Promoting and Incentivising Federated, Trusted, and Fair Sharing and Trading of Interoperable Data Assets

D1.2
PISTIS Technical Requirements and MVP

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Reviewer(s)	Costanza Pestarino (DSME) Marios Zacharias, Dimitrios Slioprasitis (SPH)
Abstract	This deliverable identifies the minimum set of technical requirements of the PISTIS platform that realise the business needs and expectations of the end-users, through a user stories-oriented methodology for defining PISTIS MVP.

Executive Summary

Deliverable D1.2 is PISTIS Technical Requirements and MVP presenting the initial results of the task T1.5 “PISTIS User Stories, Technical Requirements and MVP Design” of the WP1 “PISTIS Trusted and Interoperable Data Trading and Management Framework”. The scope of this deliverable is to define the minimum set of technical requirements of the PISTIS platform that realise the business needs and expectations of the end-users.

A methodology, derived from agile product development, has been adopted following the stakeholder’s identification and the detailed description of their interactions and functionalities of PISTIS platform from their perspective using the tool of user stories. Using common understanding between end-users and developers, a list of technical requirements has been identified based on the analysis of the user stories. These requirements have been evaluated and prioritised based on the end-users needs and the technical implementation feasibility, concluding to the definition of the PISTIS Minimum Viable Product (MVP).

The first step of the methodology identified five roles for the PISTIS Users: the data providers, the data consumers, the organisation’s administrator, the PISTIS administrator and the auditor. From the perspective of the actors-systems, PISTIS platform defined as the main system that will be interacting with the users. Further, the actors-systems includes some of the functional modules of PISTIS Platform that are widely known to the users or are providing crucial operations, such as Data Factory, IAM, Marketplace.

Afterwards, a list of fourteen (14) user stories are selected to be elaborated based on business requirements identified in D1.1. For the depiction of each user story, a combination of natural language and formal definition were used. The work was conducted with the close collaboration of both end-users and technology providers. Each user story includes a) the description of “Who, What, and Why” defining the actors, the description and the benefits of the user story, b) the formalism of the story using the BPMN notation defining the interactions between users and systems, and c) the list of technical and operational challenges and issues that must be taken into consideration in the design and implementation phase.

The thorough definition of user stories allowed the identification of seventy-six (76) technical requirements of PISTIS platform. These technical requirements are specific for expressing the added value and benefits provided by PISTIS and doesn’t include classical information systems technical requirements, such as accessibility and standard security measures.

Finally, both end-users and technology providers have prioritised the technical requirements using the MoSCoW method. A prioritisation based on weighted voting, providing more importance on the vote of end-users group, concluded to the list of requirements that must or should meet on the PISTIS MVP.

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Terms and Abbreviations

AI	Artificial Intelligence
CA	Certification Authority
FTP	File Transfer Protocol
IAM	Identity and Access Management
JSON	JavaScript Object Notation
MoSCoW	M - Must have, S - Should have, C - Could have, W - Won't have.
MVP	Minimum viable product
NFT	Non-Fungible Token
RDF	Resource Description Framework
XML	Extensible Markup Language
eIDAS	electronic IDentification And trust Services

1 INTRODUCTION

1.1 SCOPE OF THE DELIVERABLE

This deliverable focuses on the elicitation of the PISTIS platform's user stories, wrapped around the demonstrators' cases while utilising the technical partners input and further knowledge gained by the analysis of business requirements. It navigates through the intricacies of user-centric development, leveraging the power of storytelling to articulate and prioritize features. By placing users at the heart of the process and align their needs with the technical feasible solutions, the final output is the definition of the requirements for the strategic development of a Minimum Viable Product (MVP) that will demonstrate the PISTIS capabilities. The results presented are coming from the work on the task T1.5 "PISTIS User Stories, Technical Requirements and MVP Design of PISTIS".

At the core of this deliverable lies the concept of user stories—a narrative approach to requirements gathering that transcends traditional documentation. These stories, crafted from the user's perspective, encapsulate not just functional needs but the underlying motivations and aspirations of the end-users. By fostering a shared language between stakeholders, designers, and developers, a list of clearly defined processes and technical challenges are identified in each user story, allowing technology partners to elaborate towards technical requirements of PISTIS.

Building upon the foundation of user stories, this deliverable explores the strategic use of epics and themes. Epics serve as overarching narratives that encapsulate substantial features, while themes provide a structured approach to grouping related stories. This organizational framework not only simplifies the management of potentially extensive requirements but also offers a high-level perspective on project priorities. As we delve into this section, we aim to guide stakeholders through the process of categorization, ensuring that our development efforts are not just feature-centric but strategically aligned with the overarching goals of the project.

The task leads to the strategic prioritization of the technical requirements derived from user stories to shape a compelling Minimum Viable Product (MVP) of PISTIS. During this task, prioritization techniques, such as MoSCoW, are introduced, emphasizing the importance of aligning development efforts with business value, keeping the focus on crafting an MVP that not only meets the immediate needs of the end-users but lays a solid foundation for future enhancements. This deliverable serves as a roadmap, weaving together the threads of user stories, technical requirements, and strategic prioritization to guide the PISTIS project implementation towards the successful realization of an impactful MVP.

2 METHODOLOGY

The methodology that was followed, to define the minimum viable product (MVP) of PISTIS, is mainly based on the recording of the necessary features of PISTIS framework that cover the end-users needs. The methodology, as depicted in Figure 1, is an adaptation of the classic requirements extraction methodology followed in agile product design.

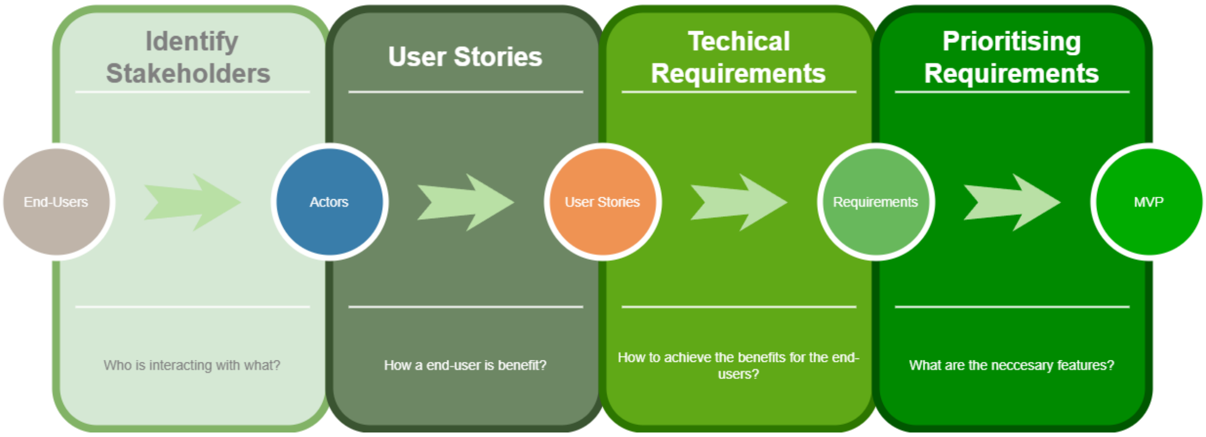

Identify Stakeholders
User Stories
Techical Requirements
Prioritising Requirements
End-Users
Actors
User Stories
Requirements
MVP
Who is interacting with what?
How a end-user is benefit?
How to achieve the benefits for the end-users?
What are the neccesary features?

Figure 1: PISTIS Technical Requirements and MVP Definition Methodology

The technical requirements and MVP definition methodology comprised of the following steps:

1. **Identify Stakeholders and User Personas**: The first step was the identification of all stakeholders or roles involved in the project. Understand the needs and expectations of different user personas to ensure a comprehensive view of the requirements. This step will help with the identification on who will finally interact with the system (or systems).
2. **User Stories definition**: The second step included the generation of user stories [1] collaboratively to capture functional requirements from an end-user perspective. User stories are typically based on the template "As a [user persona], I want [an action] so that [benefit/value]."[2]. In this task, as the final scope was to define more technical requirements, it was decided to involve the technology partners and developers in the user stories and to bring them closer to understand the needs of the users. Thus, the user stories were further described in a formal format of business processes clearly depicting the interaction between the end-users and the PISTIS framework. This provided a comprehensive description of how end users could benefit from the features of the PISTIS framework.
3. **Technical Requirements identification**: The definition of the user stories, apart from the benefits for the users, also included the technical and procedural challenges that must be faced by the PISTIS. Thus, from each user story, a list of technical requirements was defined.
4. **Prioritization of Requirements**: The final step was the prioritization of the technical requirements towards the identification of which of them had to be met in the PISTIS MVP. This led to the MoSCoW (Must-haves, Should-haves, Could-haves, Won't-haves)[3] after a weighted voting including participants from both groups of end-users and developers. Prioritisation was primarily based on business value, dependencies and customer needs, but also took into account the technical solutions needed to deliver the solutions.

In conclusion, the definition of the PISTIS MVP involved identifying the technical requirements with higher priority. Specifically, the method produced a list of requirements categorized as must-haves or

[1] Monochristou, V., and M. Vlachopoulou. "Requirements Specification using User Stories." Agile Software Development Quality Assurance, edited by Ioannis G. Stamelos and Panagiotis Sfetsos, IGI Global, 2007, pp. 71-89. https://doi.org/10.4018/978-1-59904-216-9.ch004

[2] Abhishek Choudhary, Defining Who, What, and Why: How to Write a User Story, toptal.com, https://www.toptal.com/product-managers/digital/how-to-write-a-user-story

[3] R. Popli, N. Chauhan and H. Sharma, "Prioritising user stories in agile environment," 2014 International Conference on Issues and Challenges in Intelligent Computing Techniques (ICICT), Ghaziabad, India, 2014, pp. 515-519, doi: 10.1109/ICICICT.2014.6781336.

should-haves, serving as input for the tasks within work packages WP2, WP3, and WP4. Actors Definition

To gain a clear understanding of the individuals interacting with the system and their specific needs and expectations, it is crucial to define the users involved. This step is essential for articulating user stories effectively. The users and the PISTIS system are the actors that are collaborating in the processes describing the user stories.

The user stories are focused on determining the interaction of the users with the PISTIS system rather than analysing the internal communication and data exchange between PISTIS system's functional modules. Nevertheless, as the users are familiar with the PISTIS conceptual architecture and the main components, they can express in a high-level conceptualisation their opinion about how they can execute some of the functionalities to help the technology partners to understand better their needs. In the user stories **PISTIS Platform is the main actor** representing the whole PISTIS solution. It can be seen as the complex system including all the functional modules, regardless their topology and technology.

However, since end-users already have a familiarity with the conceptual architecture of PISTIS outlined in the project proposal, as well as the basic functionality of its main components, the decision was made to incorporate references to specific modules in the user stories. This inclusion of references to PISTIS modules serves to aid both end-users and developers in comprehending how a process will be executed with PISTIS, taking into account the distinct features and roles of certain functional components. The functional components that are referred to the user stories are:

- The **PISTIS Data Factory** module is an essential module of the PISTIS conceptual architecture. It is one of the two main modules of PISTIS. The Data Factory is an application which contains an organization's data, connects with the other Data Factories to execute data exchange transactions and it is fully managed by the owner organization.
- The **PISTIS Central Platform** is the second main module of PISTIS. It is the centralized system that gathers the necessary information from the PISTIS data factories and builds an ecosystem for data publishing, monetization and financial transactions.
- The **PISTIS Identity and Access Manager (IAM)** is the module designed to ensure secure and organized access to PISTIS digital resources (data, users, etc.). It revolves around managing and controlling the identities of individuals or entities within a system, determining what actions they are authorized to perform, and monitoring their activities. IAM systems play a crucial role in safeguarding sensitive information, applications, and systems by enforcing policies and permissions. This includes authentication processes to verify the identity of users, authorization mechanisms to grant appropriate access levels, and identity lifecycle management to handle changes in user status.
- The **PISTIS Marketplace** is an online platform that facilitates the buying and selling of data assets between multiple parties. As a data asset is defined a monetized dataset published for sale.

By analysing the business requirements as well as the scope of the PISTIS platform, different roles of users have been identified, based on their utilisation of the platform. Drawing on this, the PISTIS User entity used in the user stories can act in different roles according to the functional needs. A preliminary set of these roles is the following:

- The **Data Provider** is a part of a specific organisation and can manage the datasets (data and metadata) registered in the PISTIS platform, particular in the organisation's PISTIS Data

Factory. Users acting with this role can also manage organisation assets in PISTIS marketplace including their monetisation and publication.

- The **Data Consumer** is also a user belonging to an organisation acting as a potential buyer in the PISTIS ecosystem. Data Consumers can search for data assets to buy and complete financial deals with the Data Providers that will conclude to the acquisition of the data.
- The **Organisation Administrator** is managing the resources (users and datasets) of an organisation's PISTIS Data Factory.
- The **PISTIS Administrator** is responsible for managing the functionalities and resources of the PISTIS Central Platform, such as the management of the connected PISTIS Data Factories.
- The **Auditor** is an external or internal entity (maybe an administrator) who is responsible for auditing the behaviour of the systems or sub-systems of PISTIS framework.

Moreover, in the stories there an independent entity (system or service), the **Certificate Authority (CA)**, which is a trusted entity that issues digital certificates. The Certificate Authority plays a crucial role in the implementation of secure communication over the internet by verifying the authenticity of entities involved in a transaction, such as systems and users.

3 User Stories

To attain the ultimate objective of Task 1.5, which is to define the PISTIS MVP, the initial step involves bridging the comprehension gap between end-users and developers. To accomplish this, the User Stories tool has been chosen to articulate the functionalities of the PISTIS platform based on user needs and experiences. User stories are concise, easy-to-understand narratives that capture the "who," "what," and "why" of a feature or requirement. Furthermore, they provide a clear and simple way to communicate requirements by using natural language and avoiding technical jargon. This section presents the user stories for the PISTIS platform which will act as a bridge between the end-users and the developers, helping to align the PISTIS MVP development process with user needs and expectations.

3.1 User Stories Identification

The identification of User Stories that will be analysed is based on the discussion made with the end-users for extracting their business needs. As stated in D1.1 PISTIS Operation Principles and Context Detailing, the end-users perceive the PISTIS solution as a platform that offers specific operations aligned with the data lifecycle illustrated in Figure 2.

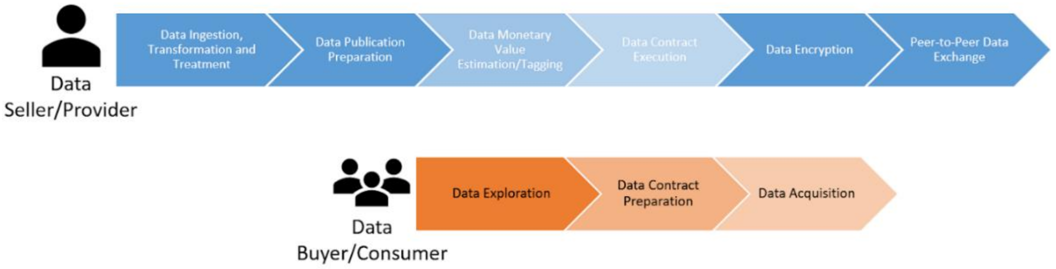

Data Seller/Provider
Data Ingestion, Transformation and Treatment
Data Publication Preparation
Data Monetary Value Estimation/Tagging
Data Contract Execution
Data Encryption
Peer-to-Peer Data Exchange
Data Buyer/Consumer
Data Exploration
Data Contract Preparation
Data Acquisition

Figure 2: Data lifecycle from the involved actors' perspective[4]

[4] PISTIS Consortium, D1.1 PISTIS Operation Principles and Context Detailing, June 2023.

The PISTIS Data lifecycle is defined for two major actors, the Data Seller/Provider and Data Buyer/Consumer. In the effort to determine the interactions of the users with PISTIS platform, a new group of users has been established, the administrators, which provide supportive operations to the systems of PISTIS framework. Figure 3 depicts the interactions in high level between actors and PISTIS.

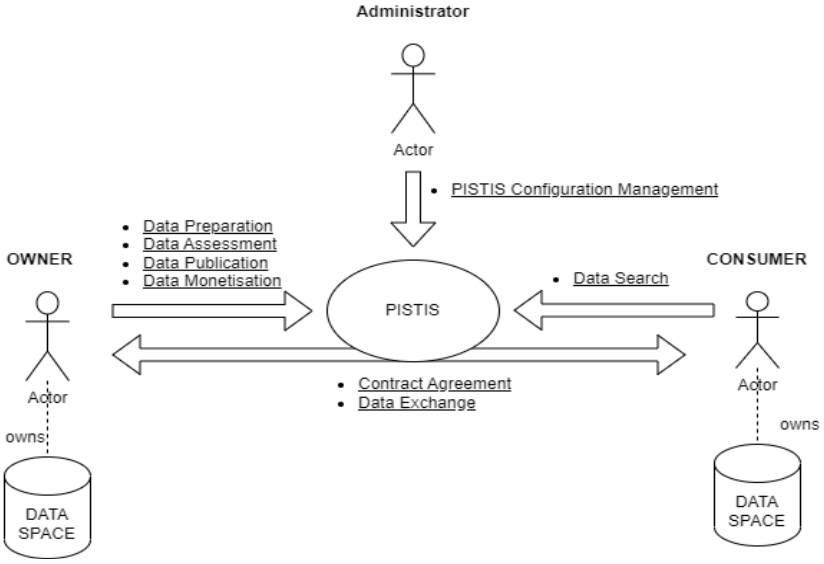


Figure 3: Actors and PISTIS high-level interactions

Derived from these interactions that articulate the core functionalities of PISTIS and taking into account general technological aspects of information systems, a list of potential user stories has been proposed. This includes the following:

Operational User Stories describing the basic functionalities provided to business end-users:

- User registration and profile management
- Data check-in
- Data transformation and analysis
- Data quality check
- Definition of access policies
- Monetization of the data
- Data Valuation
- Data usage and market analytics
- Published Data management.
- Advanced Data Query
- Smart contract creation
- Data Exchange Initialisation
- Data exchange monitor/audit

Supporting User Stories describing mostly tasks of systems administrators:

- PISTIS platform monitor/audit
- PISTIS platform configuration
- Data Space Factory Configuration/Setup

The final step to the User Stories selection was a fine tuning of the suggested stories based on the following criteria:

1. They must meet all the business requirements as depicted in D1.1.
2. If they are including duplicate procedures, then they must be merged.
3. If they are very complex, they must be separated.
4. If a user story is very simple and part of another, they must be merged.

The final list of User Stories along with the business requirements they are dealing with, especially for the Operational User Stories is the following:

Table 1: List of PISTIS User Stories

ID	User Story	Business Requirements (D1.1)
OPERATIONAL USER STORIES		
PISTIS.OUS.01	Data check-in	BR02, BR09, BR11
PISTIS.OUS.02	User registration and profile management	BR01, BR17
PISTIS.OUS.03	Data transformation and analysis	BR05, BR11
PISTIS.OUS.04	Data quality check	BR05, BR06, BR11
PISTIS.OUS.05	Definition of access policies	BR15, BR16
PISTIS.OUS.06	Monetization of the data	BR07, BR12, BR14, BR15
PISTIS.OUS.07	Data Valuation	BR07
PISTIS.OUS.08	Data usage and market analytics	BR07, BR12
PISTIS.OUS.09	Data Query	BR03, BR04
PISTIS.OUS.10	Data Transaction	BR07, BR08, BR09, BR10, BR14
PISTIS.OUS.11	Data exchange monitor/audit	BR13, BR15
SUPPORT OPERATIONS USER STORIES		
PISTIS.SOUS.01	PISTIS platform monitor/audit	BR12, BR15, BR16, BR17
PISTIS.SOUS.02	PISTIS platform configuration	BR01, BR15, BR16, BR17
PISTIS.SOUS.03	Data Factory Configuration/Setup	BR02, BR11, BR16, BR17

3.2 User Stories Definition Template

To enhance the clarity and consensus in defining PISTIS functionalities from the user's perspective while ensuring understanding by technology partners, a blend of natural language description and formalism was chosen for PISTIS User Stories. These user stories adhere to the template outlined in Table 2. Each user story includes a precise definition of involved actors (human or system), a detailed story description encompassing triggering events or conditions, and the benefits for users. The initial fields follow the widely used "As a [user persona], I want [an action] so that [benefit/value]" template.

Furthermore, each story is depicted as a process showing the interaction between the actors and the operations of the latter. The Business Process Model and Notation[5] (BPMN) was utilized as a standardized graphical notation that is used to create visual representations of business processes for defining the user stories. BPMN provides a standardized and visually intuitive way to represent complex business processes. By using standard notation, BPMN ensures consistency in process documentation across end-users and developers. This consistency is crucial for clear communication and understanding. In summary, BPMN enhances procedure management by providing a standardized, visual, and communicative way to document, analyse, and improve business processes. Besides, BPMN

[5] Object Management Group (OMG), Business Process Model And Notation, OMG specification, https://www.omg.org/spec/BPMN/2.0/

contributes to organizational efficiency, transparency, and adaptability in an ever-changing business environment.

The BPMN-based definition of a user story allows the identification of technical challenges and issues that must be considered for the realization of the indicated process by PISTIS framework. These concepts would be used later in the definition of the technical requirements.

Table 2: User stories template

Story ID	***A unique identifier of the user story***
Story Title	***The title of the story***
Story Actors	*PISTIS Administrator/PISTIS Platform/PISTIS User (Provider)/ PISTIS User (Consumer)/etc*
Overview	*A brief description of the story*
Triggers	*The motivation, action or event that triggers this story*
Workflow	*A graphical representation of the workflow (process) of the story. A BPMN (Business Process Model Notation) is preferable to be used here.*
Story Sequence	*A detailed depiction of the story in steps. Each step and sub-step are specifically numbered (1,2,3, 3.1, 3.2, ….)*
User Benefits	*Define, in bullets, the operations or functionalities that affect the user during this procedure.*
Challenges	*Define technical or business challenges that must be considered as constrains or requirements for the execution of the story*
Security Issues	*Enlist security related issues*
Other issues	*Any other issues or constrains that must be considered for the execution of the story.*

3.3 Operational User Stories

The following sections depict the user stories related to the operations carried out to deliver the main functionalities of the PISTIS Platform.

3.3.1 Data check-in

Table 3: Data check-in User Story

Story ID	**PISTIS.OUS.01**
Story Title	**Data check-in**

Story Actors	PISTIS User (Provider), PISTIS Platform
Overview	The PISTIS User (Provider) wants to register a portion of data (dataset) to the PISTIS Platform. The user must point out the data to the PISTIS platform, which will select the appropriate way to access the data. The PISTIS Platform (Data Space Factory) will receive the data source access details and the data's metadata. The data source details will be used to access the data and inject them into the PISTIS platform. The data's metadata will be used to add the new dataset to the lineage tracker and data catalogue. Finally, the PISTIS platform will orchestrate the data check-in process and notify the user when it is finished.
Triggers	A PISTIS User (Provider) that has already installed PISTIS Data Space Factory in his/her owned data space wants to add a new portion of data to the PISTIS ecosystem.

Workflow

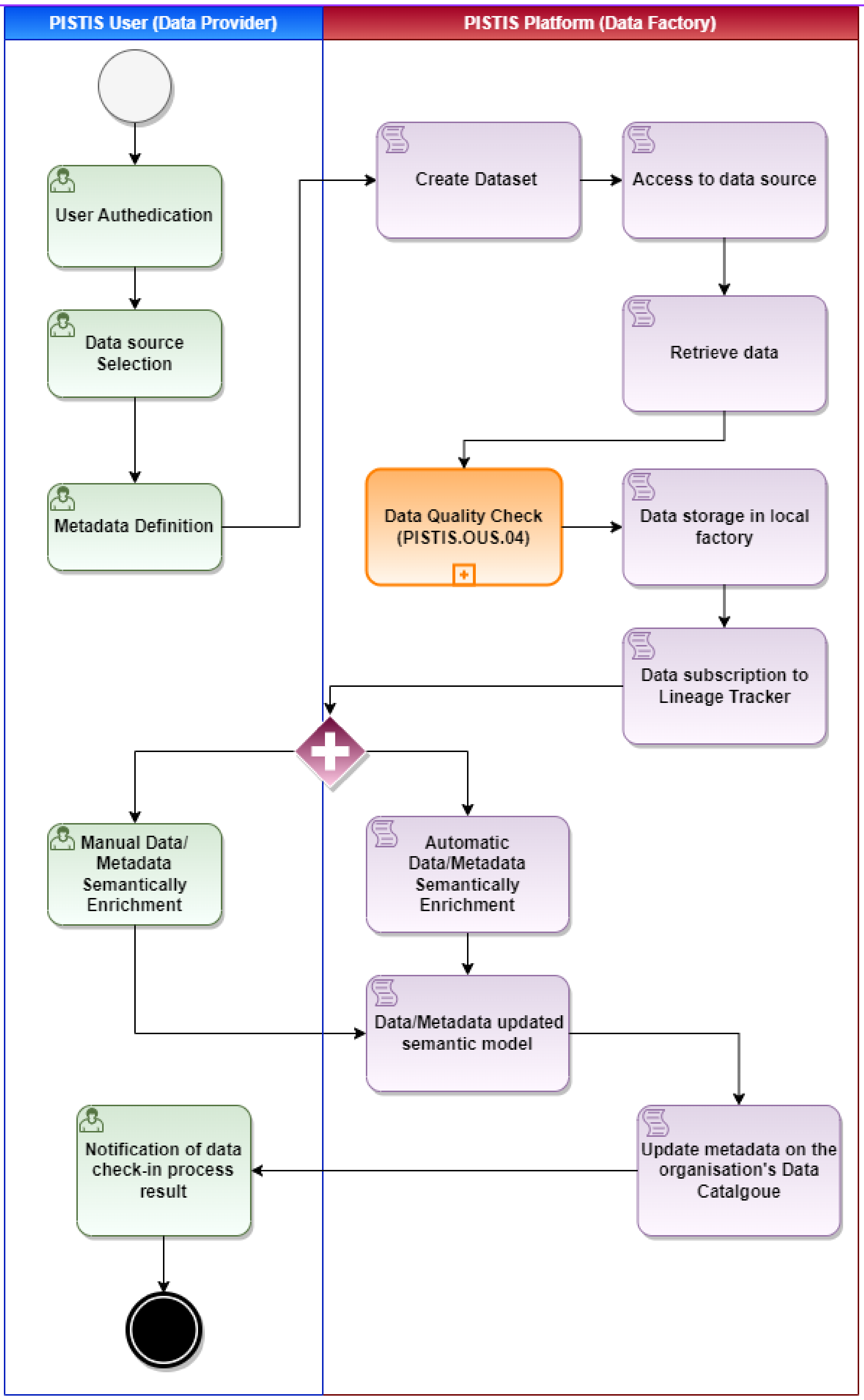

PISTIS User (Data Provider)
PISTIS Platform (Data Factory)
User Authedication
Data source Selection
Metadata Definition
Create Dataset
Access to data source
Retrieve data
Data Quality Check (PISTIS.OUS.04)
Data storage in local factory
Data subscription to Lineage Tracker
Manual Data/ Metadata Semantically Enrichment
Automatic Data/Metadata Semantically Enrichment
Data/Metadata updated semantic model
Update metadata on the organisation's Data Catalgoue
Notification of data check-in process result

Figure 4: Data check-in process

Story Sequence

1. PISTIS User is authenticated by the PISTIS platform.
2. PISTIS User selects the data that wants to check-in. The selection includes the specification of data source (uploaded file, FTP, API, etc.).
3. PISTIS User defines data’s metadata by completing a form.
4. PISTIS Platform creates a local dataset.
5. PISTIS Platform access the data source according to the parameters defined in step 2.
6. PISTIS Platform retrieves data.

	7. The data quality check sub-process is executed in the retrieved data (PISTIS.OUS.04). 8. The validated data is saved in the local storage. 9. PISTIS Platform registers the new dataset to lineage tracker. 10. PISTIS Platform semantically enriches data/metadata. It can be done in two ways: 10.1. Manually by the user. 10.2. Automatically by analysing available metadata and especially data. 11. PISTIS Platform the registers the new dataset to the organisation's local data catalogue. 12. PISTIS Platform notifies PISTIS User that data check-in process is finished.
User Benefits	The user will be able to: - Define the dataset that will be checked in. - Define the metadata of the new dataset. - Inject dataset into PISTIS Platform (internal storage). - Informed of possible errors during the procedure - Redefine correct metadata in case of error. - Informed of successfully end of the procedure.
Challenges	- The data can be accessed/stored in various types of sources, i.e. HTTP APIs, FTP, storage volumes, cloud storages, etc. - The data doesn't not follow a specific format or structure. - The metadata can be described in various description languages and formats, i.e. JSON, XML, TXT, etc., a specific metadata model is needed.
Security Issues	- Confidentiality and Authentication: Only the correct user, as the provider of the data, should be able to have access to perform this task. - Accountability and non-repudiation of the user's actions regarding providing the necessary privileges to the PISTIS Platform to selected data sources. This will be achieved through the provision of appropriate signature mechanisms for verifying the correctness of user's actions.
Other issues	-

3.3.2 User registration and profile management

Table 4: User registration and profile management User Story

Story ID	**PISTIS.OUS.02**
Story Title	**User registration and profile management**
Story Actors	PISTIS Platform, PISTIS User (Organization Administrator), PISTIS User, Trusted CA

Overview	A new PISTIS User wants to sign-up within PISTIS Platform. User is offered the option to create a new account or signup with one of his existing Identity Providers (e.g., Google, eIDAS). In both cases, the user's signup within the PISTIS Platform is followed by mandatory PISTIS Organization selection and optional preference for activation, or not, two-factor authentication (2FA) for the account. Upon completion of the new user's signup request, a new account is created within a guest role with limited permissions and no effective access rights in the PISTIS Platform. Each user will have to connect and get issued Verifiable Credentials from a Trusted CA (per example an eIDAS Trusted Provider for issuing credentials connected to a user's Wallet). PISTIS Organization Administrator approves (or declines) the signup request by selecting and assigning a certain set of roles to the new account, from the available pool of roles. At any time, the user will be able to manage their profile for the newly created account for the PISTIS platform, i.e., manage secondary details and 2FA preference. PISTIS Organization Administrator will be privileged with the right to disable (or remove) the account, change its access right by modifying its set of roles.
Triggers	This story is divided in three sub-stories based on the functionality provided by the PISTIS Platform concerning the management of user's profiles. Each sub-story is initiated by different events. 1. User registration: A user wants to register for a PISTIS account. 2. User profile self-management: An existing PISTIS User wants to manage his/her profile. 3. PISTIS Organization Administrator manages a user's profile: PISTIS Organization Administrator wants to alter an existing PISTIS User's profile.
Workflow	**User registration**

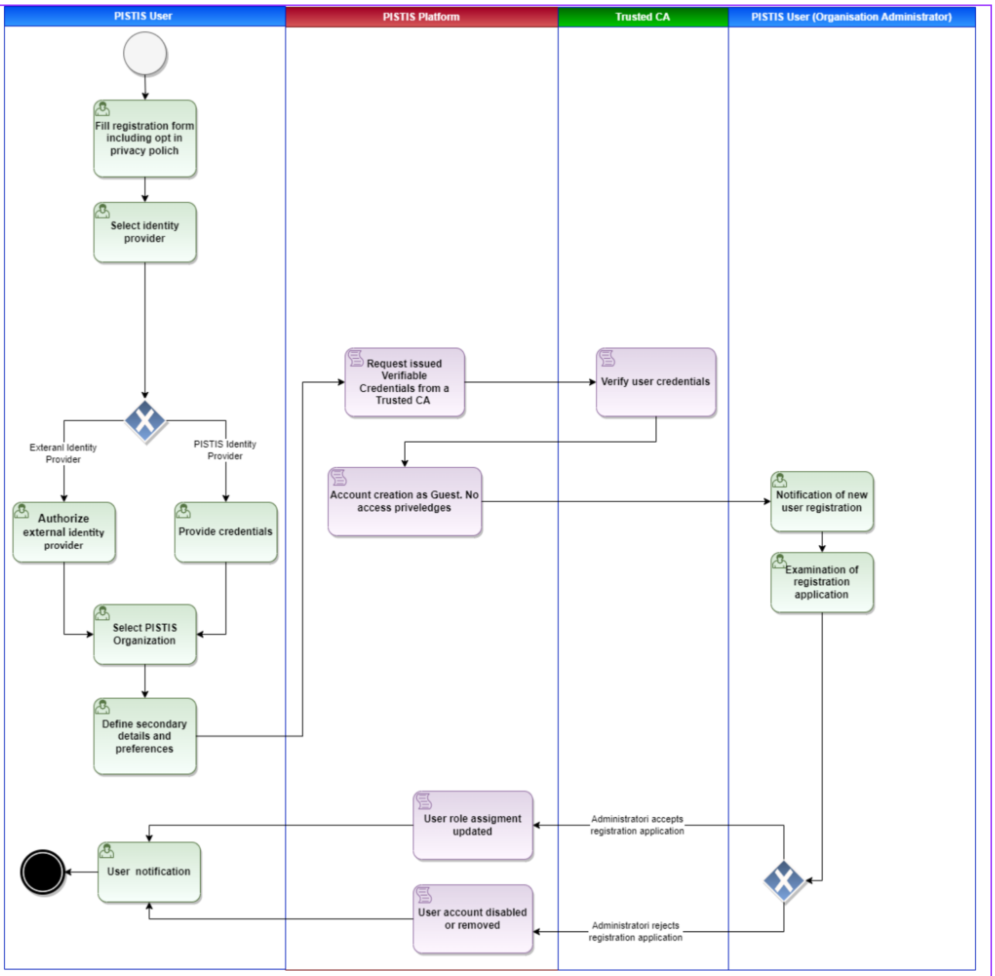

PISTIS User
PISTIS Platform
Trusted CA
PISTIS User (Organisation Administrator)
Fill registration form including opt in privacy polich
Select identity provider
Exteranl Identity Provider
PISTIS Identity Provider
Authorize external identity provider
Provide credentials
Select PISTIS Organization
Define secondary details and preferences
Request issued Verifiable Credentials from a Trusted CA
Verify user credentials
Account creation as Guest. No access priveledges
Notification of new user registration
Examination of registration application
User role assigment updated
Administratori accepts registration application
User notification
User account disabled or removed
Administratori rejects registration application

Figure 5: User registration process

User profile self-management

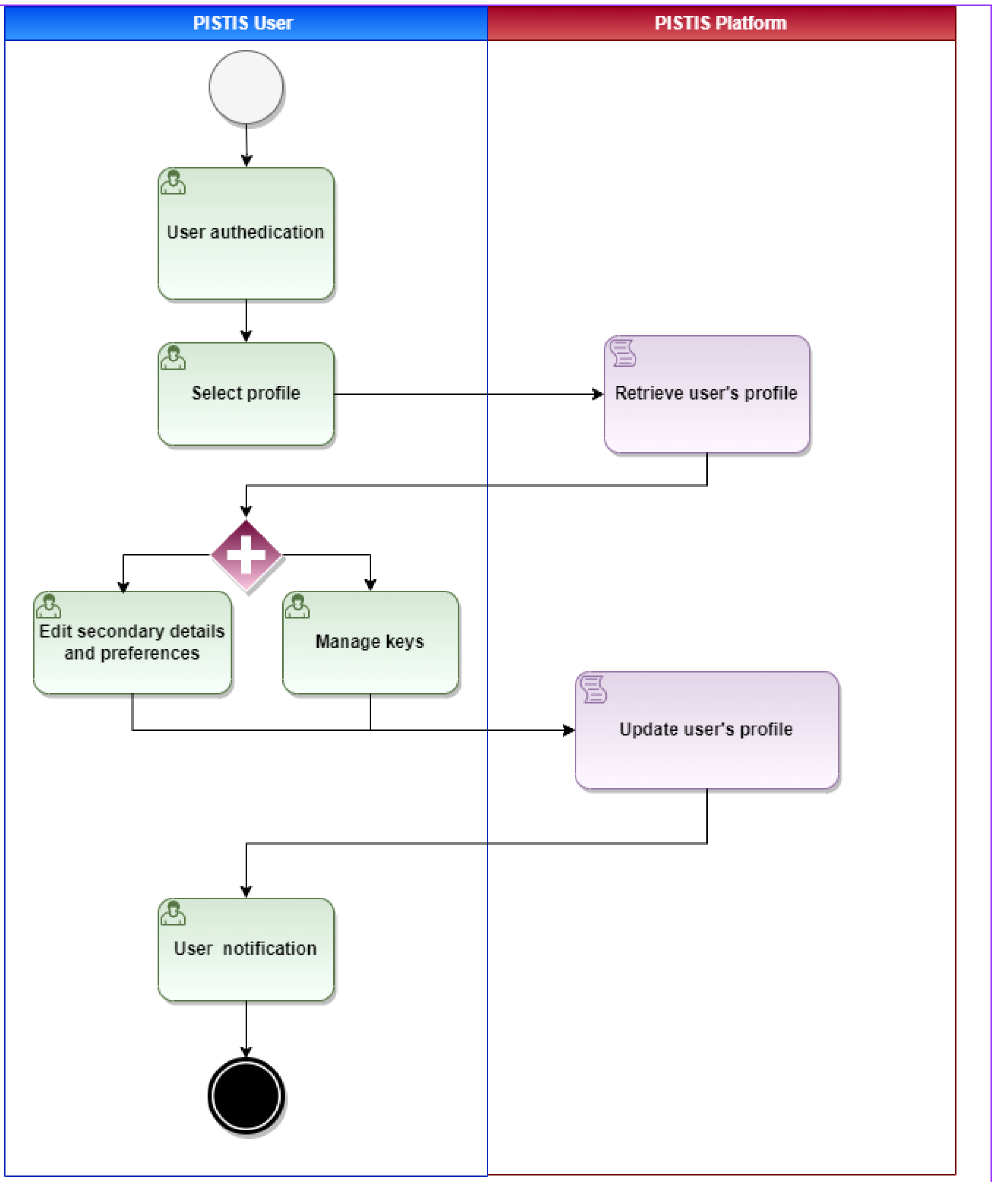
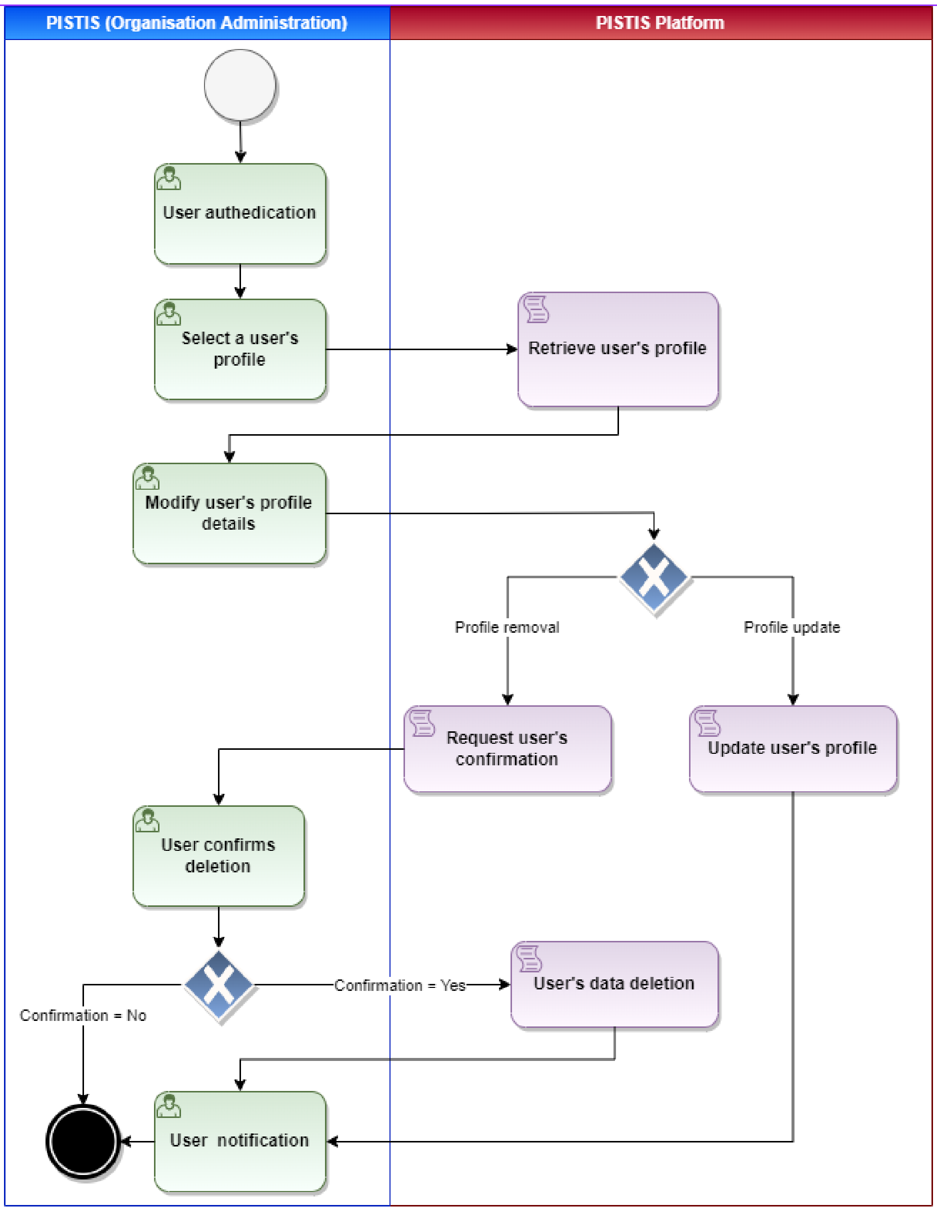


Figure 6: User profile self-management

PISTIS Organization Administrator manages a user's profile.

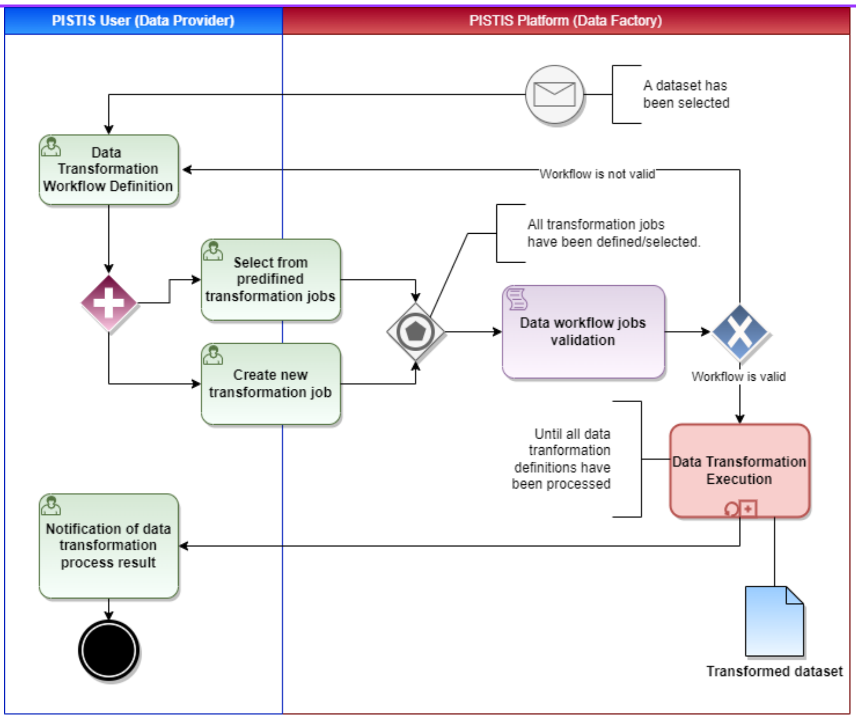
	 PISTIS (Organisation Administration) PISTIS Platform User authedication Select a user's profile Retrieve user's profile Modify user's profile details Profile removal Profile update Request user's confirmation Update user's profile User confirms deletion Confirmation = No Confirmation = Yes User's data deletion User notification Figure 7: Process of PISTIS Organization Administrator manages a user's profile.
Story Sequence	**User registration** 1. User accesses the registration form of PISTIS Platform, accepts PISTIS privacy policy and opts in for registering in the PISTIS platform. 2. User selects how to login to the PISTIS platform having two options: 2.1. User wants to sign up with username and password. 2.2. User wants to sign up by using his/her existing identity in one of the available external identity providers. In this case it is required authorisation of the selected external identity provider. 3. User is prompted to select a PISTIS Organization (required) 4. User is prompted to enter secondary profile details and other preferences (e.g., 2FA activation) 5. PISTIS Platform requests and retrieves issued Verifiable Credentials from a Trusted CA for the specific user. 6. User account is created with a Guest role and has no effective access in the PISTIS Platform

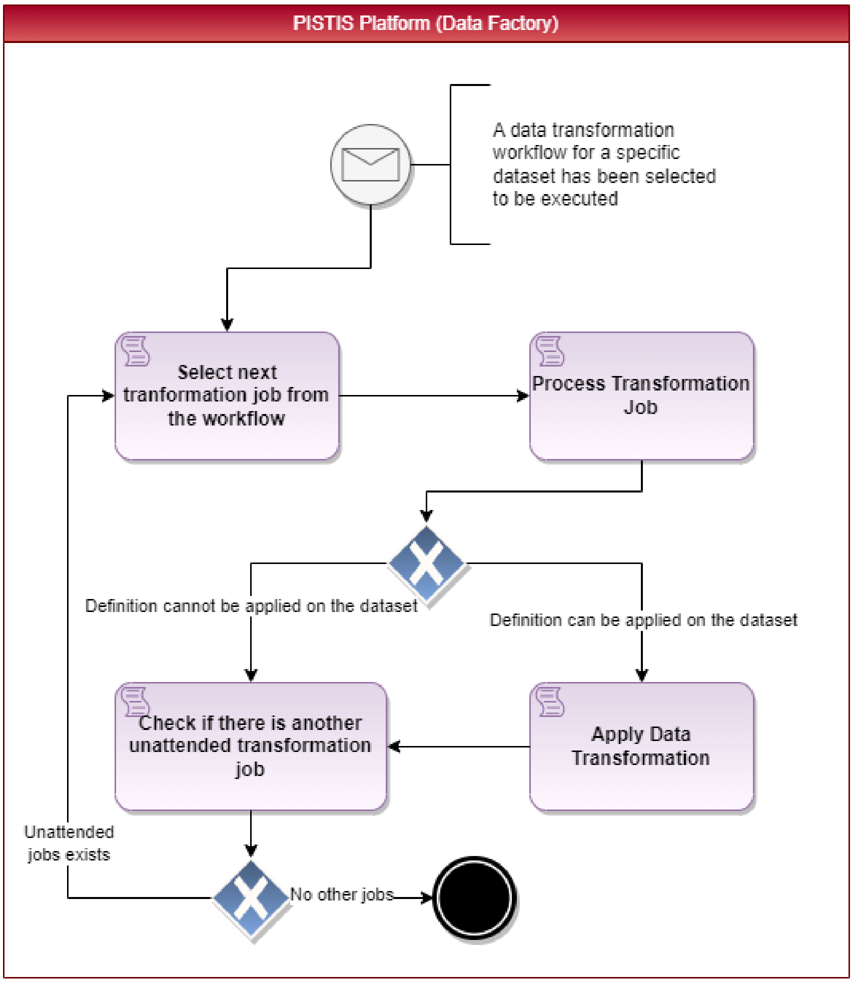
	7. PISTIS Organization Administrator gets notified for registration application. 8. PISTIS Organization Administrator approves/declines registration application. 8.1. Account approval is completed by enabling a set of roles to the new account (and removing the Guest role) 8.2. Account disallowance is completed by either disabling the account or totally erase it. **User profile self-management** 9. PISTIS User logs in the PISTIS platform 10. PISTIS User accesses the profile management webpage. 10.1. PISTIS User edits secondary account details or preferences 10.2. PISTIS User manages their keys and/or certificates. 11. PISTIS Platform updates User profile. 12. PISTIS User is notified on the result. **PISTIS Organization Administrator manages a user's profile** 13. PISTIS Organization Administrator logs in the PISTIS platform. 14. PISTIS Organization Administrator accesses the PISTIS Users management webpage. 15. PISTIS Organization Administrator selects an account to be edited: 15.1. PISTIS Organization Administrator disables/removes the account. 15.2. PISTIS Organization Administrator modifies the profile of the selected PISTIS User (assigned roles, related organisation, etc.). 16. PISTIS Platform updates User profile. 17. PISTIS Organization Administrator is notified on the result.
User Benefits	• A User will be able to create an account within PISTIS ecosystem and utilize, if desired, their existing identity in an external Identity Provider. • A PISTIS User will be able to manage their account secondary details and preferences, as well as their keys/certificates. • A PISTIS User will be able to bind their verifiable credentials with PISTIS Platform. • PISTIS Organization Administrator will be able to manage a PISTIS User profile.
Challenges	• Ensure a user-friendly registration process. • Ensure a user-friendly role assignment process for the PISTIS Organization Administrator to avoid conflicts. • Integration with external Identity Providers. • Integration with eIDAS Trusted CA • Securely store and handle user credentials, personal details, and keys/certificates. • 2FA implementation for enabling and disabling the option.
Security Issues	• Protect user credentials and sensitive data. • Secure data exchange with the external Identity Providers. • Ensure that User registration process complies with eIDAS requirements. • Ensure 2FA implementation effectiveness. • Identification and monitoring of unauthorized access and data breaches.

	• Ensure immediate user role adjustment.
Other issues	-

3.3.3 Data transformation and analysis

Table 5: Data transformation and analysis User Story

Story ID	**PISTIS.OUS.03**
Story Title	**Data transformation and analysis**
Story Actors	PISTIS Platform, PISTIS User (Provider)
Overview	The Pistis User (Provider) wants to perform a transformation process over a portion of data (dataset) in the PISTIS Platform (Data Factory). This process is defined as a data workflow of data transformation jobs. Each transformation job includes the triggering criteria for the transformation, the type of transformation and the transformation parameters. The transformation jobs defined that might apply (according to the triggering of each data transformation defined by the user) will be executed following the transformation criteria defined. The resultant dataset will be returned.
Triggers	The data transformation is a process that is executed on a selected dataset and can be part of other functional processes of the PISTIS Platform (i.e. Data check-in).
Workflow	 PISTIS User (Data Provider) PISTIS Platform (Data Factory) A dataset has been selected Data Transformation Workflow Definition Workflow is not valid All transformation jobs have been defined/selected. Select from predifined transformation jobs Create new transformation job Data workflow jobs validation Workflow is valid Until all data tranformation definitions have been processed Data Transformation Execution Notification of data transformation process result Transformed dataset **Figure 8: Data transformation and analysis** **Data Transformation Execution Sub-process**

	 PISTIS Platform (Data Factory) A data transformation workflow for a specific dataset has been selected to be executed Select next tranformation job from the workflow Process Transformation Job Definition cannot be applied on the dataset Definition can be applied on the dataset Check if there is another unattended transformation job Apply Data Transformation Unattended jobs exists No other jobs **Figure 9: Data Transformation Execution Sub-process**
Story Sequence	1. The process is started with the selection of a specific dataset. This selection is the result of another process, i.e. data check-in or PISTIS User's selection. 2. PISTIS User (Data Provider) defines a data workflow consisted of data transformation jobs. Each data transformation job includes a) a triggering criterion and b) a transformation definition including what needs to be transformed and how it needs to be transformed. Data transformation workflow is built by defining the transformation jobs following one the actions: 2.1 Select from a set of predefined transformation jobs and provide the appropriate parameterisation. 2.2 Create a new transformation job definition and provide the appropriate parameterisation. 3. PISTIS Platform receives the transformation workflow and checks the validity of the workflow definition according to the definitions of the transformation jobs involved in the workflow. 4. PISTIS Platform executes the sub-process of data transformation execution: 4.1 *Data Transformation Execution Sub-process*: 4.1.1 PISTIS Platform selects the next unattended transformation job. 4.1.2 PISTIS Platform process the transformation job by checking if the triggering criteria is matched by the dataset:

	4.1.2.1 Data transformation component performs the defined data transformation on the dataset in case the triggering criteria is matched by the dataset. 4.1.3 When the transformation is performed, or in case the dataset did not match the transformation triggering criteria, the platform checks if there are any other unattended transformation jobs. 4.1.3.1 If there are the process is re-executed by the step 4.1.1 4.1.4 Data transformation component ends processing all the data transformation definitions. 5. PISTIS User is informed that the dataset has been successfully transformed.
User Benefits	The user will be able to: • Define or select the different transformations to be carried out by the PISTIS Platform. • Define the target dataset where the transformations will be applied. • Define the triggering criteria to apply each one of transformations defined. • Define the elements to be transformed in the target dataset. • Define the transformation procedure
Challenges	• Create a definition of all the allowed transformations supported by the PISTIS Platform. • Integrate a solution into the architecture to obtain (and provide) all the required resources for a proper functioning (i.e. transformation definitions, dataset repository for retrieval and storage, etc.).
Security Issues	-
Other issues	-

3.3.4 Data quality check

Table 6: Data quality check User Story

Story ID	**PISTIS.OUS.04**
Story Title	**Data quality check**
Story Actors	PISTIS Platform (Data Factory), PISTIS User (Provider)
Overview	PISTIS User asks PISTIS Platform to check the quality of data and its metadata before the publication. PISTIS Platform checks the quality of (meta-)data and extends its metadata with the quality information.
Triggers	This process can be triggered by two events: 1. PISTIS Users logins and selects a dataset for quality checking. 2. A dataset has been already selected by the user in another process (i.e. Data check-in).

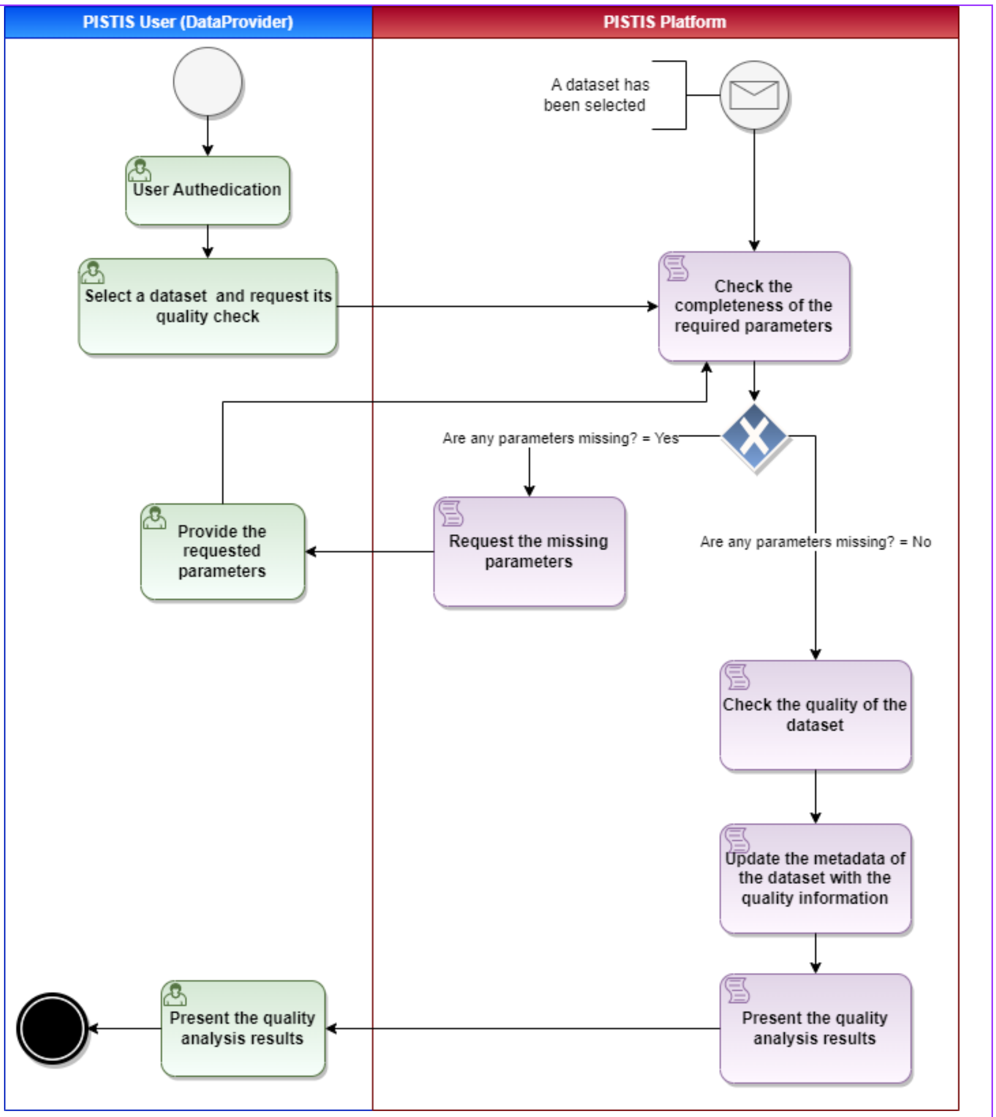
<table>
<tr>
<td><b>Workflow</b></td>
<td>

PISTIS User (DataProvider)
PISTIS Platform
A dataset has been selected
User Authedication
Select a dataset and request its quality check
Check the completeness of the required parameters
Are any parameters missing? = Yes
Are any parameters missing? = No
Provide the requested parameters
Request the missing parameters
Check the quality of the dataset
Update the metadata of the dataset with the quality information
Present the quality analysis results
Present the quality analysis results

Figure 10: Data quality check process
</td>
</tr>
<tr>
<td><b>Story Sequence</b></td>
<td>
1. Selection of dataset for Quality check:
   1.1. PISTIS User (Data Provider) selects a dataset stored in the PISTIS Platform and requests PISTIS to check its quality.
   1.2. A dataset is already selected from another process that invokes quality check process.
2. PISTIS Platform checks that all information for the quality check is available and if necessary, asks to the PISTIS User to provide the required information:
   2.1. PISTIS User provides the requested additional information. Step 2 is repeated.
3. PISTIS Platform checks the quality of the dataset.
4. PISTIS Platform updates the metadata of the dataset with the quality information.
5. PISTIS Platform presents the quality analysis results to PISTIS User.
</td>
</tr>
<tr>
<td><b>User Benefits</b></td>
<td>
The user will get:

- The results of the dataset quality assessment according different KPIs
- The list of the identified issues
</td>
</tr>
</table>

	• The explanation of the dataset quality assessment methodology as reference information
Challenges	• The analysis of data may require a long time, so the workflow may become asynchronous. • Analyse the quality of dynamically changed data registered to PISTIS Platform cannot be achieved by continuous execution of the quality check especially if there is data that changes in a tight time frame. A solution including the storage of data snapshot and the execution of the data quality check on them is more feasible.
Security Issues	Secure data management and access need to be ensured.
Other issues	-

3.3.5 Definition of access policies

Table 7: Definition of access policies User Story

Story ID	PISTIS.OUS.05
Story Title	**Definition of access policies**
Story Actors	PISTIS User (Platform Administrator), PISTIS (Organization Administrator), PISTIS Platform (IAM)
Overview	PISTIS modules at data space level are provided with corresponding access rights by PISTIS Administrator at the deployment time as described in PISTIS.OUS.15 Data Space Factory Configuration/Setup. PISTIS Organization Administrator wants to define a set of policies will constitute a specific PISTIS role available for assignment to PISTIS Organization Users. Each PISTIS access policy should describe: (a) who will be able to access a PISTIS Organization resource (either a specific PISTIS Platform feature or a PISTIS Organization's dataset), (b) the scope (rights) on the accessible PISTIS Organization's resources (extending base Create, Read, Update, Delete, Admin with PISTIS specific policies, for example Trading, Transformation, Pricing, etc.) and (c) refine accessibility on nested objects/attributes within a certain PISTIS Organization's resource (e.g. Read an entire data stream but Update a specific child attribute).
Triggers	PISTIS Organization Administrator wants to refine certain access rights to a PISTIS Organization Role or create new policies to match PISTIS data exchange requirements.

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<td><b>Workflow</b></td>
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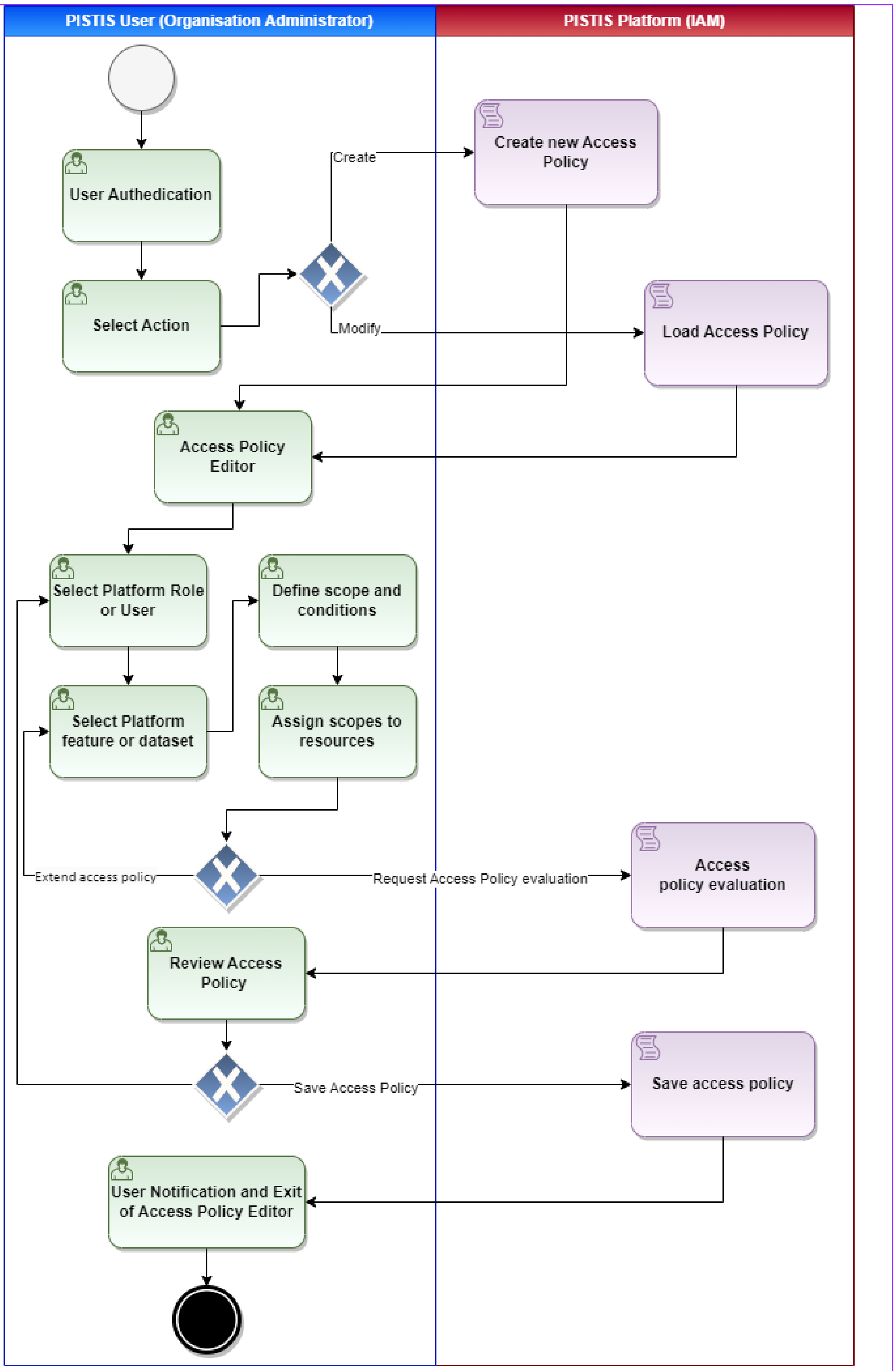

PISTIS User (Organisation Administrator)
PISTIS Platform (IAM)
User Authedication
Select Action
Create
Modify
Create new Access Policy
Load Access Policy
Access Policy Editor
Select Platform Role or User
Define scope and conditions
Select Platform feature or dataset
Assign scopes to resources
Extend access policy
Request Access Policy evaluation
Access policy evaluation
Review Access Policy
Save Access Policy
Save access policy
User Notification and Exit of Access Policy Editor

Figure 11: Definition of access policies

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</tr>
<tr>
<td><b>Story Sequence</b></td>
<td>

1. PISTIS User (Organization Administrator) accesses a web interface that provides the necessary functionality for creating a new PISTIS Organization Role (Access Policy) or to modifying an existing one.
2. Depending on the selection of action by the PISTIS User, the PISTIS platform:
   2.1. Creates a new Organization Role.
   2.2. Loads the requested Organisation Role

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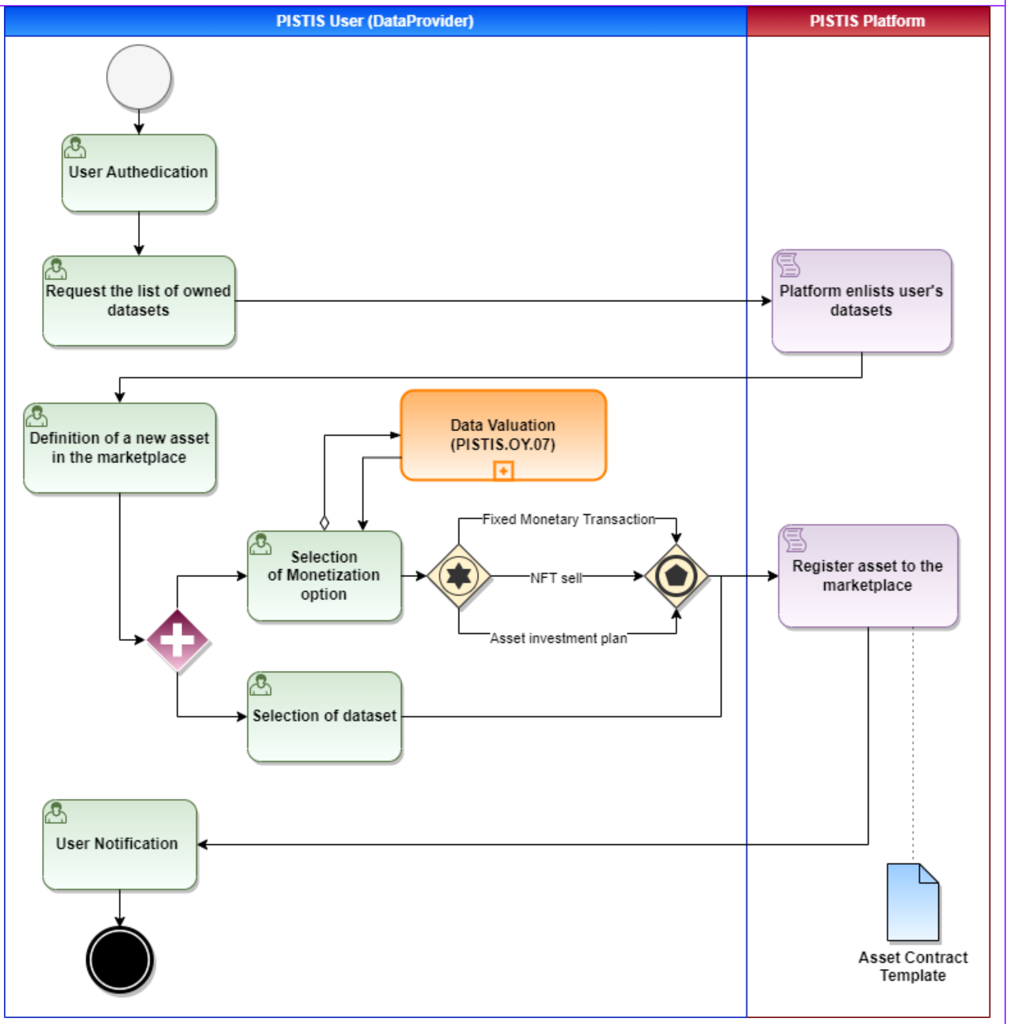
</table>

	3. PISTIS User adds/removes admission of access of a certain object (either a PISTIS Platform feature or a PISTIS Organization's data stream/dataset) to the selected PISTIS Organization Role. 4. PISTIS User modifies the access policy to the selected resource in the following steps. 4.1. PISTIS Organization Administrator specifies the scope of access (by extending base Create, Read, Update, Delete, Admin policies with PISTIS specific policies, for example Trading, Transformation, Pricing, etc.) for each accessible Object. 4.2. PISTIS Organization Administrator defines conditions (including attributes-based policies) for the selected scope. 4.3. PISTIS Organization Administrator refines the PISTIS Organization Role by adding/removing specific scopes on nested objects/attributes within a certain PISTIS Organization's resource. 5. Step 3 and 4 can be repeated until PISTIS User completes the definition of the access policy. 6. When PISTIS User completes access policy definition, PISTIS Platform evaluates the defined policy. 7. PISTIS Organization Administrator review the evaluation results on the modified PISTIS Organization Role. 7.1. PISTIS Users continues PISTIS Organization Role editing (step 2.a is repeated) 7.2. PISTIS Users commands PISTIS platform to save the defined PISTIS Organization Role. 8. PISTIS User is notified by the PISTIS platform for the result of the access policies modification.
User Benefits	• Effective access policies per PISTIS Platform feature, data stream/dataset and attribute with extended access policies to match PISTIS data trading requirements (i.e., Trading, Transformation, Pricing, etc.) • Fine-tuned access policies on nested objects/attributes within a PISTIS resource to match PISTIS data exchange requirements.
Challenges	• Definition of precise and granular access policies. • Ensuring that access policies are aligned with PISTIS business and regulatory requirements. • Provision of a user-friendly graphical environment to the PISTIS Organization Administrator to efficiently modify access policies, balancing security with user convenience. • Provide an effective way to evaluate an access policy before applying it to the PISTIS ecosystem.
Security Issues	• Protect the integrity of access control mechanisms. • Ensure that each access policy is protected against unauthorized access. • Ensure/ Establish access policy immediate enforcement. • Ensure that access policies do not overlap or do not conflict each other. In case of conflict, provide transparent and explanatory insights/notifications to PISTIS Administrators.

Other issues	-

3.3.6 Monetization of the data

Table 8: Monetization of the data User Story

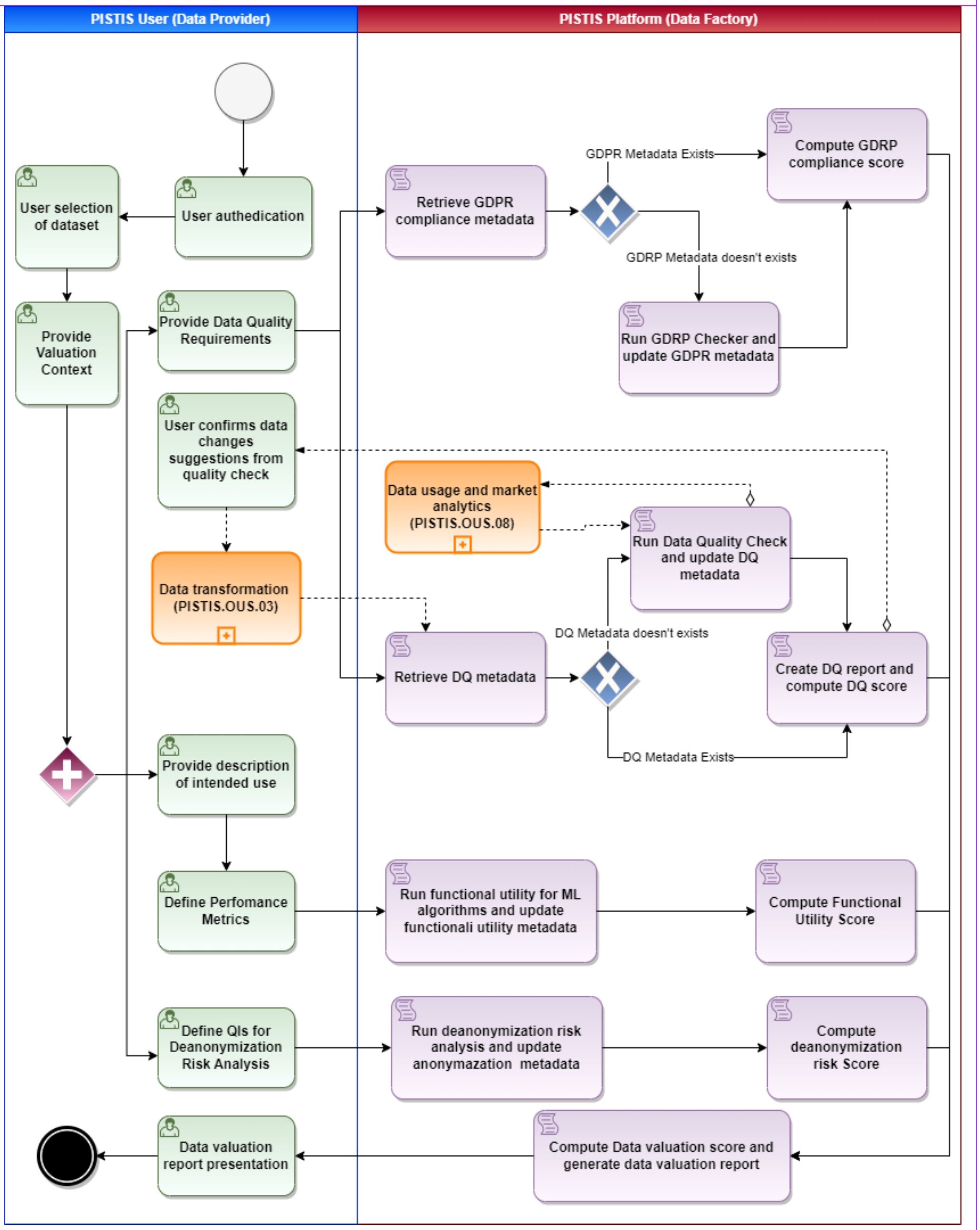
Story ID	**PISTIS.OUS.06**
Story Title	**Monetization of the data**
Story Actors	PISTIS User (Provider), PISTIS platform
Overview	The PISTIS Users (Data Provider) need to define the way that their dataset will be placed on the market to be able to make a profit from the foreseen transactions.
Triggers	Upon selecting a dataset to be placed on the market as an asset for sale, the Data Monetisation workflow is triggered to define the monetisation method for this exact data asset.
Workflow	 PISTIS User (DataProvider) PISTIS Platform User Authedication Request the list of owned datasets Platform enlists user's datasets Definition of a new asset in the marketplace Data Valuation (PISTIS.OY.07) Selection of Monetization option Fixed Monetary Transaction NFT sell Asset investment plan Register asset to the marketplace Selection of dataset User Notification Asset Contract Template **Figure 12: Monetization of the data**

Story Sequence	1. An authenticated PISTIS User requests from the PISTIS platform the list of the owned datasets. 2. The PISTIS User prepares a new asset to be placed on the market. 2.1. The PISTIS User selects the dataset (data and metadata) that wants to monetize. 2.2. The user selects the way that he is willing to sell the asset by opting for: • a fixed monetary transaction (that could have also the value of zero) or a monthly fee as a subscription, • selling the NFT of the asset, • creating an investment plan for the asset 2.2.1.(Optional) PISTIS User can perform data valuation as assistance to his decision on the monetization option. 3. PISTIS platform registers the new asset to the market and a contract template is created to facilitate the smart contract creation process. 4. PISTIS Platform notifies PISTIS User that the asset has been published in the marketplace.
User Benefits	The user gets an interface where they can: • choose the way that the asset is going to be sold, • set the price of the asset alongside some descriptions of the asset, • draft the transaction contract that the buyer must accept when buying the asset.
Challenges	• The definition of the pre-defined terms of the transaction contract template is a complex task as may include various and different terms for governing the data transfers.
Security Issues	-
Other issues	• Interaction with the Data Valuation components and the market analytics is foreseen to inform the user prior to setting the price. • In the case of an NFT transaction, all data provider existing contracts for that specific dataset should be transferred to the new NFT owner. • In the case of an investment plan transaction, all data provider existing contracts for that specific data asset, should be updated to also include the new party that co-owns the dataset.

3.3.7 Data Valuation

Table 9: Data Valuation User Story

Story ID	**PISTIS.OUS.07**
Story Title	**Data Valuation**
Story Actors	PISTIS Platform, PISTIS User (Owner, Consumer)
Overview	The Owner or the Consumer want to get a quantitative and qualitative assessment of the value of a data asset.

Triggers	• An Owner who wants to assess the value of their data asset before selling it. • A Consumer who wants to assess the value of their data asset before buying it.
Workflow	 PISTIS User (Data Provider) PISTIS Platform (Data Factory) User selection of dataset User authedication Provide Valuation Context Provide Data Quality Requirements User confirms data changes suggestions from quality check Data transformation (PISTIS.OUS.03) Provide description of intended use Define Perfomance Metrics Define QIs for Deanonymization Risk Analysis Data valuation report presentation Retrieve GDPR compliance metadata GDPR Metadata Exists Compute GDRP compliance score GDRP Metadata doesn't exists Run GDRP Checker and update GDPR metadata Data usage and market analytics (PISTIS.OUS.08) Run Data Quality Check and update DQ metadata DQ Metadata doesn't exists Retrieve DQ metadata Create DQ report and compute DQ score DQ Metadata Exists Run functional utility for ML algorithms and update functionali utility metadata Compute Functional Utility Score Run deanonymization risk analysis and update anonymazation metadata Compute deanonymization risk Score Compute Data valuation score and generate data valuation report **Figure 13: Data Valuation**
Story Sequence	1. PISTIS User (Owner or Consumer) selects a data asset from the PISTIS platform. 2. PISTIS User defines the valuation context, by providing the importance of the different data value dimensions (e.g., accessibility, size, format, origin, type, tools, data quality, functional utility, GDPR compliance, deanonymisation risk, business impact etc.) 3. PISTIS User provides a description of the intended use of the data asset (e.g., data analysis, data visualisation, training algorithms). 3.1. If training an algorithm (regression, classification, clustering), the PISTIS User will also define a set of metrics and minimum requirements for those metrics.

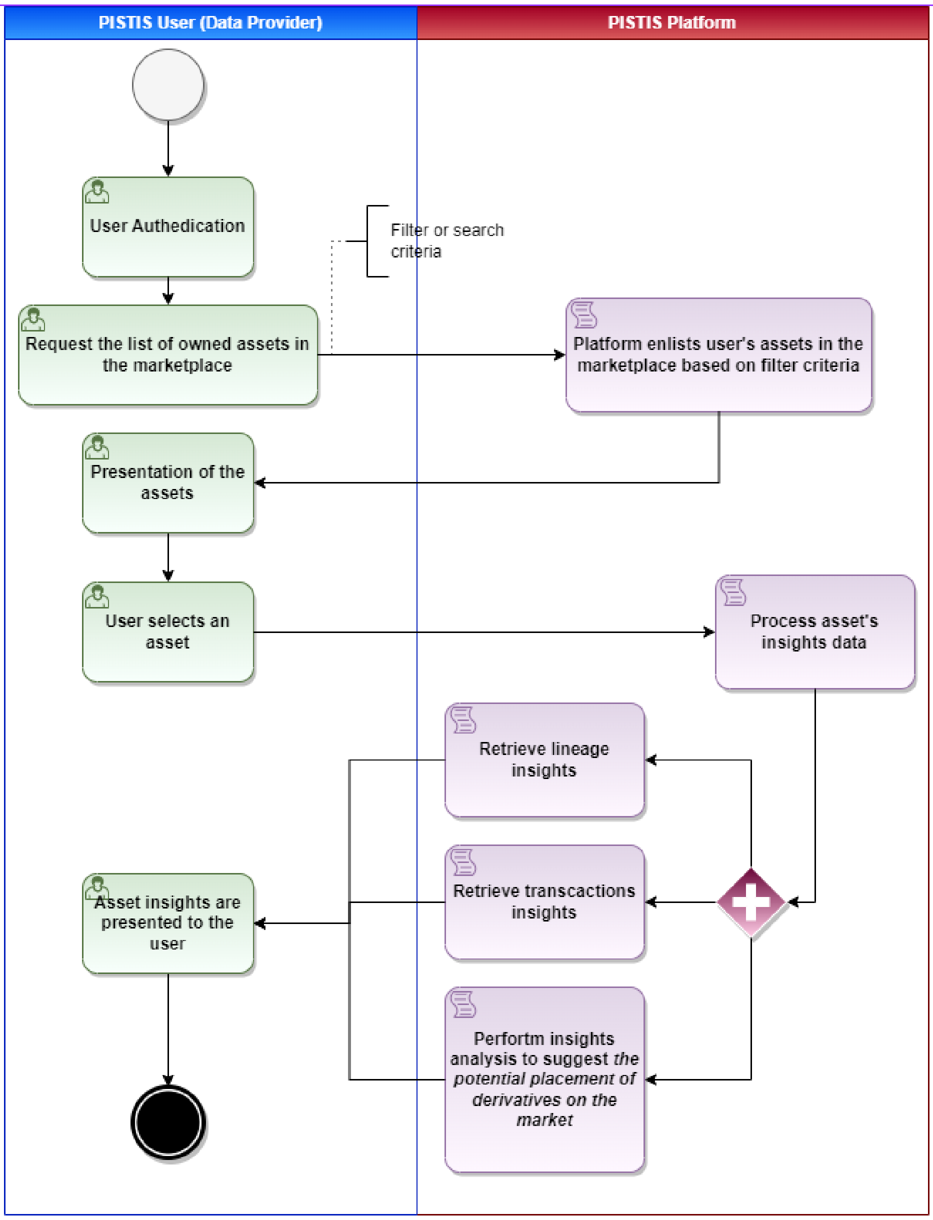
	4. PISTIS User defines data quality requirements (metrics and minimum acceptable values). 4.1. If data quality relevant metadata is available for the data asset, retrieve it. 4.2. Otherwise, PISTIS Platform runs the data quality check, based on the User requirements and updates metadata. A score quantifies each data quality metric. (Optional) If it is necessary, the results of the analysis of the data usage and market, are included in the inputs of the quality assessment. 4.3. (Optional) Consider the data quality assessment report. The PISTIS User (Data Provider) can accept the recommendations of the data quality assessment report. In this case, the Data Transformation subprocess is initiated to create an alternative data asset, which implements the data quality recommendations in the data quality assessment report. Rerun the data quality assessment for the new data asset. 5. Execute GDPR check. If GDPR compliance metadata is available for the data asset, retrieve it. Otherwise, the PISTIS Platform runs the GDPR data compliance and updates metadata. Quantify GDPR compliance as a numerical score. 6. Run the deanonymisation risk analysis and obtain a relevant score. 7. Combine the scores from the different data value, according to their importance, as previously defined by the PISTIS User. 8. Generate a data valuation report, including the general data value score, as well as its breakdown along the data value dimensions. Generate user-friendly explanations of the scores.
User Benefits	The user gets: • A method for stating the context in which data valuation is performed. This allows for different users to perform various valuations for the same data asset. By default, non-contextual valuation involves only data quality assessment, GDPR check and deanonymisation risk analysis. • The possibility to transform the data set based on the results of data quality assessment. • A report of the data value score, as well as its breakdown along the defined data value dimensions.
Challenges	• From a UX perspective, we anticipate some friction because of the complexity of the entire process. • The definition of the context can be lengthy and may require a certain level of introspection (e.g., users need to carefully think of intended uses, business impact etc.) • Data quality requirements involve the definition of data quality rules, which involve a reasonable technical level on behalf of the user. • Defining the importance of each data value dimension may not be so straightforward. We will need to think what's the granularity of the tuning that will be allowed for each dimension. A continuous scale from 0-1 might pressure the user into making too fine adjustments. An ordinal scale, while losing granularity, might help at least in the beginning. • Reporting is always difficult, especially for a highly dimensional process, such as data valuation.

Security Issues	*N/A*
Other issues	*Data valuation doesn't generate a financial value of data. Instead, it is quantifying different dimensions which are associated with the value of data. Data monetisation can use these to compute a monetary value of the data asset, based on the scores obtained for each dimension.*

3.3.8 Data usage and market analytics

Table 10: Data usage and market analytics User Story

Story ID	**PISTIS.OUS.08**
Story Title	**Data usage and market analytics**
Story Actors	PISTIS User (Provider), PISTIS Platform
Overview	The data provider uses facilities to understand how his/her data are used currently and what is the potential of them
Triggers	The data providers want to set a new data asset on the market and wants to get informed about how it could perform. The data provider wants to check how a data he owns is being used by himself and by buyers of it.

Workflow	 PISTIS User (Data Provider) PISTIS Platform User Authedication Filter or search criteria Request the list of owned assets in the marketplace Platform enlists user's assets in the marketplace based on filter criteria Presentation of the assets User selects an asset Process asset's insights data Retrieve lineage insights Retrieve transcactions insights Perfortm insights analysis to suggest *the potential placement of derivatives on the market* Asset insights are presented to the user **Figure 14: Data usage and market analytics**
Story Sequence	1. The PISTIS User visits the market insights facility where they can have a view of the overall market. 2. The PISTIS User filters the market insights dashboard to constrain the view of assets that are similar to the one they would like to sell. 3. The PISTIS User gets some insights on how their data (which they already sold in the past) is currently used by buyers, by receiving insights from the analytics engine that analyses the lineage of the data and the potential placement of derivatives on the market. 4. The PISTIS User is able to get details on the lineage of the data seeing both theirs and their buyers' actions on the original data.
User Benefits	The user gets: • A dashboard to view specific elements of the overall PISTIS market. • Insights relevant to the data category/type the user is interested in selling. • Insights on how data the user has already sold are being used.

	- Lineage information on the operations of the user's data.
Challenges	Insights on the performance of data assets on the market rely heavily on the existence of a high number of transactions happening in the market, and on the availability of similar datasets to the ones under investigations. Understanding usage of data from other parties via lineage inspection and market placement is challenging
Security Issues	N/A
Other issues	Usage Analytics should be restrained only on lineage tracking and market transaction analyses, as other information relevant to usage may violate users' business secrets.

3.3.9 Data Query

Table 11: Data Query User Story

Story ID	**PISTIS.OUS.9**
Story Title	**Data Query**
Story Actors	PISTIS Platform, PISTIS User (Consumer)
Overview	The PISTIS User (Consumer) access the PISTIS platform to search of a dataset. Firstly, the user can browse/search the metadata catalogue for datasets. In case the user wants to proceed to more thorough search in the data, they can use the platform interface to define search criteria on natural language. Upon the criteria's validation, the Platform will search the metadata for the best possible matches and in parallel forwards the search to the stored data. The results of both modules will be merged into a single list which will then be sorted and returned to the user.
Triggers	An existing PISTIS User (Consumer) wants to find one or more Datasets that match their needs.

Workflow

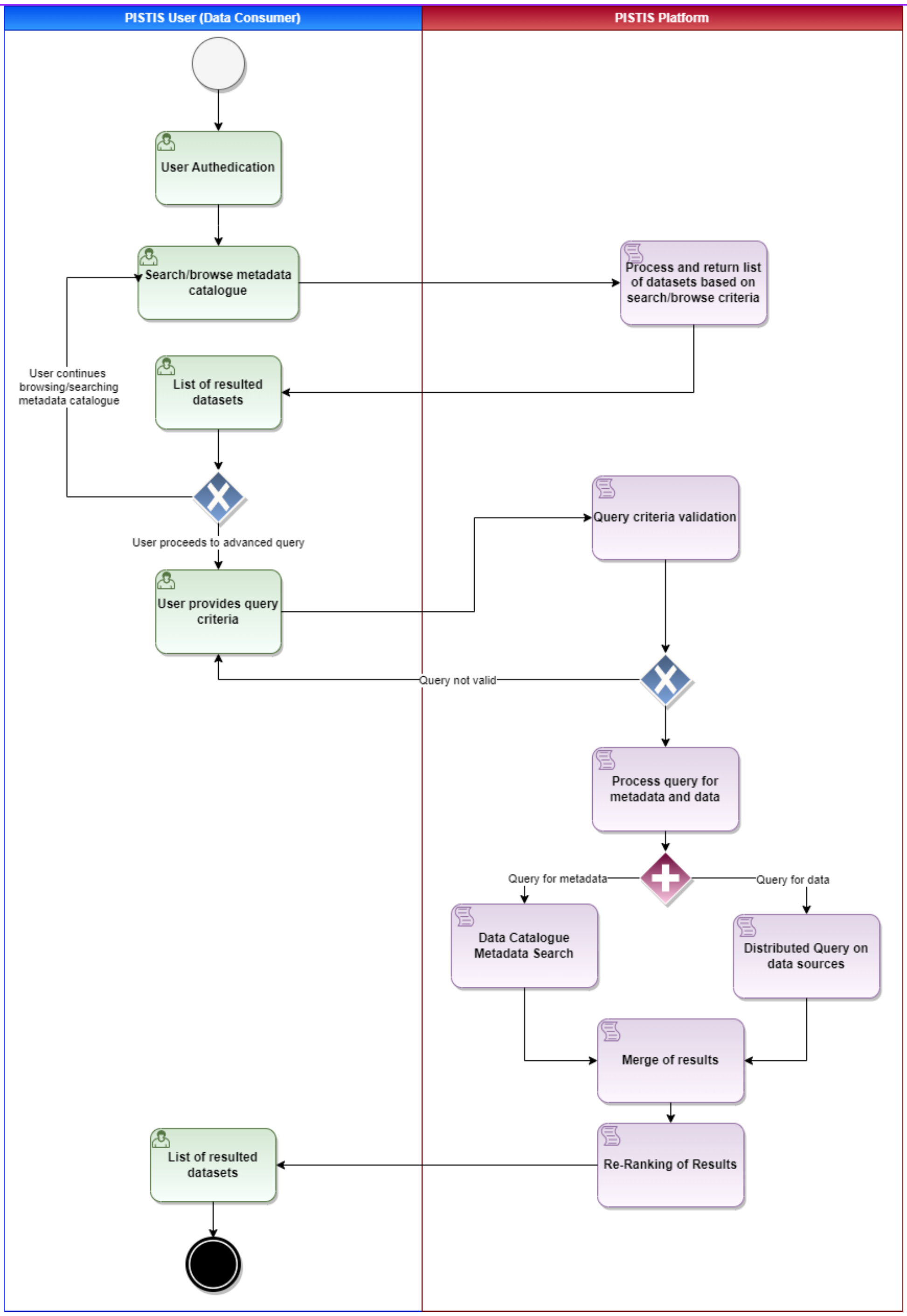

PISTIS User (Data Consumer)
PISTIS Platform
User Authedication
Search/browse metadata catalogue
Process and return list of datasets based on search/browse criteria
User continues browsing/searching metadata catalogue
List of resulted datasets
User proceeds to advanced query
Query criteria validation
User provides query criteria
Query not valid
Process query for metadata and data
Query for metadata
Query for data
Data Catalogue Metadata Search
Distributed Query on data sources
Merge of results
List of resulted datasets
Re-Ranking of Results

Figure 15: Data Query

Story Sequence

1. PISTIS User is authenticated by the PISTIS Platform.
2. PISTIS User search/browse for datasets in the metadata catalogue.
3. PISTIS User wants to proceed to more advanced search providing Query Criteria in natural language.
   3.1. PISTIS Platform validates the Query Criteria based on the grammar and language rules. If the query is not valid, the user is notified.
4. PISTIS Platform splits the Query to a part that is aimed to the Metadata and a part that is aimed to the Data.
   4.1. The Metadata part is forwarded to the PISTIS Data Catalogue.
   4.2. The Data part executes a query mechanism to the distributed data spaces.

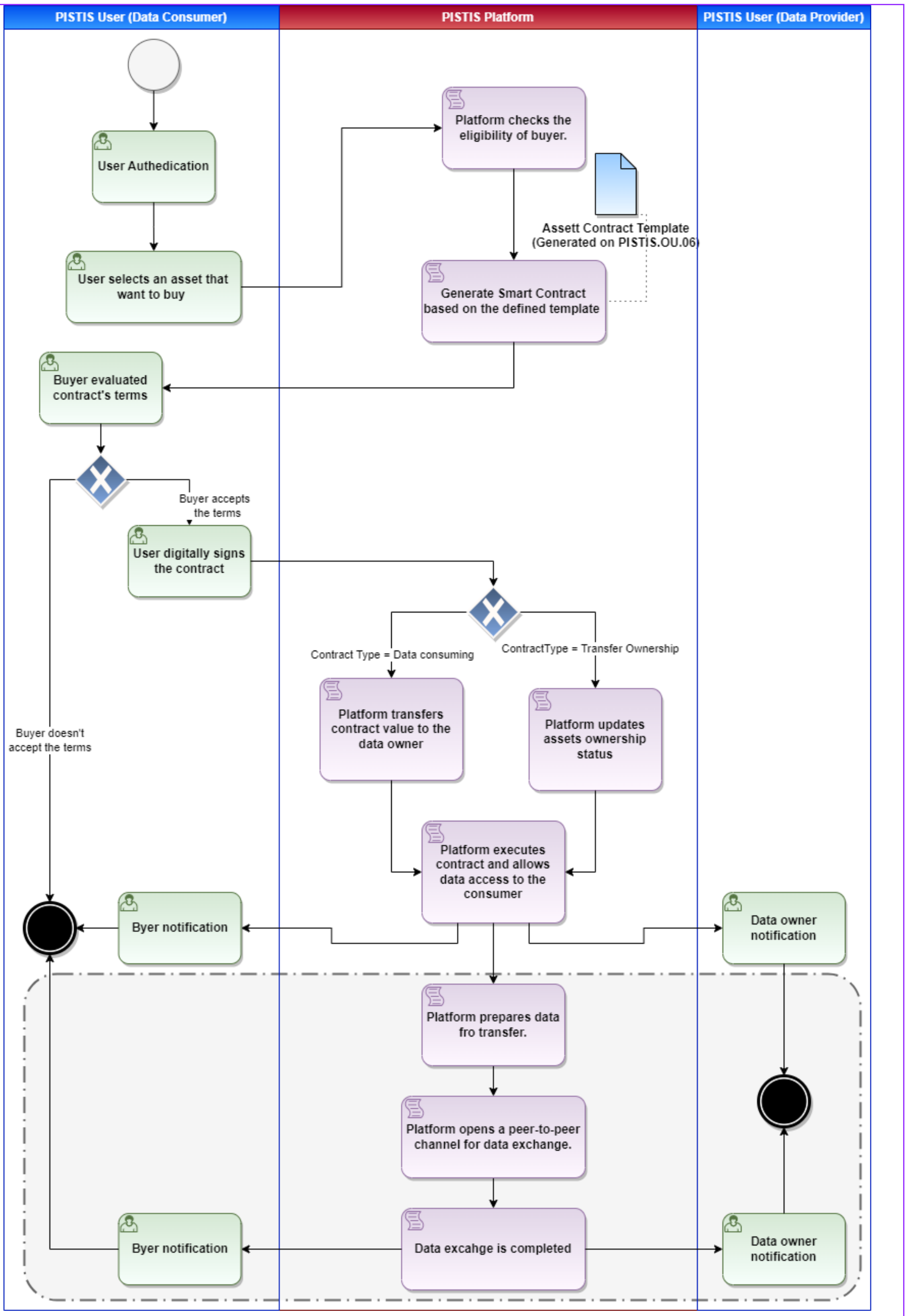
	5. PISTIS Platform merges the results generated by both subtasks. 6. PISTIS platform re-ranks the results list and sends it to PISTIS User.
User Benefits	The user will be able to: • Search for a dataset using metadata. • Search for a dataset using sample data. • Informed for possible errors in the criteria they provided for the search. • Receive an ordered list of datasets that match the criteria they provided.
Challenges	• The variety of the different formats and schemas used for the storage of metadata introduces a great level of complexity. • The volume of data stored in the Data Factories makes extensive searches difficult and slow. • When the list of potential matches becomes large the user might not find what they are looking for if it is not placed on the top.
Security Issues	• Confidentiality and Authentication: Only the correct user, as defined by the various policies, should be able to have access to perform this task. • System abuse: The user should be able to perform only a reasonable number of queries, so the system is protected against scrappers and other forms of abuse.
Other issues	-

3.3.10 Data Transaction

Table 12: Data Transaction User Story

Story ID	**PISTIS.OUS.10**
Story Title	**Data Transaction**
Story Actors	PISTIS Platform, PISTIS User (Provider), PISTIS User (Consumer)
Overview	There is an intention between two users (provider and consumer) to exchange the ownership of a dataset. The PISTIS platform should let the two parties seamlessly transfer the data and the value. The data provider has listed their datasets on the PISTIS platform, and the data consumer has loaded their wallet with the necessary amount of money. The transaction is initiated by the generation, signature, and activation of a smart contract, based on the smart contract template created on data monetization process (PISTIS.OUS.06). Upon the sign of the smart contract the peer-to-peer data exchange follows between data provider and data consumer.
Triggers	Once a data consumer wants to buy a data asset. The PISTIS platform holds the price that the data provider has placed on the data, and a template of the contract to which terms the two parties should agree for executing the transaction. The data consumer sends a request to the platform, using the dedicated user interface, to initiate the data exchange and the transfer of the contract value to the data provider's wallet.

Workflow



PISTIS User (Data Consumer)
PISTIS Platform
PISTIS User (Data Provider)
User Authedication
User selects an asset that want to buy
Platform checks the eligibility of buyer.
Assett Contract Template (Generated on PISTIS.OU.06)
Generate Smart Contract based on the defined template
Buyer evaluated contract's terms
Buyer accepts the terms
User digitally signs the contract
Buyer doesn't accept the terms
Contract Type = Data consuming
ContractType = Transfer Ownership
Platform transfers contract value to the data owner
Platform updates assets ownership status
Platform executes contract and allows data access to the consumer
Byer notification
Data owner notification
Platform prepares data fro transfer.
Platform opens a peer-to-peer channel for data exchange.
Data excahge is completed
Byer notification
Data owner notification

Figure 16: Data Transaction

Story Sequence

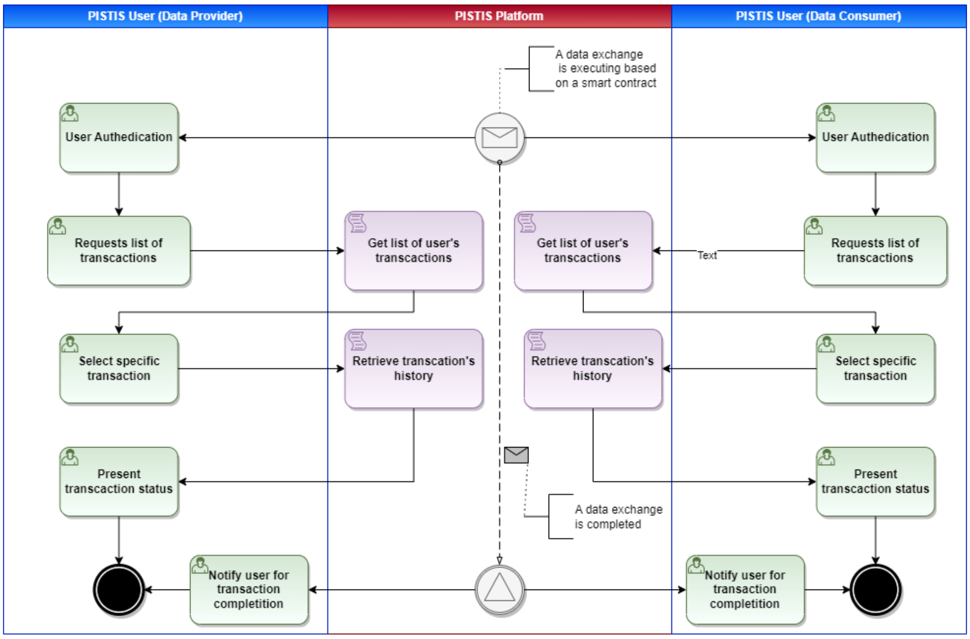
1. The PISTIS User (Consumer) views a data asset available in the market and chooses to buy it.
2. The PISTIS platform checks if the Consumer possesses the necessary amount of PISTIS coins to execute the transaction.
3. The PISTIS Platform generates a smart contract based on asset's contract template to be signed by the PISTIS User (Consumer)

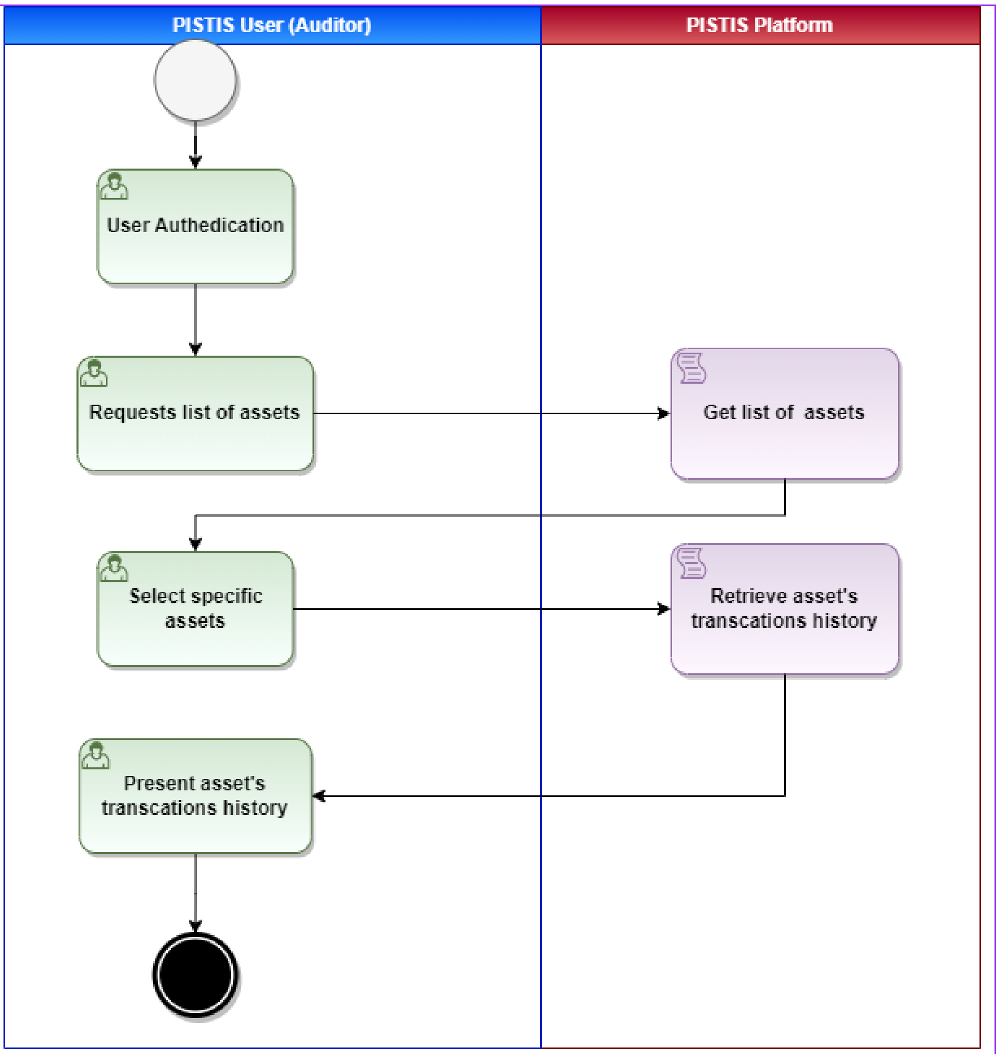
	4. The PISTIS User (Consumer) views the contract terms and signs it, utilising the owned private key. 5. The PISTIS Platform, depending on the type of contract, 5.1. transfers the contract value amount from the Consumer to the Owner of the data. 5.2. In case of partial (investment plan) or totally (NFT) ownership change, the PISTIS Platform records in the ledger the new ownership status of the dataset. 6. The PISTIS Platform executes the smart contract to allow the data to be exchanges between the different PISTIS Data Factory environments. 7. The PISTIS platform informs both the Owner and the Consumer for the execution of the smart contract. 8. The PISTIS platform executes the data exchange. 9. The PISTIS platform encrypts the data before initialising the transfer. 10. The PISTIS platform activates a peer-to-peer data exchange channel, based on the contract terms, through which data is transferred from one PISTIS data factory to the other. 11. The PISTIS platform informs both the Owner and the Consumer for the competition of the data transfer.
User Benefits	• The PISTIS User (Consumer) gets a facility to check the terms of a contract and sign the contract. • The PISTIS User (Provider) gets a facility to automate asset transactions using smart contracts. • The PISTIS users can easily execute financial transactions. The process of conversion between FIAT money and Pistis stablecoin is hidden from the users. Moreover, users don't have to worry about exchange ratios. • The PISTIS users do not have to hold any receipt of the purchase or manuscript of contract since everything is recorded on the blockchain.
Challenges	In case of ownership change, the platform must care to change the attributes of past but still valid contracts relevant to the same dataset, to allow the new owners to profit from new transactions. In case of ownership change, the platform must transfer the dataset to the new owner. In case the registration of the data transaction, especially for stream data, value transaction and smart contract on the relevant blockchain should be fast enough. This is a challenge since most of the blockchain networks require some time for status update. For example, Bitcoin has 10 minutes block confirmation time while Ethereum has on average 10-15 seconds delay.
Security Issues	N/A
Other issues	N/A

3.3.11 Data exchange monitor/audit

Table 13: Data exchange monitor/audit User Story

Story ID	**PISTIS.OUS.12**

Story Title	**Data exchange monitor/audit**
Story Actors	PISTIS Platform, PISTIS User (Provider), PISTIS User (Consumer), PISTIS User (Auditor, Certification Body)
Overview	Authorised PISTIS Users will be able to get real time information about the progress of the data exchanges and will be notified accordingly.
Triggers	**Monitor Specific Dataset Exchange** A PISTIS User (Consumer) has already bought a data asset through the PISTIS Platform. Thus, the contract is already verified, the dataset is encrypted, the money has already been transferred successfully, and the dataset is scheduled to be transferred peer-to-peer to the PISTIS User (Consumer). During this procedure an auditing mechanism is enabled to notify the PISTIS User (Owner and Consumer) about the data transaction status. **Auditing History** A PISTIS User (Auditor, Certification Body) can search the history of transactions.
Workflow	**Monitor Specific Dataset Exchange**  PISTIS User (Data Provider) PISTIS Platform PISTIS User (Data Consumer) A data exchange is executing based on a smart contract User Authedication User Authedication Requests list of transcactions Get list of user's transcactions Get list of user's transcactions Text Requests list of transcactions Select specific transaction Retrieve transcation's history Retrieve transcation's history Select specific transaction Present transcaction status A data exchange is completed Present transcaction status Notify user for transaction completition Notify user for transaction completition Figure 17: Monitor Specific Dataset Exchange process. **Auditing History**

Story Sequence	 PISTIS User (Auditor) PISTIS Platform User Authedication Requests list of assets Get list of assets Select specific assets Retrieve asset's transcations history Present asset's transcations history **Figure 18: Auditing History process.** **Monitor Specific Dataset Exchange** 1. PISTIS User (Consumer and Owner) successfully authenticated and authorized the Platform. 2. PISTIS User requests the list of transactions and selects one of them to view the status. 3. The PISTIS platform stores the hashes of the value and data transactions along with the dataset information, a pointer to the off-chain storage and a timestamp signed by the PISTIS Platform and generates a certificate that the transaction was successful. Further, PISTIS Platform updates the information on the lineage tracker. 4. PISTIS User can view the status and all the details of the selected transaction. 4.1. PISTIS User (Provider) is notified by the PISTIS Platform that the transaction is completed. 4.2. PISTIS User (Consumer) is notified by the PISTIS Platform that the transaction is completed. **Auditing History**

	1. PISTIS User (Auditor, Certification Body) successfully authenticated and authorized. 2. PISTIS User searches in the PISTIS Platform for a specific dataset of interest to access the transaction history. 3. PISTIS User requests from the the history of the specific dataset. 4. PISTIS platform searches all the smart contract instances for this specific dataset and provides the history of transactions of the specific dataset to the PISTIS User (Auditor, Certification Body).
User Benefits	PISTIS User (Consumer) will be able to: - Get notifications about the data transaction status. PISTIS User (Provider) will be able to: - Get notifications about the data transaction status. PISTIS User (Auditor, Certification Body) will be able to: - Access the data transaction history
Challenges	PISTIS User is successfully authenticated and authorized to the PISTIS Platform.
Security Issues	- Confidentiality & Authentication & Authorization: The transactions monitored data should be encrypted and only authorised PISTIS Users should be able to access them. - Integrity: The transactions monitored data should not be altered. - Availability: The transactions monitored should be available to the authorised PISTIS Users or PISTIS Administrator. - Privacy: The identity of the involved users of the actual data transaction and the corresponding payment value should not be revealed.
Other issues	N/A

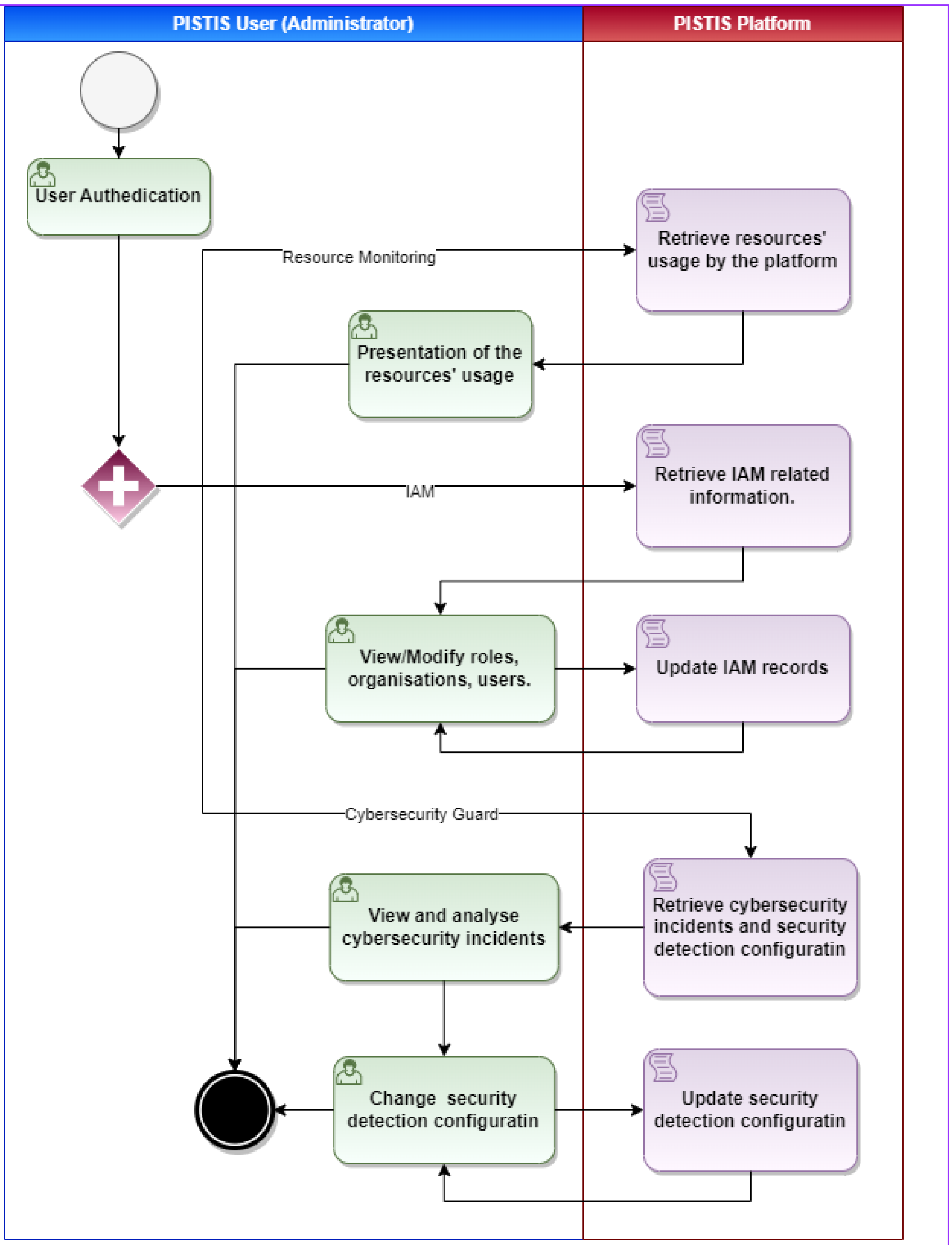
3.4 Support Operations User Stories

The following sections present the three user stories that support the system operations, explaining the interaction between users and PISTIS platform and the executed processes.

3.4.1 PISTIS platform monitor/audit

Table 14: PISTIS platform monitor/audit User Story

Story ID	**PISTIS.SOUS.01**
Story Title	**PISTIS platform monitor/audit**
Story Actors	PISTIS User (Administrator), PISTIS Platform
Overview	The operations relevant to the monitoring of the PISTIS platform status and health by the PISTIS Administrator
Triggers	N/A

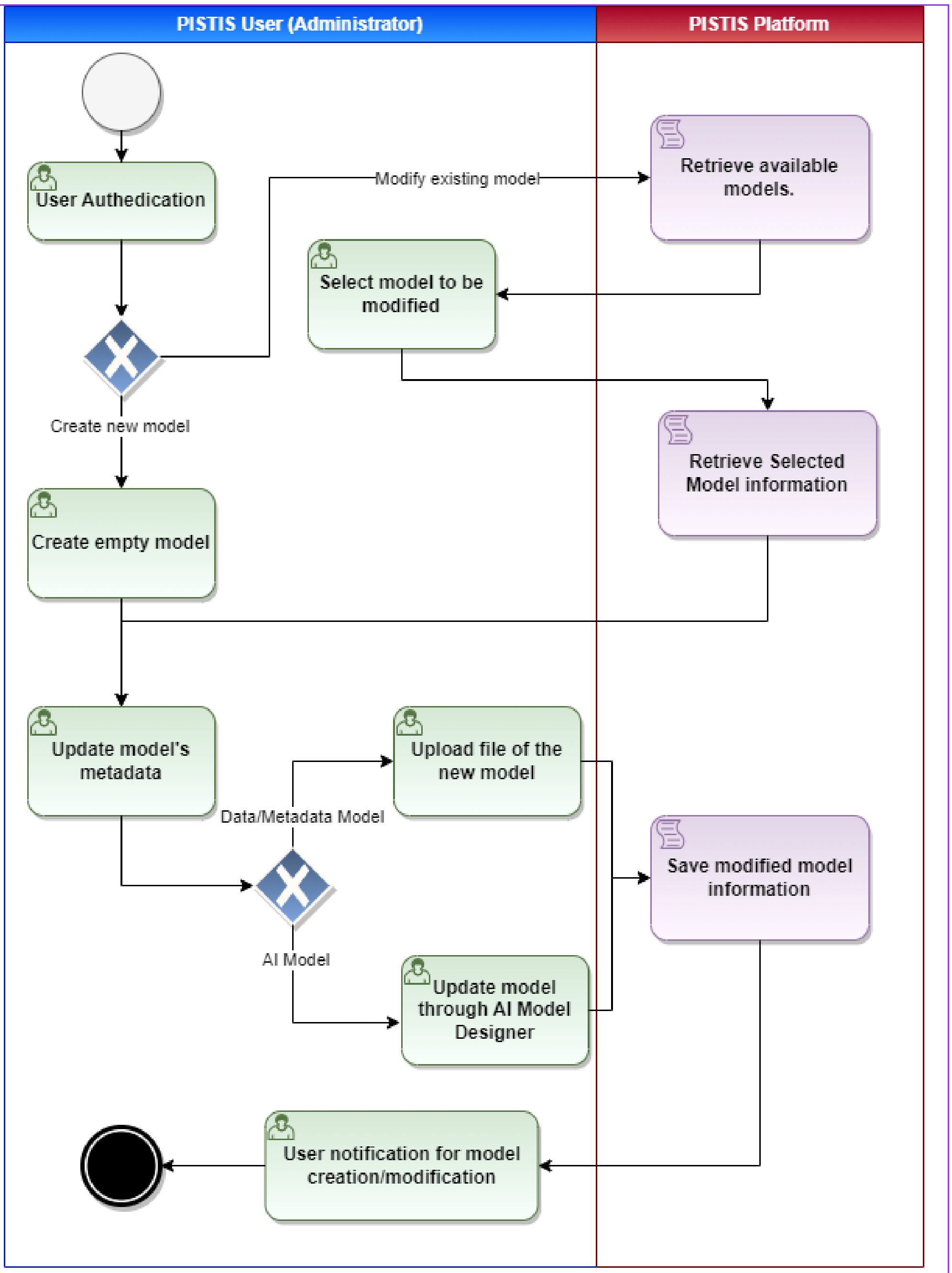
Workflow	 PISTIS User (Administrator) PISTIS Platform User Authedication Resource Monitoring Retrieve resources' usage by the platform Presentation of the resources' usage IAM Retrieve IAM related information. View/Modify roles, organisations, users. Update IAM records Cybersecurity Guard Retrieve cybersecurity incidents and security detection configuratin View and analyse cybersecurity incidents Change security detection configuratin Update security detection configuratin **Figure 19: PISTIS platform monitor/audit process**
Story Sequence	1. The PISTIS Administrator logs into the PISTIS Cloud Platform using his credentials and lands on the administration home page. 2. The PISTIS Administrator can visit the dedicated pages to monitor the resources of the PISTIS platform, to administer the organisations and users of the PISTIS platform, and to check for cybersecurity incidents and manage the rules for detection. 2.1. Alt flow #1 (Resource Monitoring) 2.1.1. By visiting the resources page the PISTIS Administrator can view the resources used in PISTIS 2.2. Alt flow #2 (IAM) 2.2.1. By visiting the IAM service, the PISTIS Administrator can view a list of all organisations signed up in PISTIS.

	2.2.2.By visiting the view page of the organisation in the IAM the PISTIS Administrator can see the organisation details and the list of users of that organisation 2.2.3.The PISTIS Administrator can enable/disable/update/delete or view an organisation and assign attributes to the organisation. 2.2.4.By visiting the users page within an organisation, the PISTIS Administrator can enable/disable/update/delete or view details for a user and assign roles. 2.3. Alt flow #3 (Cybersecurity Guard) 2.3.1.The PISTIS Administrator navigates to the CyberSecurity Guard page to monitor security incidents. 2.3.2.The PISTIS Administrator Guard can upload a new security detection configuration file to update the existing detection rules
User Benefits	The user will get: • Graphs showcasing the resources utilisation and other related metrics (such as no of transactions, no of datasets, etc.) of the PISTIS platform. • An IAM service to administer organisations and users over the whole PISTIS platform. • A cybersecurity guard interface to insert detection rules and monitor incidents
Challenges	• Off-line validation checks (such as company and signatory user validation, etc.) might be necessary to enable/update the organisations onboarding PISTIS, to offer a trusted environment. • Need to perform deep checks when changing user roles or removing users, to transfer ownership of operations and privileges of such users (such as wallet's access) to other users
Other issues	Information about users stored in the IAM should follow the GDPR provisions and a DPO should be assigned for any requests

3.4.2 PISTIS platform configuration

Table 15: PISTIS platform configuration User Story

Story ID	**PISTIS.SOUS.02**
Story Title	**PISTIS platform configuration**
Story Actors	PISTIS Administrator
Overview	Enrichment/Population of the different global repositories (AI pre-trained models, Data, Metadata) that will be used by the different modules of the PISTIS Data Factories
Triggers	Introductions of changes in data models (for example when PISTIS is to support a new industry domain) or new requests for AI models will trigger this action

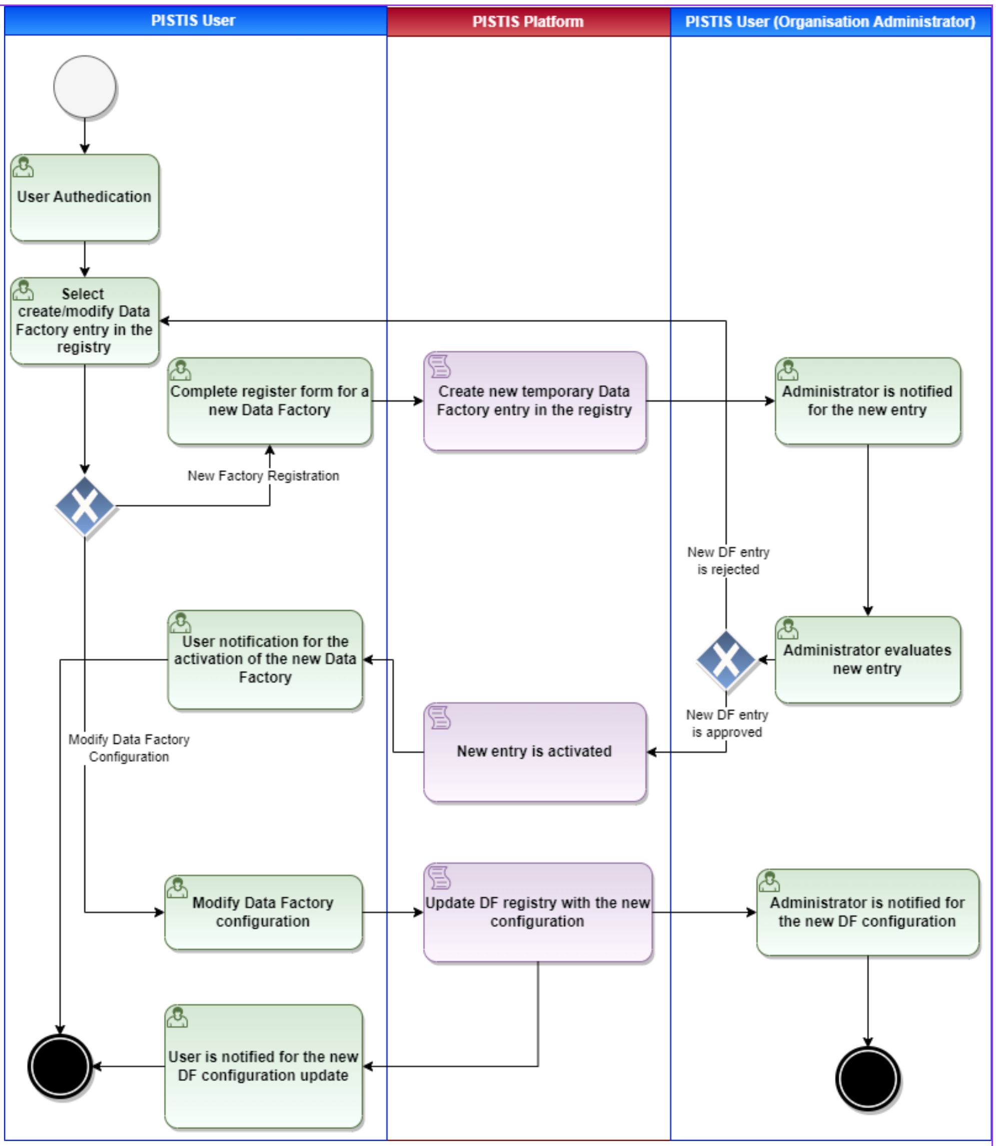
Workflow	 PISTIS User (Administrator) PISTIS Platform User Authedication Modify existing model Retrieve available models. Select model to be modified Create new model Retrieve Selected Model information Create empty model Update model's metadata Upload file of the new model Data/Metadata Model Save modified model information AI Model Update model through AI Model Designer User notification for model creation/modification **Figure 20: PISTIS platform configuration**
Story Sequence	1. The PISTIS Administrator visits the Models Manager and sees the contents of the repositories. 2. The PISTIS Administrator selects the type of model they want to upload/update. 3. The PISTIS Administrator provides/edits the model’s metadata accompanying the model they want to upload/update. 3.1. The PISTIS Administrator chooses the file that holds the model and uploads/updates the selected model. 3.2. In case of an AI model, the PISTIS Administrator logs into the AI Model Designer and designs the model.
User Benefits	The user gets:

	- A facility to view the content of the Repositories for the a) Pretrained AI models, b) the Data Models, c) the Semantic Models - A service to perform CRUD operation in the different reports
Challenges	Need to make all models backwards compatible when updating in order not to disrupt operations that are based on previous models
Security Issues	*N/A*
Other issues	*N/A*

3.4.3 Data Factory Configuration/Setup

Table 16: Data Factory Configuration/Setup User Story

Story ID	**PISTIS.SOUS.03**
Story Title	**Data Factory Configuration/Setup**
Story Actors	PISTIS User, PISTIS Administrator
Overview	Upon deploying a PISTIS Data Factory instance, this deployment should be made known via the central PISTIS Platform (PISTIS Data Factory Registry) so that it can join the overall ecosystem.
Triggers	Deployment of a new PISTIS Data Factory instance or updating of the location (e.g. IP address) of an existing PISTIS Data Factory.

Workflow	 PISTIS User PISTIS Platform PISTIS User (Organisation Administrator) User Authedication Select create/modify Data Factory entry in the registry Complete register form for a new Data Factory Create new temporary Data Factory entry in the registry Administrator is notified for the new entry New Factory Registration New DF entry is rejected User notification for the activation of the new Data Factory Administrator evaluates new entry New DF entry is approved Modify Data Factory Configuration New entry is activated Modify Data Factory configuration Update DF registry with the new configuration Administrator is notified for the new DF configuration User is notified for the new DF configuration update Figure 21: Data Factory Configuration/Setup
Story Sequence	1. The PISTIS user registers the location of its PISTIS Data Space Factory in the central PISTIS platform. 2. The Administrator is notified of a new record/update in the Data Factory Registry's connections table. 3. The PISTIS administrator approves the entry of the user. 4. The user is notified of the activation of the Data Factory environment
User Benefits	The PISTIS user gets: • An interface to register the location of their PISTIS Data Factory The PISTIS Administrator gets: • An interface to check the status of a connection of a PISTIS Data Factory and enable/disable its connection to the network
Challenges	N/A
Security Issues	N/A

Other issues	N/A

4 Technical Requirements

User Stories provided a high-level description of the process of the main functionalities that PISTIS will provide to its end users combining business and technology perspective. Through a comprehensive analysis of each user story, focusing particularly on users' benefits, challenges, issues, and leveraging technical solutions derived from state-of-the-art practices, a compilation of technical requirements has been generated. Each technical requirement for PISTIS represents a technical-oriented feasible approach to address the business requirements expressed in the user stories. Nevertheless, it shall be stressed that the requirements do not encompass strict technical solutions guidelines. The definitive architecture of the PISTIS framework and the technical specifications for its functional components will be defined in the tasks assigned to work packages WP2, WP3 and WP4 of the project .

Table 17 enlists the requirements identified in each user story along with additional details for each one.

Table 17: PISTIS Technical Requirements

ID	Description	Explanation
PISTIS.OUS.01	**Data check-in**	
REQ_1	PISTIS supports the registration of a new dataset to the ecosystem.	PISTIS platform must provide an interface or a mechanism to the user to define the new data and its metadata.
REQ_2	PISTIS supports data registration from different data source type.	PISTIS platform must support multiple type of data sources such as FTP, HTTP APIs, SFTP, DB connections, etc.
REQ_3	PISTIS supports various format and description languages of metadata.	PISTIS platform must support various format (JSON, XML, RDF, etc.) and various description languages or standards or ontologies for the metadata.
REQ_4	PISTIS ensures that only authorised user can register datasets.	Only authenticated and authorised users can check-in their data to the PISTIS platform.
REQ_5	PISTIS stores the new dataset in an internal storage located on the organisation's site (Data Factory).	The new dataset will be stored into the PISTIS platform internal storage to be used for all the process that are defined into the PISTIS data pipeline.
PISTIS.OUS.02	**User registration and profile management**	
REQ_6	PISTIS platform supports new user registration for an organisation.	A User must be able to apply for an account within PISTIS ecosystem by providing his/her necessary information and the related organisation.
REQ_7	PISTIS authentication mechanisms supports integration with external Identity Providers.	A User must be able to utilize their existing account(s) in an external Identity Provider.
REQ_8	PISTIS supports account management.	A User must be able to manage their account (preferences, details, and keys/certificates)

REQ_9	PISTIS supports PISTIS Account binding with a Trusted CA (i.e. eIDAS).	A User's account must be able to be bind their verifiable credentials with a Trusted CA (eIDAS)
REQ_10	PISTIS Platform user registration mechanism is integrated and aligned with eIDAS Trusted CA	Registration process must be integrated and aligned with eIDAS requirements
REQ_11	PISTIS allows Organisation Administrator to modify a user's profile.	PISTIS Organization Administrator must be able to manage a PISTIS User profile
REQ_12	PISTIS platform provides secure storage of user's account assets.	User credentials, personal details and keys/certificates must be securely stored and handled
REQ_13	PISTIS supports 2FA for user authentication.	A PISTIS User account must offer configurable 2FA option
REQ_14	PISTIS supports user's account data awareness.	A PISTIS User must be fully informed about what data is being collected during registration, how it will be used, and whether it will be shared with third parties
REQ_15	PISTIS establishes secure connection for data exchange with third-party systems (i.e. external Identity Providers).	User credentials and any sensitive data must be securely stored and exchanged with the external Identity Providers
REQ_16	PISTIS supports immediate role adjustment after profile update.	Any role change must be immediately effective.
REQ_17	PISTIS supports monitor of account's activities and identification against security flaws.	PISTIS accounts must be protected against unauthorized access and data breaches, via continuous monitoring and on time identification of potential security flaws
PISTIS.OUS.03	**Data transformation and analysis**	
REQ_18	PISTIS Platform supports user to select or define data transformations on a dataset.	PISTIS Platform should provide an interface to select or define the transformations to be applied over a dataset. A data transformation workflow is defined including all the appropriate information for the data transformation execution.
REQ_19	PISTIS Platform supports multiple transformations on a dataset.	PISTIS Platform should allow the application of different transformations over a dataset.
REQ_20	PISTIS Platform data transformation supports skip mechanism for non-applicable transformations.	PISTIS Platform should avoid apply transformations when these are not applicable for the structure of the applied dataset (e.g. numerical operations over string values, etc.)
REQ_21	PISTIS Platform supports user-defined transformation jobs.	PISTIS Users can define their own transformation jobs when they built a data transformation workflow.
REQ_22	PISTIS Platform supports pre-defined transformation job templates.	PISTSI Users can define a transformation job by selecting from a list of pre-defined transformation job templates and parameterized them according to their needs.

PISTIS.OUS.04	**Data quality check**	
REQ_23	PISTIS supports analysis of data and metadata quality based on standard quality criteria.	Analysis of the quality of data and metadata stored in PISTIS according to the predefined criteria and procedures.
REQ_24	PISTIS data's metadata is enhanced with quality analysis results.	The quality analysis results must be stored as (enhanced) part of metadata
REQ_25	PISTIS supports regular quality checks.	It should be possible to check the quality of data on a regular basis, especially in the case of dynamically changed data (i.e. data stream or data coming from APIs)
PISTIS.OUS.05	**Definition of access policies**	
REQ_26	PISTIS Platform supports access policies editor	PISTIS platform must offer a GUI-like editor for the definition and editing of certain access rights to a PISTIS Organization Role or the creation of new policies to match PISTIS data exchange requirements
REQ_27	PISTIS Platform supports high availability for Access policies editor.	Access policy editor must be available any time to all PISTIS Organization Administrators
REQ_28	PISTIS Platform provides effective access policies as extension of CRUD model.	Access policies must extend CRUD model with PISTIS-specific data trading requirements (i.e., Trading, Transformation, Pricing, etc.); applicable to any PISTIS Platform feature, data stream/dataset and attribute
REQ_29	PISTIS Platform allows user to define access policies precisely and granularly.	Access policies must be able to be fine-tuned on nested objects/attributes within a PISTIS resource to match PISTIS data exchange requirements
REQ_30	PISTIS platform supports access policy evaluation.	Access Policy Editor must provide an effective way to evaluate an access policy before applying it to the PISTIS ecosystem. i.e. Access Policy definition must ensure that generated access policies do not overlap or do not conflict with each other. In case of conflict, transparent and explanatory insights/notifications to PISTIS Administra-tors must be provided.
REQ_31	PISTIS platform supports Immediate enforcement of access policies modifications.	Access Policy definition must ensure immediate enforcement upon creation or modification
PISTIS.OUS.06	**Monetization of the data**	
REQ_32	PISTIS allows user to create data assets for publishing in the marketplace.	The data asset shall be described using metadata and other information prior to being placed on the market
REQ_33	PISTIS requires each data asset to have a monetary value.	The Data Asset should be accompanied by a PISTIS coin value. This could be also zero for freely provided data assets.
REQ_34	PISTIS supports various data monetisation options.	Three different monetisation options should be offered to a data asset, and only one should be selected: Fixed/Monthly price, NFT trade, Investment Plan

REQ_35	PISTIS supports the creation of user-defined data transaction contract templates.	The user must specify specific contract terms to accompany each asset sold, indicating issues such as the duration of the contract, the times a buyer can download the data, etc.
REQ_36	PISTIS supports asset's NFT Generation.	The user shall be able to generate an NFT from a data asset and have it ready for trade
REQ_37	PISTIS supports asset's NFT Trade.	The user shall be able to sell the NFT of the data for the dataset to have a new owner.
REQ_38	PISTIS supports asset's Investment Plan Activation.	The user shall be able to set an investment plan on a dataset, indicating the equity they are willing to offer to the interested investors, and the price they are asking for it.
PISTIS.OUS.07	**Data Valuation**	
REQ_39	PISTIS platform stores all the information on actions regarding data and provides access to its components.	Metadata related to ownership, lineage, transformations, terms of use and license shall be available and stored in the PISITS Data Catalogue and the PISTIS Lineage Tracker.
REQ_40	PISTIS platform stores the data valuation results of a dataset along with its metadata.	Metadata about the results of data valuation should be created or updated. This will include data value dimensions, their respective scores, the aggregate scores, and the aggregation metrics.
REQ_41	PISTIS platform supports user-managed data transformations based on data quality assessment recommendations.	Data quality assessment should also return suggestions for improving the quality of a dataset. A user can accept or decline them. If the user accepts them, these need to be passed to the Data Transformation module, which runs them to generate a new data asset, based on the data quality rules. Following this, the Data Quality Assessment should be run again on the (new) transformed data asset.
REQ_42	PISTIS platform's data valuation considers the dataset's usage analytics.	Data valuation will include insights generated from usage analytics of a data asset. These will be retrieved from the Data Usage and Intentions Analytics.
REQ_43	PISTIS platform supports deanonymisation risk analysis.	Check the risk of deanonymising a previously anonymised data asset. The user will need to define the quasi-identifiers inside the data set, run possible anonymisation and attempt deanonymisation. This will involve the Anonymisation module.
REQ_44	PISTIS platform supports GDPR compliance checker for the datasets.	Include a GDPR compliance score in the Data Valuation process. This should be retrieved from its corresponding metadata.
REQ_45	PISTIS platform's data valuation supports functional utility checks on a data asset based on user-defined metrics.	To compute the functional utility of a data asset, ML models and evaluation metrics shall be made available by the PISTIS User.
REQ_46	PISTIS platform provides an interpretable data valuation report.	The data value score should be easy to understand. It should be easy to deconstruct it in its composing parts, down to the lowest level of data value dimensions. Further, the PISTIS user will visualise scores at

		different aggregation levels, to better interpret the drivers of the value of their data.
PISTIS.OUS.08	**Data usage and market analytics**	
REQ_47	PISTIS provides detailed market insights related to data assets.	The user shall be able to have an overview of the PISTIS market, by viewing indexes and metrics that are related to specific data, filtered by attributes such as sector, data type, metadata, etc.
REQ_48	PISTIS provides data usage insights for each data asset.	The user shall be able to see analytics relevant to the usage (by combining lineage and market transaction information) of a specific dataset, or relevant to a group of similar datasets.
REQ_49	PISTIS provides a detailed view of the lineage of the data published in the platform.	The user shall be able to see the lineage of a dataset owned, including both a log of their actions and those of the actions of other stakeholders that have bought his asset
PISTIS.OUS.09	**Advanced Data Query**	
REQ_50	PISTIS provides a UI for advanced search mechanism on the published data assets.	PISTIS platform must provide a UI that enables users to create their queries on the data assets.
REQ_51	PISTIS search mechanism supports query criteria validation.	For the submission of a query, the PISTIS Platform must validate that the criteria provided follow certain language grammar and syntactic rules to avoid non-understandable queries.
REQ_52	PISTIS search mechanism supports quey splitting for metadata and data.	PISTIS platform must identify the parts of a query that refer to the metadata and those that refer to the data and split them accordingly
REQ_53	PISTIS search mechanism searches datasets through their metadata	PISTIS platform must offer a mechanism that is able to discover datasets using their metadata.
REQ_54	PISTIS search mechanism searches datasets on their data.	PISTIS platform must offer a mechanism that is able to discover datasets by matching the stored data.
REQ_55	PISTIS search mechanism supports metadata and data search results merging.	PISTIS platform must have a way to combine the results returned by two different search mechanisms in a unified list.
REQ_56	PISTIS search mechanism supports search results reranking	PISTIS platform must sort the results returned by the search mechanisms in a descending order of relevance.
PISTIS.OUS.10	**Data Transaction**	
REQ_57	PISTIS generates smart contract for each data transaction.	The PISTIS Platform shall create a smart contract based on the terms chosen by the PISTIS User (Provider) before allowing any data transaction.
REQ_58	PISTIS smart contract mechanism validates the eligibility of the buyer.	The PISTIS platform shall check if the PISTIS User (Consumer) possesses the necessary value indicated in the smart contract to allow him to sign it.

REQ_59	PISTIS smart contract mechanism requires the digital sign of the smart contract from the buyer.	The PISTIS User (Consumer) shall view, accept, and sign the smart contract to enable the transfer of the data
REQ_60	PISTIS supports Peer-to-Peer Data Exchange	PISTIS platform should enable direct peer-to-peer data exchange between Data Providers and Data Consumers.
REQ_61	PISTIS supports Secure Data Encryption on data transactions.	The platform should employ robust encryption algorithms to protect the data during transfer. Encryption keys should be securely managed and accessible only to authorized parties.
REQ_62	PISTIS supports digital wallet for financial transactions.	Users should be able to manage their wallets, including balance checking and transaction history. (Cash in, Cash out).
REQ_63	PISTIS supports multi-signatures on a smart contract.	Multi-signature technology should be supported allowing multiple users of the same organization to collectively authorize a transaction by requiring multiple signatures to approve and execute a transfer.
PISTIS.OUS.11	**Data exchange monitor/audit**	
REQ_64	PISTIS supports data transaction status notification.	PISTIS User (Owner/Consumer) must be notified about the status of the transaction.
REQ_65	PISTIS ensures the only authorised users are notified for a data transaction.	Only authenticated and authorised PISTIS Users (Owner/Consumer) should be notified about the data transaction status.
REQ_66	PISTIS stores data transaction activities for auditing purpose.	All data transfers must be monitored and stored for auditing purposes.
REQ_67	PISTIS provides detailed history of a data transaction.	Only authenticated and authorised PISTIS Users (Auditor/Certification Body) should have access to the transaction history.
PISTIS.SOUS.01	**PISTIS platform monitor/audit**	
REQ_67	PISTIS supports Resource Monitoring System	The PISTIS platform must provide the PISTIS Administrator with a view to monitoring all resources relevant to the infrastructure and to the operation of the system
REQ_68	PISTIS supports organisation management via IAM	The PISTIS platform must provide the PISTIS Administrator with an interface for the IAM, to manage organisations and their attributes, and users and their roles.
REQ_69	PISTIS supports users' management via IAM.	The PISTIS platform must provide the PISTIS Administrator with an interface for the IAM, to users and their roles.
REQ_70	PISTIS supports cybersecurity Monitoring.	The PISTIS platform must provide the PISTIS Administrator with an interface for the monitoring of possible cybersecurity incidents
REQ_71	PISTIS supports user-defined cybersecurity Policies Updates.	The PISTIS platform must provide the PISTIS Administrator with an interface for the updating of the platform cybersecurity policies

PISTIS.SOUS.02	**PISTIS platform configuration**	
REQ_72	PISTIS supports CRUD Operations on data/metadata/AI models repositories.	The PISTIS Platform must provide the PISTIS Administrator and with an interface to perform CRUD operations in the different Global Repos
PISTIS.SOUS.03	**Data Factory Configuration/Setup**	
REQ_73	PISTIS provides an interface to organisation's administrators to Register Data Factory location to PISTIS ecosystem.	The PISTIS Platform must allow users to specify the location and the configuration of their Data Space Factory.
REQ_74	PISTIS notifies platform administration for the request of new PISTIS Data Factory connection entries	The PISTIS Platform shall notify the PISTIS Administrator for a new connection entry request made in the central PISTIS Platform.
REQ_75	PISTIS allows platform administration to evaluate and activate a new PISTIS Data Factory connection request.	The PISTIS Platform must ask the PISTIS Administrator to accept/activate a new PISTIS Data Factory connection registration. This step is mandatory for the activation of the Data Factory.
REQ_76	PISTIS notifies organisation administrator when a new PISTIS Data Factory connection was activated.	The PISTIS Platform shall notify the organisation's administrator for the activation of the requested new PISTIS Data Factory connection.

5 MVP

The MVP represents the fundamental version of a product that effectively addresses the core problem or fulfils the essential needs of the users. The idea of MVP in PISTIS is to release a version of the envisioned PISTIS framework that is both desirable and operational for the end users and can be completed during the project implementation's period. The PISTIS MVP is a set of requirements that will be addressed in the final delivered version of the PISTIS platform.

The process of determining the requirements defining the PISTIS MVP involves the employment of the MoSCoW method[6] . This method is used to set priorities on the list of requirements derived from the analysis of User Stories. MoSCoW is an acronym representing a prioritization technique used in project management and software development. It can be used to categorise and prioritise requirements or tasks based on their importance. According to the MoSCoW method each requirement is characterised by one of the following priorities:

- **Must-haves (M)**: These are the non-negotiables, the core features or requirements that must be included in the final product. Without these, the project would not be considered a success.
- **Should-haves (S)**: These are important but not critical. They add significant value to the project, and ideally, they should be included unless there are constraints that prevent it.

[6] Kravchenko, Tatiana, Tatiana Bogdanova, and Timofey Shevgunov. "Ranking requirements using MoSCoW methodology in practice." Computer Science On-line Conference. Cham: Springer International Publishing, 2022.

- **Could-haves (C)**: These are nice-to-have features. They are desirable but not crucial for the project's success. If there's time and resources, they can be included, but they can also be pushed to future releases.
- **Won't-haves (W)**: These are deliberately excluded from the current scope of work. They might be considered for future phases or versions, but they are not part of the immediate plan.

To prioritise the PISTIS requirements for MVP, the followed methodology included the evaluation of each requirement by two groups:

- **End-users Group**: This group includes the partners that will operate the final PISTIS framework during the pilots. This group expresses the opinion of the end-users, and the evaluation is based on the business and operational perspective.
- **Technical Group:** This group comprises partners who hold the essential technical expertise necessary for implementing the PISTIS MVP. Their primary role involves evaluating and expressing the technical feasibility of meeting each requirement outlined for the final delivered product. .

The next step of PISTIS MVP definition methodology was the presentation and the discussion of the requirements to the two groups. Subsequently a prioritisation voting survey was carried out. Each participant assigned an integer to each requirement according to a voting scale 1-4. Each number represented one of the priorities of the MoSCoW method. 1=Won't Have, 2=Could Have, 3=Should Have, 4=Must Have.

The evaluation score for prioritizing each requirement was derived through the use of a weighted mean for aggregating the voting results. The calculation of the prioritization evaluation score for each requirement follows a specific equation. $Priority = Round\left(\frac{a * \sum_{i=0}^{N} VE_i + b * \sum_{j=0}^{M} VT_j}{a * N + b * M}\right)$

Where:

N = number of participants from End-Users Group

VE_i= the vote of the participant i of the End-Users Group

M = number of participants from Technical Group

VT_j= the vote of the participant j of the Technical Group

a, b = the weight of the vote from each group

The application of weights in the votes of each group was decided so that the final score will emphasize more to the needs of end-users of the product. Finally, the calculated mean was rounded so the final score will represent the closest integer number to the MoSCoW numerical scale. For the weight variables, the balanced value of a=1.2 and b=0.8 was used and the results are presented in the following table.

Table 18: Requirements Prioritising Vote Results

Requirement	Evaluation	Importance	Requirement	Evaluation	Importance	Requirement	Evaluation	Importance	Requirement	Evaluation	Importance

REQ_1	4	Must Have	**REQ_21**	3	Should Have	**REQ_41**	3	Should Have	**REQ_61**	4	Must Have
REQ_2	4	Must Have	**REQ_22**	3	Should Have	**REQ_42**	3	Should Have	**REQ_62**	4	Must Have
REQ_3	3	Should Have	**REQ_23**	3	Should Have	**REQ_43**	3	Should Have	**REQ_63**	2	Could Have
REQ_4	4	Must Have	**REQ_24**	3	Should Have	**REQ_44**	3	Should Have	**REQ_64**	4	Must Have
REQ_5	3	Should Have	**REQ_25**	3	Should Have	**REQ_45**	3	Should Have	**REQ_65**	4	Must Have
REQ_6	4	Must Have	**REQ_26**	3	Should Have	**REQ_46**	3	Should Have	**REQ_66**	4	Must Have
REQ_7	2	Could Have	**REQ_27**	3	Should Have	**REQ_47**	3	Should Have	**REQ_67**	4	Must Have
REQ_8	4	Must Have	**REQ_28**	2	Could Have	**REQ_48**	4	Must Have	**REQ_68**	3	Should Have
REQ_9	4	Must Have	**REQ_29**	2	Could Have	**REQ_49**	4	Must Have	**REQ_69**	3	Should Have
REQ_10	4	Must Have	**REQ_30**	2	Could Have	**REQ_50**	4	Must Have	**REQ_70**	3	Should Have
REQ_11	3	Should Have	**REQ_31**	3	Should Have	**REQ_51**	3	Should Have	**REQ_71**	2	Could Have
REQ_12	4	Must Have	**REQ_32**	3	Should Have	**REQ_52**	3	Should Have	**REQ_72**	3	Should Have
REQ_13	2	Could Have	**REQ_33**	3	Should Have	**REQ_53**	4	Must Have	**REQ_73**	3	Should Have
REQ_14	3	Should Have	**REQ_34**	3	Should Have	**REQ_54**	3	Should Have	**REQ_74**	3	Should Have
REQ_15	4	Must Have	**REQ_35**	3	Should Have	**REQ_55**	3	Should Have	**REQ_75**	3	Should Have
REQ_16	3	Should Have	**REQ_36**	3	Should Have	**REQ_56**	3	Should Have	**REQ_76**	3	Should Have
REQ_17	4	Must Have	**REQ_37**	3	Should Have	**REQ_57**	4	Must Have			
REQ_18	3	Should Have	**REQ_38**	3	Should Have	**REQ_58**	4	Must Have			
REQ_19	3	Should Have	**REQ_39**	4	Must Have	**REQ_59**	4	Must Have			
REQ_20	3	Should Have	**REQ_40**	3	Should Have	**REQ_60**	4	Must Have			

According to the results, twenty-five (25) requirements must be addressed in the final product, forty-four (44) are important but not crucial and only seven (7) are not necessary.

The PISTIS MVP will be a platform that address, in its final version, sixty-nine (69) technical requirements with Must-Have and Should-Have priority.

The following table enlists the final set of the PISTIS MVP requirements sorted by their prioritisation.

Table 19: PISTIS MVP Requirements

ID	Description	Priority

REQ_1	PISTIS supports the registration of a new dataset to the ecosystem.	Must Have
REQ_2	PISTIS supports data registration from different data source type.	Must Have
REQ_4	PISTIS ensures that only authorised user can register datasets.	Must Have
REQ_6	PISTIS platform supports new user registration for an organisation.	Must Have
REQ_8	PISTIS supports account management.	Must Have
REQ_9	PISTIS supports PISTIS Account binding with a Trusted CA (i.e. eIDAS).	Must Have
REQ_10	PISTIS Platform user registration mechanism is integrated and aligned with eIDAS Trusted CA	Must Have
REQ_12	PISTIS platform provides secure storage of user's account assets.	Must Have
REQ_15	PISTIS establishes secure connection for data exchange with third-party systems (i.e. external Identity Providers).	Must Have
REQ_17	PISTIS supports monitor of account's activities and identification against security flaws.	Must Have
REQ_39	PISTIS platform stores all the information on actions regarding data and provides access to its components.	Must Have
REQ_48	PISTIS provides data usage insights for each data asset.	Must Have
REQ_49	PISTIS provides a detailed view of the lineage of the data published in the platform.	Must Have
REQ_50	PISTIS provides a UI for advanced search mechanism on the published data assets.	Must Have
REQ_53	PISTIS search mechanism searches datasets through their metadata	Must Have
REQ_57	PISTIS generates smart contract for each data transaction.	Must Have
REQ_58	PISTIS smart contract mechanism validates the eligibility of the buyer.	Must Have
REQ_59	PISTIS smart contract mechanism requires the digital sign of the smart contract from the buyer.	Must Have
REQ_60	PISTIS supports Peer-to-Peer Data Exchange	Must Have

REQ_61	PISTIS supports Secure Data Encryption on data transactions.	Must Have
REQ_62	PISTIS supports digital wallet for financial transactions.	Must Have
REQ_64	PISTIS supports data transaction status notification.	Must Have
REQ_65	PISTIS ensures the only authorised users are notified for a data transaction.	Must Have
REQ_66	PISTIS stores data transaction activities for auditing purpose.	Must Have
REQ_67	PISTIS provides detailed history of a data transaction.	Must Have
REQ_3	PISTIS supports various format and description languages of metadata.	Should Have
REQ_5	PISTIS stores the new dataset in an internal storage located on the organisation's site (Data Factory).	Should Have
REQ_11	PISTIS allows Organisation Administrator to modify a user's profile.	Should Have
REQ_14	PISTIS supports user's account data awareness.	Should Have
REQ_16	PISTIS supports immediate role adjustment after profile update.	Should Have
REQ_18	PISTIS Platform supports user to select or define data transformations on a dataset.	Should Have
REQ_19	PISTIS Platform supports multiple transformations on a dataset.	Should Have
REQ_20	PISTIS Platform data transformation supports skip mechanism for non-applicable transformations.	Should Have
REQ_21	PISTIS Platform supports user-defined transformation jobs.	Should Have
REQ_22	PISTIS Platform supports pre-defined transformation job templates.	Should Have
REQ_23	PISTIS supports analysis of data and metadata quality based on standard quality criteria.	Should Have
REQ_24	PISTIS data's metadata is enhanced with quality analysis results.	Should Have
REQ_25	PISTIS supports regular quality checks.	Should Have

REQ_26	PISTIS Platform supports access policies editor	Should Have
REQ_27	PISTIS Platform supports high availability for Access policies editor.	Should Have
REQ_31	PISTIS platform supports Immediate enforcement of access policies modifications.	Should Have
REQ_32	PISTIS allows user to create data assets for publishing in the marketplace.	Should Have
REQ_33	PISTIS requires each data asset to have a monetary value.	Should Have
REQ_34	PISTIS supports various data monetisation options.	Should Have
REQ_35	PISTIS supports the creation of user-defined data transaction contract templates.	Should Have
REQ_36	PISTIS supports asset's NFT Generation.	Should Have
REQ_37	PISTIS supports asset's NFT Trade.	Should Have
REQ_38	PISTIS supports asset's Investment Plan Activation.	Should Have
REQ_40	PISTIS platform stores the data valuation results of a dataset along with its metadata.	Should Have
REQ_41	PISTIS platform supports user-managed data transformations based on data quality assessment recommendations.	Should Have
REQ_42	PISTIS platform's data valuation considers the dataset's usage analytics.	Should Have
REQ_43	PISTIS platform supports deanonymisation risk analysis.	Should Have
REQ_44	PISTIS platform supports GDPR compliance checker for the datasets.	Should Have
REQ_45	PISTIS platform's data valuation supports functional utility checks on a data asset based on user-defined metrics.	Should Have

REQ_46	PISTIS platform provides an interpretable data valuation report.	Should Have
REQ_47	PISTIS provides detailed market insights related to data assets.	Should Have
REQ_51	PISTIS search mechanism supports query criteria validation.	Should Have
REQ_52	PISTIS search mechanism supports quey splitting for metadata and data.	Should Have
REQ_54	PISTIS search mechanism searches datasets on their data.	Should Have
REQ_55	PISTIS search mechanism supports metadata and data search results merging.	Should Have
REQ_56	PISTIS search mechanism supports search results re-ranking	Should Have
REQ_67	PISTIS supports Resource Monitoring System	Should Have
REQ_68	PISTIS supports organisation management via IAM	Should Have
REQ_69	PISTIS supports users' management via IAM.	Should Have
REQ_70	PISTIS supports cybersecurity Monitoring.	Should Have
REQ_72	PISTIS supports CRUD Operations on data/medata/AI models repositories.	Should Have
REQ_73	PISTIS provides an interface to organisation's administrators to Register Data Factory location to PISTIS ecosystem.	Should Have
REQ_74	PISTIS notifies platform administration for the request of new PISTIS Data Factory connection entries	Should Have
REQ_75	PISTIS allows platform administration to evaluate and activate a new PISTIS Data Factory connection request.	Should Have
REQ_76	PISTIS notifies organisation administrator when a new PISTIS Data Factory connection was activated.	Should Have

6 CONCLUSION

This deliverable presented the methodology and all the activities realised towards the definition of the PISTIS MVP. Drawing on business requirements, technology advancements, and the initial concept of PISTIS as outlined in D1.1, the focus of the work was directed towards defining the essential technical prerequisites necessary to support the functional framework of PISTIS.

To overcome this challenge a methodology was employed based on the definition of the user stories that describe the needs and the benefits of the end-users of PISTIS platform. Indeed, our approach involved a fusion of the conventional narrative-oriented user story definition with a formal representation of the user story as a business process. The mixed approach for defining who and how will interact with the PISTIS platform build the foundation of the common understanding between end-users and developers. After examining the business requirements and data lifecycle of PISTIS, a list of fourteen (14) user stories were identified, described, and subsequently categorized into two distinct groups based on the operations they offer to users: business operations and system support operations. The analysis of the user stories led to the identification of seventy-six (76) technical requirements primarily aligned with the functional needs of the end-users, focusing on the specific value and benefits imparted by PISTIS. It should be noted that these technical requirements do not encompass basic information systems technical aspects, such as accessibility and standard security measures. The outcome, the PISTIS MVP, was defined after the prioritisation analysis of the technical requirements. Using the MoSCow method, a total of sixty-nine (69) technical requirements were selected to characterise the PISTIS MVP. Divided in two categories, requirements that must be addressed and those that should be addressed, the MVP's technical requirements serve as the guiding principles for designing and implementing the PISTIS framework and its components across work packages WP1, WP2, and WP3.