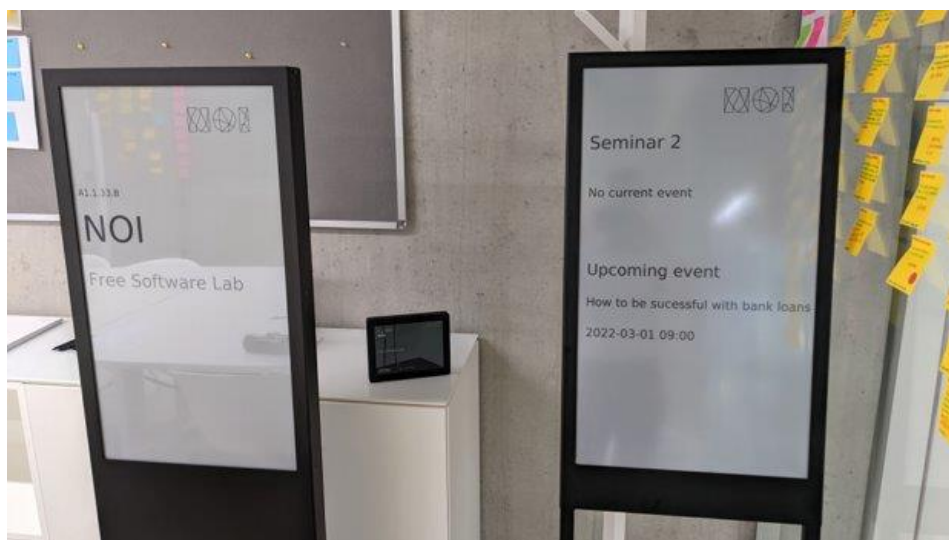
The source code of the actual version of the ePaper backend has been published in GitHub in the following repositories containing:

- The source code of the front-end web application that allows the user to manage, update and view the information displayed on the ePaper totems:

<https://github.com/noi-techpark/it.bz.opendatahub.epaper.webapp>

- The source code of the API that enables the communication between the web application and the totems:

<https://github.com/noi-techpark/it.bz.opendatahub.epaper.api>.



**Figure 2:** ePaper Totems and tag developed during the first iteration of the project.

During the first half of 2023 NOI S.P.A., on top of the feedback provided by the Meeting Management who manages the entire NOI Seminar Area, decided to extend the number and the types of totems. This means that also the ePaper Backend application should be extended to manage the new Totem and Tag types:

- 64" ePaper Totem that will be used to display the information about all NOI Techpark's Seminar Rooms;
- 7-9" ePaper Tag that will be used to display the information about the meetings taking place in the NOI Techpark's meeting rooms.

## 1.2 TARGET USER

The target users of the ePaper are:

- **NOI meeting manager** who wants to keep NOI Techpark's visitors informed about events that are taking place in the seminar rooms;
- **NOI B&C manager** who wants to keep the NOI Signage always updated with the right information and using the right templates.
- **NOI facility manager** who wants to
  - have the overview of the totems;
  - have an overview of the battery status of the battery powered devices.
  - Be notified if a device has problems (e.g., low battery status, device offline or non-responding, etc.)

### 1.3 USE CASES AND FUNCTIONALITIES TO BE IMPLEMENTED

This section summarizes the main use cases and functionalities that emerged from the collected feedback and that should be implemented. Please note that all screenshots and design images included in this market research have to be considered only as examples. The market research includes also the elaboration of the UI/UX of the new functionalities.

#### 1.3.1 Reuse Compliancy

The source code of the actual version of the ePaper backend webapp and API have been released under the AGPL-3.0 license (web application: <https://github.com/noi-techpark/it.bz.opendatahub.epaper.webapp/tree/main/LICENSES> and ePaper API <https://github.com/noi-techpark/it.bz.opendatahub.epaper.api/tree/main/LICENSES>) and is REUSE compliant. The new version of the ePaper web application frontend and API should be released under the same license and must be REUSE compliant as well. More information about the REUSE project are available at the following link:

<https://reuse.software/>

#### 1.3.2 Add 64 inch Totems

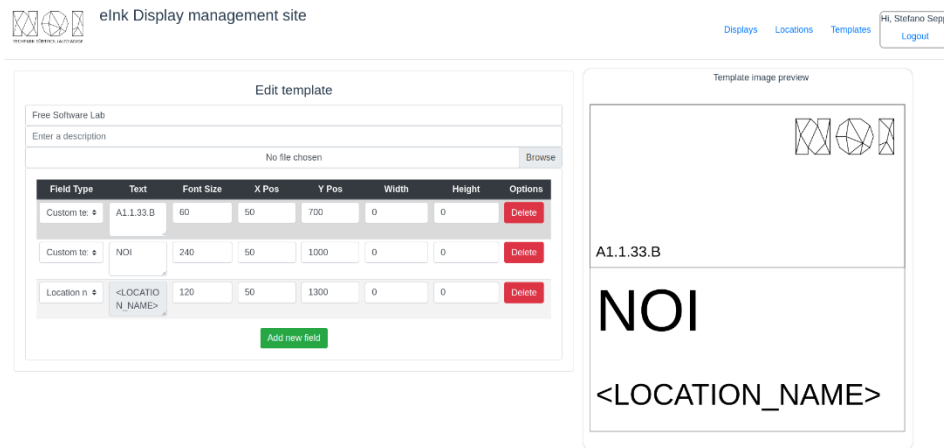
The ePaper Backend should allow the NOI Facility Managers to add new totems with a screen size of 64 Inch with a resolution of 1440 x 5120 pixel. The technical specification of the 64" display are the following:

- the screen is composed by two 32 inch ePaper display with a resolution of 1440 x 2560pixels each;
- the screen can display 24 bit bitmap images.

Considering that the totem integrates two different ePaper displays the ePaper Backend should sent to the totem two different images and its display order.

#### 1.3.3 Create 64-inch Templates

The ePaper Backend should allow the NOI B&C manager to easily create 64-inch templates to be used to display the information on 64-inch totems. Since the 64-inch image is composed of two 32-inch images, the NOI B&C manager while creating a new 64-inch template should easily understand how the content is disposed, to avoid placing contents on the border between the two images.

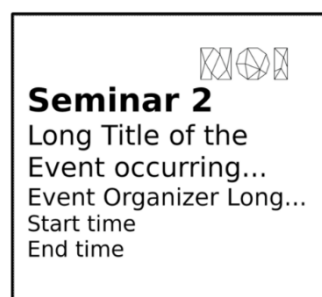


**Figure 3:** 64-inch template example.

As displayed in Figure 3, a possible solution is to show the borders of the two images composing the 64-inch template, to help the user to understand how will be splitted on the totem.

#### 1.3.4 Fields position, dimensions and content management

The ePaper Backend should allow the NOI B&C manager to define field type (e.g., custom text, location name, event title, event start, etc.), font size (in pixle), the position (in pixel) and the dimension (height and width in pixel) of each field. In case that the text exceeds the defined field dimension, the webapp should cut the text and put 3 dots at the end of the string.



**Figure 4:** example of text cut.

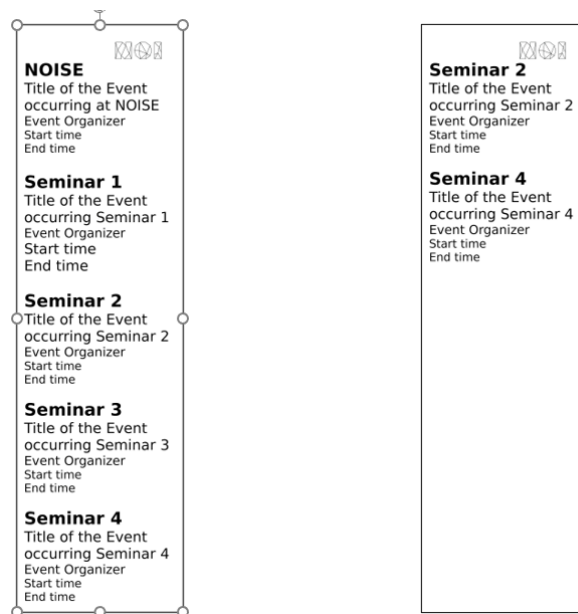
An optional additional feature that could be considered is the possibility to select a field, change its position and resize it only using the mouse and drag and drop functionality.

#### 1.3.5 Multi Room totem management

The ePaper Backend should allow the meeting to display on a single totem information about more rooms, to provide information about all events happening in

the Seminar Area. This means that the ePaper web application should behave as follows:

- for the "multi rooms displays" the user must have the possibility to provide for each field (Event Organizer, Event Title, Event Start, Event end, etc.) the related room;
- for the "single room displays" the room of the display is automatically associated to each automatically generated field.



**Figure 5:** example of multi room totem images.

Please note that the ePaper web application for the multi room displays should automatically hide the rooms without events while generating the images to be displayed. Moreover, as shown in Figure 5, the rooms with events should be always displayed on the upper side of the screen.

### 1.3.6 Add new 7-9 Inch tags

The ePaper Backend should allow the NOI Facility Managers to add tags with different screen sizes included between 7 and 9 Inch. The technical range of resolution of the ePaper screens will be:

- 640x384
- 800x600
- 800x480
- 960x672
- 1872x1404

The file format accepted by the ePaper screens will be:

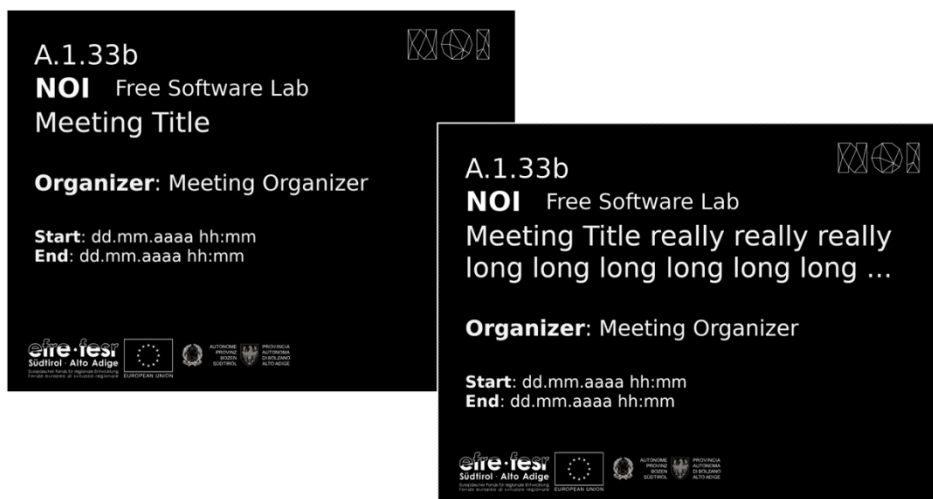


- The screen can display 2 to 24 bit bitmap images.

During the ePaper Tag testing phase the system should be able to handle probably 4 different ePaper screen types that will combine the technical features mentioned in this paragraph.

### 1.3.7 Create New 7-9 Inch Templates

The ePaper Backend should allow the NOI B&C manager to easily create templates to be used to display the information on each Tag included in the testing phase.



**Figure 6:** example of tag templates.

As displayed in Figure 6, the Tags will be mainly used to display the information about the meetings occurring in the NOI meeting rooms. For this reason it is important that the NOI B&C manager can easily import the following fields in the template:

- Name and number of the room;
- Code of the room;
- Title of the meeting;
- Start of the meeting;
- End of the meeting;
- Name of the meeting organizer;
- One image (e.g., the logo of a company).

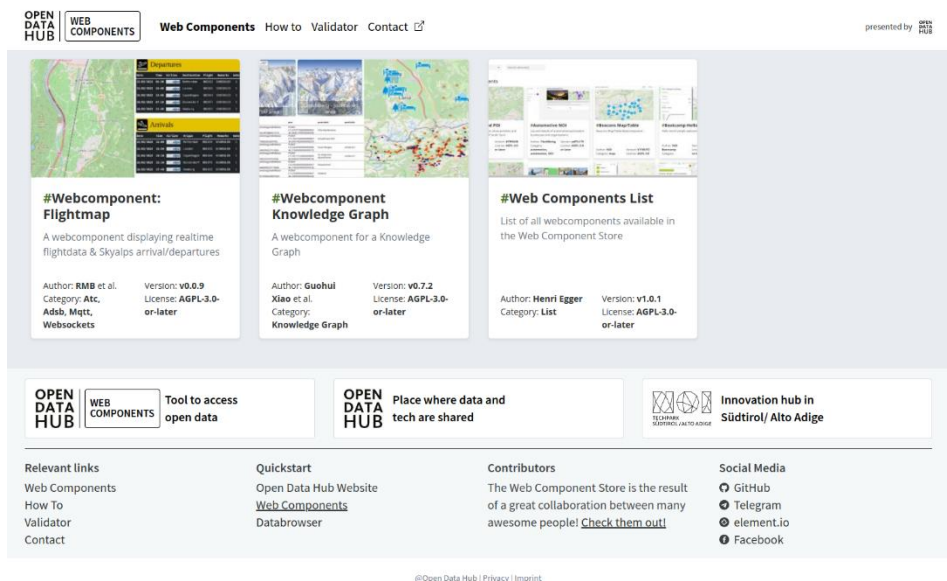
### 1.3.8 Battery powered devices (totem/tags)

In the next iteration of the project NOI will test also battery powered devices (totems/tags). This means that it could be that in the communication process some optimization could be implemented. This kind of updates will be agreed during the project by analyzing the real needs that will emerge.

### 1.3.9 Open Data Hub design alignment

The design of the ePaper Backend should be improved, to:

- Increase the usability of each feature;
- Uniform the design to all other Open Data Hub tools.



**Figure 7:** example of Open Data Hub design.

To define the design of the tool the Open Data Hub Web Component Store (see Figure 7) should be used as reference tool. The Open Data Hub Web Component store is reachable at the following link:

<https://webcomponents.opendatahub.com/>

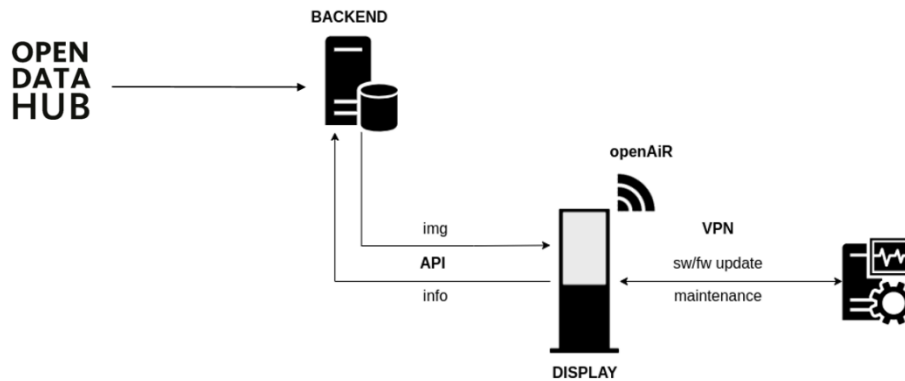
## 1.4 TASKS AND SERVICES

The task, services and activities included in this market research are:

- UI/UX definition of the ePaper Backend;
- development of the new feature;
- participation to all biweekly sprint meetings with the entire project team;
- active support during the release of the web component;
- 40 hours of support on request to be used in case of need (e.g., new features to be implemented and that were not foreseen at the beginning of the development).

## 1.4 GENERAL ARCHITECTURE

This paragraph includes the description of the general architecture that has been built to manage the ePaper totems and tags.



**Figure 8:** ePaper general architecture.

As represented in Figure 8, the ePaper Backend, will get all Data about the Events and Meetings taking place in the Seminar Area of in a NOI Meeting Room from the Open Data Hub:

<https://api.tourism.testingmachine.eu/swagger/index.html#/EventShort>

On top of the data retrieved from the Open Data Hub the ePaper backend will create the schedule of the content and the bitmap images to be displayed on the ePaper Totems and Tags. In the actual configuration the totems make on a regular base (e.g. every minute) a request to the ePaper APIs (see link below), to verify if a new image is available. The request includes:

- The totem/tag ID;
- The battery status (if the device is battery powered).

The ePaper API are available at the following link:

<https://api.epaper.opendatahub.com/>

The API responds to the API call by sharing the hash code of the image that should be displayed. The totem checks if the hash code received from the API is different from the one of the image that is displayed on the screen. If yes, the totem will download the new image and display it on the screen. The totem notifies the APIs once the display process is successfully ended. If the hash code is the same as the one of the image displayed on the screen, the totem will wait till the next interval to repeat the procedure.

To register a new device (totem or tag) in the ePaper backend the user will need to input the following parameters:

- **ID** (typically the MAC address)
- **Device Name**
- **Resolution** in pixel

## 2. Constraints

In this section are listed and described the constraints that the service provider must follow to work with NOI on this project.

### 2.1 ECONOMIC EXPLOITATION

Where the creation of material subject to proprietary rights, including copyrights, sui generis data rights, and related rights, including solely of photographs, industrial design, all rights of economic exploitation arising from achieved results are reserved to NOI S.p.A., excepting those expressly excluded when the order is placed.

Further, if the material includes a software development project, all source code from libraries or other modules used in the realization of an assignment and belonging to a third party must be released under an Open Source license ([opensource.org/licenses](https://opensource.org/licenses)) in a manner compatible with the scope of the "outbound" software license, without requirement for adaptation, addition, cancellation or requests for permission from third parties on the part of NOI S.p.A. In the absence of any expressly indicated license, the terms of the GNU GPL v3 license shall apply. The use of material belonging to third parties must be expressly declared at the time of the offer or be easily and immediately understandable from the description of the project. If code is developed during the realization of this assignment, NOI S.p.A. will initiate a Git repository on which the supplier must develop and publish the source code.

If the material consists of data, creative works (drawings, literary works, cinematographic works, figurative art, photographs), industrial design or other material which are subject in whole or in part to the proprietary rights of a third party, the use of such material is permitted provided it is licensed under conditions compatible with the license under which said material will be published, if indicated. If no license is indicated, the material will be subject to conditions compatible with the Creative Commons Zero (CC0) license.

### 2.2 INVOICING

The invoicing of the activities concluded by the supplier will be sent to NOI S.p.A via electronic invoice only after the outputs produced have been successfully tested by NOI S.p.A. Before to proceed with the testing of the outputs, the supplier must provide to NOI S.p.A.:

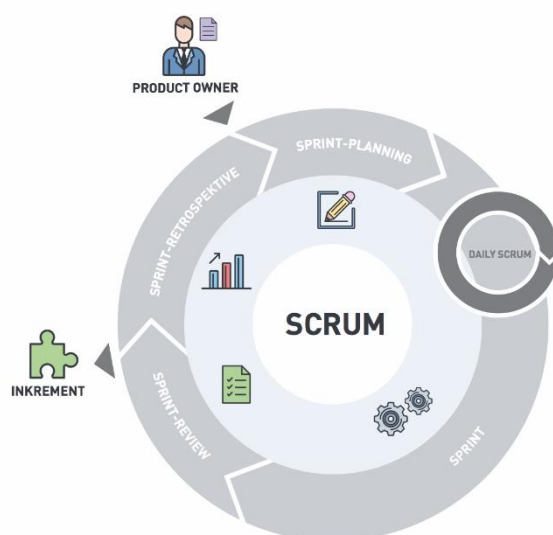
- the entire documentation.
- if code development is planned, the code must be uploaded to the Git repository provided by NOI S.p.A.
- in the case of multimedia contents (e.g., photos, videos, illustrations, documents), the service provider must upload it on specific platforms (e.g., Vimeo, Flickr, etc.) and provide the source files or open versions through appropriate file hosting services indicated by NOI S.p.A.

All invoices must include that the transaction is subject to the Split Payment discipline as mentioned in the art.17-ter del DPR 633/197 and must be issued exclusively in electronic format (Unique Office code: T04ZHR3).

### 2.3 WORK METHODOLOGY

The SFSCON is an event organized by the Tech Transfer Digital of NOI S.P.A. Since the main project of the Tech Transfer Digital is the Open Data Hub, for the development of the SFSCON App the team will follow the same work methodology as in the Open Data hub Project. This paragraph will include more details about the work methodology.

The development of the activities covered by this market survey will follow the agile method (scrum). Two weeks sprint sessions are scheduled, unless otherwise agreed, during the kick-off meeting with the core team of NOI S.p.A.



**Figure 3:** the SCRUM methodology.

The software development will take place in three phases/environments:

- **development environment:** this environment is on supplier’s infrastructure and is used during the development of the software components.
- **testing environment:** on infrastructure made available from NOI Techpark. This environment is used to test the new working versions of the software components. For the publication of the new versions a Continuous Integration (Jenkins) pipeline will be developed by the NOI team. For this reason, the new versions of the code will have to be “committed” to a dedicated Git Repository according to the instructions provided by the team of the NOI Techpark.
- **production environment:** on infrastructure made available from NOI Techpark. After the testing phase, as soon as the software produced is

considered sufficiently stable, the software will be integrated into the production environment. Also, this process is managed automatically with Continuous Integration pipelines.

To coordinate the project NOI S.p.A. will use a Kanban Board in GitHub. Each functionality or issue will be described by NOI S.p.A. in GitHub and put on the Kanban Board. The Kanban Board will have the following columns:

- **Backlog:** contains all issues that are on hold and must be discussed during the next sprint meeting with the supplier;
- **ToDo:** contains all issues that must be concluded in the actual sprint;
- **In Progress** contains all issues where that are working in progress.
- **To Review:** contains all issues that NOI Techpark has to review and that has to be reviewed during the sprint meeting.

All issues in the Kanban, apart from the one in Backlog, must be assigned to the user that must make the next step (e.g., the issues in ToDo will be assigned to the developer who must develop the functionality, the issue in To Review will be assigned to the tester, etc.). The supplier will have access to the project Kanban board and will have to check it regularly.

To allow the NOI S.p.A. team to properly review and test the code, for each issue in the ToDo lane the service provider has to send a pull request to the development Branch of the repository at least 5 working days before the sprint meeting.

To allow a better integration of the systems already in use by NOI Techpark it is required to implement all software components, where possible, using the technologies that are already in use by the Open Data Hub (<https://opendatahub.com/>) project.

## 2.4 REPOSITORY GIT

The source code must be uploaded to the Git repositories provided by NOI Techpark. During the upload, the service provider must take particular attention to the following aspects:

- do not commit usernames or passwords. NOI Techpark uses GitHub Actions to build the code which implements password ingestion based on special keywords in the source code;
- well document the code describing at least:
  - the general architecture of the system;
  - the list of the licenses of all the libraries used;
  - the installation process;
  - all other useful information for people who want to fork or install and use the project.

As Open Data Hub (<https://opendatahub.com/>) we have created some boilerplate repositories for the most common project type (es. Java project, Web Component,

.Net Core project, etc.). In case you are starting a new project from scratch, before starting your project please look for the boilerplate that best fits your project and use it to initialize your repository.

#### 2.4.1 Documentation

While you are documenting your code, please consider that the official language of the Open Data Hub is English. So, the entire documentation, including the comments in the code, must be in English. Moreover, you must observe the following guidelines:

- use the right boilerplate of the README.md if exists;
- use only markdown or text (no binaries, no PDF, etc.);
- should be so detailed that a third person, without any connection to the developers can setup the project, run it and develop it further;
- Java Doc and similar tools for other languages should be as complete as possible;
- add the author tags incl. emails;
- README.md should be a good description of the project and should also have usage instructions (boilerplate does not consider that). Mainly because tools like **npm** use it as homepage for each project

In general, the documentation of the project (e.g., readme file, license file, etc.) should be done to allow third parties developers, who do not know anything about the project, to understand the whole project and replicate, install or modify it without the need to contact NOI S.p.A. Therefore, the documentation (README.md) should include also:

- a brief description that allows the user to understand the overall goal and functionalities of the project;
- longer and detailed description that includes also:
  - description of the distinct parts of the repository/application;
  - description of distinct parts of the project (also other repositories, if existing, and a link to them) and how this application is part of the overall project;
  - external services/code/framework/software that are used including their license and copyright information;
- detailed development setup instructions (including testing);
- detailed deployment setup instructions.

#### 2.4.2 Licensing and Reuse compliance

In respect to the licensing and copyright information, the service provider must follow the guidelines defined by the Reuse project:

<https://reuse.software/>

The service provider must provide code where the Reuse linter passes without errors and the licenses must all be compatible with each other.

### 2.4.3 Pull request (PR)

As mentioned in the previous paragraphs the service provider, before each sprint meeting, will deliver the source code by making a Pull Request to the Development Branch of the repository Git provided by NOI S.p.A. at the beginning of the project. In general, the service provider must observe the following guidelines to make the pull requests:

- at the beginning of each sprint the service provider will open a Pull Request (PR) with a prefix [WIP] as Work in Progress;
- during the sprint, the service provider must regularly push the commits to that PR to allow NOI S.p.A. to monitor the status of the project;
- at the end of the sprint (at least 5 days before the sprint meeting) the service provider will close and send the Pull Request.

NOI S.p.A. will analyze the Pull Request before the meeting and eventually send feedback to the service provider. The minimal requirements for a Pull Request to get accepted are:

- the documentation must exist and be as complete as possible in respect to the status of the project;
- commits must not contain credentials or any other sensible data;
- contributions (e.g., documentation, comments, etc.) must be in English;
- merge conflicts must be resolved by the contributor;
- all Continuous Integration verifications must pass;
- Pull Request branches should have a linear history, that is, they should not contain merge commits.

During the development cycles the pull request comments and in general the issues and the dedicated Kanban board on GitHub (original repository) must be tracked by the service provider. The discussion about issues, pull requests, and other specific comments on the code development will be managed on GitHub in the project repository and NOT through email. That also involves moving user stories to the corresponding column in the Kanban and assigning them to the right user.

### 2.4.4 Commits

These paragraphs contain some guidelines that the service provider should follow while implementing the project:

- commits should contain a single thing/feature, not be too big and specially they should not be a combination of unrelated features or bug-fixes;
- each commit must be described: present tense and active (e.g., "Add logging to commons" not "commons will get logging now" and not "Added logging").



#### 2.4.5 Deployment

For the deployment of the project NOI S.p.A. will use its CI/CD infrastructure, for this reason it is important that the service provider includes in the documentation of the project the information about how the application should be deployed or updated by a CD pipeline. Therefore, the documentation should point out the following things:

- What parameters must be configured? Which ones are secrets and which are not?
- What services must be used? (e.g., PostgreSQL database, S3, etc.)
- What steps must be made to package the application/project so that it can be copied to the server?
- What steps must be made on the server after deploying? (ex. Database migrations executing with special command)
- What must be adjusted on the server only once? (ex. cron job, shared folder).

#### 2.4.6 Testing

All projects should include unit tests and the minimal requirements for the service provider are:

- setup a test infrastructure;
- write unit tests to cover the most key features;
- the minimal test coverage should be 20%;
- tests should cover own business logic (even if minimal) and not third-party API's / libraries.

Finally, a test-driven development is appreciated.

#### 2.4.7 API development

In case that within the project it is foreseen also the development or the change of APIs, the service provider should observe the following guidelines:

- all API calls must be documented in the README.md;
- Swagger UI should be used;
- in case of errors the API should return to the consumer valid and descriptive error messages;
- the API should be RESTful, if possible, but, in case of need, other formats will be considered. In case of non RESTful APIs the service provider should present to NOI S.p.A. enough documentation to allow NOI S.p.A. to decide whether to go on with the modern technology or stick to RESTful;
- the API must include also:
  - Response codes,
  - HTTP methods,
  - validity errors,
  - logging: JSON format for production and plain-text for local development written to stdout.

#### 2.4.8 Access Control List (ACL) management

In case that the project foresees Access Control List management, the service provider should observe the following guidelines:

- every login to a webapp needs ACL;
- the passwords must be complex enough to be secure;
- OAuth 2.0 standard is required Session management for webapps should be present, logout after an inactivity time (the length of the inactivity time depends on the single projects and must be agreed with NOI S.p.A.)

As an Access Management tool NOI S.p.A. uses Keycloak (<https://www.keycloak.org/>) instance. More details are available at the following links:

<https://github.com/noi-techpark/documentation#oauth>

#### 2.4.9 Dockerization

NOI S.p.A. is using Docker (<https://www.docker.com/>) to automate the deployment of the application and we strongly recommend to:

- use docker for local development;
- keep local docker setup, staging and production as similar as possible (these will be provided and updated by the NOI S.p.A. team);
- use environmental variables to configure different stages (i.e., .env files).

## 2.5 WORKING PLACE AND HOUR

#### 2.5.1 Working Hours

The execution of the works that involve collaboration with the staff of NOI Techpark or other entities involved in the project must be carried out within a timeframe ranging from 9.00 to 12.00 and from 15.00 to 17.00. Depending on the needs, different times may be agreed via email between the service provider and the entities involved.

#### 2.5.2 Working Place

The meetings that will be agreed during the project will take place, according to the needs of the project team, online or in the NOI Techpark offices:

- Via Alessandro Volta, 13, Bolzano.

Any expenses that the supplier will have to incur to reach these locations will not imply an additional cost for NOI Techpark. In any case, any travel costs that the supplier will have to incur to ensure the natural performance of the project activities (e.g., extraordinary coordination meetings, interventions that require presence on site, development activities to be carried out in agreement with the one or more entities / suppliers involved in the project, etc.) cannot be billed to NOI Techpark.

### 3. Request to the supplier

#### 3.1 PROJECT INFORMATION

The supplier must include in all documents (e.g., offer, invoice, etc.) the following information:

**Project name:** IMPACT – Impacting Innovation Through Specialization

**Project code:** EFRE1048

**Project CUP:** J57H23000640009

#### 3.2 OUTPUTS

The service provider should produce the following outputs:

- One document including all ePaper Backend screen design;
- source code released in the repository provided by NOI S.P.A.;
- technical documentation as defined in the previous paragraphs;
- The new version of the ePaper Backend working in production at the following link:

<https://epaper.opendatahub.com/login>.

### 4. Documentation

To participate in this market research, we kindly ask you to provide the following documentation:

- a short company description that includes also a list of references in similar projects;
- a short description of the team that will be assigned to the project including a short description of the competences of each team member;
- the cost estimation for each single task described in the chapter 1.4 of the present document.;
- the hourly rate of each team member included in the project team.

### 5. Contacts

The service providers who are interested in participating in this market research will have to present their estimation by the **13<sup>th</sup> of September 2023**.

In case of any question please contact:

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