



Persistent Personal Data Vaults Empowering a Secure and Privacy
Preserving Data Storage, Analysis, Sharing and Monetisation Platform

D6.1

Project and Pilots Evaluation and Impact Measurement Plan

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Abstract	This document sets out the framework and the guidance required to evaluate the DataVaults project. The Evaluation Plan itself is included as an Appendix and it will be updated throughout the evaluation process as a living document.
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Executive Summary

This document, alongside its “sister document” - D6.2, forms the guidelines for how the project will move forward into the demonstration and evaluation phases of the project.

This document scrutinises all the available tools for carrying out a successful evaluation and draws together a set of techniques which DataVaults will now utilise. This collection of tools and techniques forms the Evaluation Framework.

A laborious process of scrutinising the Description of Action and the early deliverables was undertaken in order to identify all the possible questions which could be raised concerning the project, its running and its outcomes. This provided a solid base from which to establish the mechanisms which will be required, in order to be able to start to answer the most significant and illuminating of these identified questions.

Similarly, considerable energy was spent on “making sense” of why we were undertaking the project and what it was that we were seeking to achieve. What was the theory covering what we were trying to change? Understanding this provided us with an underpinning knowledge and logic of how we would be having an impact on the European Data Economy in addition to the more precise ambitions of the project. And from this, a steer towards which of the available tools and techniques of value for the evaluation process should be adopted for approaching how we would answer those questions dealing with the higher level goals for the project.

We considered issues such as how we would carry out measurements and what would be the metrics to adopt? What would be the evaluation criteria for different aspects of the project? And how we should engage with stakeholders? Collectively, all this work allowed us to produce a plan for coordinating the evaluation process.

The Evaluation Plan itself, is produced as Appendix A, as it will become a living document as the project progresses and it is based upon this Framework. It will be strengthened and details added to it, and it will be further influenced by the experience of using the plan and the framework in order to evaluate the alpha and beta versions of the platform.

The document also reports on some of the work demonstrating ethical compliance.

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Terms and Abbreviations

API	Application Programming Interface
BDVA	Big Data Value Association
D	Deliverable
BDVA	Big Data Value Association
DAA	Direct Anonymous Attestation
DoA	Description of Action
DTU	Danish Technical University
EFFRA	European Factories of the Future Research Association
EU	European Union
GDPR	General Data Protection Regulations
IEEE	Institute of Electrical and Electronic Engineers
IFIP	International Federation for Information Processing
IoT	Internet of Things
KPI	Key Performance Indicator
MVP	Most Valuable Product
REST API	Representational State Transfer
TOC	Theory of Change
TPM	Trusted Platform Module
WP	Work Package

1 INTRODUCTION

1.1 DOCUMENT STRUCTURE

Out of necessity, this is a lengthy document, as it is a cornerstone of the project. But given the constraints imposed by corona virus and hindrance to communication activity, there is more background presented to clarify the process, given the absence of face to face meetings.

The evolution of the project will be determined by the plans set out in this document and its sister document, D6.2, delivered at the same time. T

This document is organised as follows:

- Chapter 1 introduces the scope and objectives of the document
- Chapter 2 provides the DataVaults Evaluation Methodology
- Chapter 3 covers the evaluative thinking underpinning DataVaults and provides the DataVaults Theory of Change and Logic Model, which tells the “story” of DataVaults which is to be evaluated.
- Chapter 4 covers the Evaluation Criteria and Measurement framework for the questions, which are to be answered.
- Chapter 5 is the creation of the DataVaults Evaluation Plan which will subsequently referred back to for the duration of the project.
- Chapter 6 Stakeholders Engagement Strategy for interacting with citizens and economic stakeholders.
- Chapter 7 is the consideration of the metrics to be used in the evaluation process.
- Chapter 8 covers the methods for Data Collection and for its subsequent Analysis
- Chapter 9 provides the Conclusions.
- Appendix A. is the DataVaults Evaluation Plan
- Appendix B. is the Ethics Committee Report
- Appendix C. is Scoping the Evaluation Questions

1.2 OVERVIEW OF EARLY WORK PLANNED IN WP6

This is the first deliverable in a work package which is pivotal to the project. The work package covers how we will demonstrate and evaluate the results of the project.

“D6.1 Project and Pilots Evaluation and Impact Measurement Plan” is one of the two intrinsically linked and early deliverables of “WP6: Multi-Layer Demonstrators Setup, Operation and Business Value Exploration”. It sets out to describe how we will evaluate both the pilots and the project as a whole. It provides the “Documentation of the evaluation framework and validation methodology, defining the various practices for recording feedback from the demonstration activities and including a set of test-cases to be executed by the demonstrator partners.”

In tandem, work has been carried out on planning the piloting at the five demonstration sites, to be carried out by Olympiacos Sporting Club, the Municipality of Piraeus, the Andaman7 healthcare application, MiWenergia energy services provider and the Municipality of Prato.

“D6.2 Pilot Scenarios and Implementation Plan”, delivered at the same time, documents *“the set of scenarios that will run during each demonstrator, including the evaluation indicators and the overall time plan; as well as a fully detailed documentation manual for the operation of the demonstrators.”* Thus, the two deliverables influenced each other in both the planning of the demonstrations and in scoping their evaluation process.

Together:

- They elaborate the Verification and Validation Framework for the project.
- Provide a general guideline to monitor and align the demonstrators’ phases within the evaluation framework.
- Guide the planning and coordination of the Demonstrators’ Set-up.
- Prepare for and set-up the Demonstrators’ Implementation.
- Prepare for evaluating the demonstrators and estimating their impact.
- Prepare for the Technical Verification and Validation.
- Prepare for the Business Validation.
- Prepare to document the Impact Assessment and Lessons Learned

Delivery of D6.1 marks a shift from the planning phase to the demonstration phase, when real results will start to appear. Thus, there will be no results available to report in D6.1. The work marks the commencement of Phase III: Verifying, Validating and Demonstrating DataVaults. For the successful deployment of the DataVaults’ infrastructure, an all-inclusive framework for verifying, validating and evaluating the outcomes of the previous phases (from their conception to final release and experimentation in pilot settings) will be elaborated. During the validation and demonstration activities, all the different features will be tested and the corresponding KPIs will be measured to verify the achievement of the objectives, both in terms of functional completeness, as well as in terms of users’ satisfaction and experience.

Task 6.1 will work towards providing an inclusive **demonstrators’ evaluation framework** as well as a **general guideline document** to be used to **monitor and align the demonstration phases**.

The evaluation framework will be studied extensively and defined in complete detail, as it will lead to valuable observations and conclusions about the **viability and the sustainability** of the DataVaults platform. All partners participating in WP6 will collaborate in the **review of test cases** that will take place during the execution of the demonstrators. These test cases will be designed based on the business cases, use cases and requirements identified in the previous WPs of the project.

1.3 OVERVIEW OF THE DATAVAULTS EVALUATION PROCESS

1.3.1 The “Evaluative Thinking” process

An evaluation that reflects evaluative thinking is the systematic process of telling the DataVaults “story” by:

- Identifying assumptions about why we think the project will work and be a success
- Determining what change we expect to see during and after we implement what we have set out to do in the Description of Action (DoA).
- Collecting and analysing data to help us understand what happened during the project.
- Communicating, interpreting and reflecting on the results.
- Using these results and lessons learned to help make informed decisions to be able to plan for a successful exploitation after the project finishes.

Part of the storytelling will include the creation of a “Theory of Change” and a “Logic Model”.

A general perception is that evaluation should be designed into a project from the beginning and the DoA provides evidence of this early awareness of this task in hand; it is never too soon to start planning an evaluation. Evaluation should be viewed as a collaborative process that involves all of the stakeholders in various roles, whilst it helps tell the story of the DataVaults project through a continuous cycle of asking, planning, and acting, reflecting and improving. We should strive to make sure that findings are practical and useful for end users and inform decision-making and capacity building for further exploitation and sustainability. Indeed, evaluation can be regarded as a means of communication within the project.

In short, *“Evaluation is an objective process of understanding how a project or other intervention was implemented, what effects it had, for whom, how and why”* [1]

We will return to evaluative thinking in more detail in section 2.3.2.

1.3.2 What is an evaluation framework?

The Data Vaults evaluation framework can be described as having six interdependent and iterative steps:

1. Engagement of the stakeholders- those persons involved in or affected by the project and primary users of the evaluation.
2. Drawing from the project plan in the DoA, a description of its needs, expected effects, activities, resources, stages, context, logic model, etc.
3. Focussing the evaluation design on relation to purpose, users, uses, questions, methods, agreements.
4. Gathering credible evidence Indicators, sources, quality, quantity, etc.
5. Justifying conclusions - analysis/synthesis, interpretation, judgment, recommendations.
6. Ensure further use and share lessons learned.

It covers design, preparation, feedback, follow-up, dissemination and culminating in a roadmap for further deployment.

In evaluation, there is no “one-size fits all” approach and DataVaults will use a wide range of methods to cover its own requirements. The agile approach to software development, the depth of requirements analysis, the complexity of the situations to be assessed, the wide variety of stakeholders with different ambitions needing to be satisfied within complex eco-systems all contribute the need for flexibility in the methods adopted.

1.3.3 Impact Assessment

Impact Assessment refers to the process of identifying and measuring future consequences of a current or proposed project and its relevance here will be in addressing the differences which may be brought about by the project to the demonstrators, which may not have occurred without the project.

1.4 RELATIONSHIP TO REST OF WP6

Tasks 6.3 to 6.7 will see the deployment of the demonstrators.

Within Task 6.8, the evaluation framework from D6.1 will be utilised once the demonstrators are in operation. Extensive data collection, regarding the experiences of the demonstrator partners with the DataVaults platform, will be conducted. The data collection will meet the guidelines of the predefined evaluation framework in order to ensure the high quality of the feedback gained and the consistence of the evaluation activities. Based on the data collected, an overall assessment and evaluation of DataVaults will be carried out. The evaluation activities will be focused both on the correct application of the DataVaults platform and on its impact on the edge as well as the cloud-based services developed using the platform.

Within “*Task 6.9 -Scale-up Activities, Best Cases, and Replication Roadmap*” the focus will be upon the lessons learnt from the project with regard to the implementation, operation and execution of the demonstrators. The lessons generated will be formulated as methodological adoption guidelines for the further exploitation and utilisation of the DataVaults platform. Moreover, the appropriate guidelines and documentation will be authored to support the partners responsible for the demonstrations in their implementation of solutions with the help of the DataVaults platform, an activity especially important for when it is necessary to deal with “external to the project” stakeholders. This will lead to activities for further population of the platform with data and for bringing on board other entities.

Later deliverables in this work package will essentially report on all the work prescribed in these two early deliverables (namely D6.1 and D6.2), which will be realised in Tasks 6.3 to 6.7 covering the deployment and operation of the demonstrators across the five locations.

These iterations are:

- *D6.3 Pilots Evaluation of Alpha Platform Version [M24].* Documentation of the demonstrators’ operation and execution consolidating the input of Tasks 6.3-6.7 in the early stages of deployment.
- *D6.4 Demonstrators’ Evaluation of Beta Platform Version [M30].* Similar to the above, but this time focusing on the beta version of the platform

- *D6.5 Final Evaluation and Impact Assessment Report [M36]*. This report will evaluate the final version of the platform.
- *D6.6 DataVaults Scale-up Roadmap and Key Takeaways [M36]*. Documentation and lessons learnt from the DataVaults project, constituting methodological adoption guidelines for the utilisation of the platform.

1.5 RELATION OF THIS DELIVERABLE TO REST OF PROJECT

During the first phases of the project, the needs and requirements of the stakeholders and the personal data market, were elicited. The product development phase involves a series of steps to develop/extend/customise technologies utilising the agile development philosophy to constantly update the platform based on feedback received from the actual users. The objective of that phase was to develop a truly innovative product that meets the requirements of the users in a cost-effective and time-efficient manner. Developments were interleaved with releases of mock-ups and Maximum Value Product (MVP) prototypes to create a shared understanding on the functionalities of system modules.

For the successful deployment of the DataVaults infrastructure, an all-inclusive framework for verifying, validating and evaluating the outcomes of the previous phases (from their conception to final release and experimentation in pilot settings) has now been elaborated. The Personal DataVaults, the Cloud-based DataVaults platform and all the relevant service bundles need to be checked to ascertain that they have been built in the right way, without bugs, malfunctions and security issues (technical verification), and to be appropriate for the needs of the targeted stakeholders (business validation).

To this end, an iterative approach, engaging the project's demonstrators in the assessment and feedback loop from the very early development stages, has been adopted. These demonstrators will continue to be constantly engaged in the design phases of the project and will be provided with all prototype and intermediate versions of the platform's Apps, backbone, services, APIs etc. so they would be in a position to provide feedback to the developers in order to update, parameterise and improve the product accordingly.

The final designs and details of the DataVaults business model and plan, will be shaped by the lessons learnt and impact assessment deriving directly from the experience of the project's demonstrators and it will be utilised to increase the reception and market acceptance. The successful implementation of WP6 in terms of effectively testing the DataVaults solution and providing the necessary feedback to evaluate the platform relies on the execution of the demonstrators in a coordinated and unified manner. The project's results (both scientific as well as technical ones) will be validated by external stakeholders, providing further insights on the market readiness of the solution and its exploitable assets.

Figure 1 below, illustrates how this deliverable, alongside D6.2, is at the heart of the project.

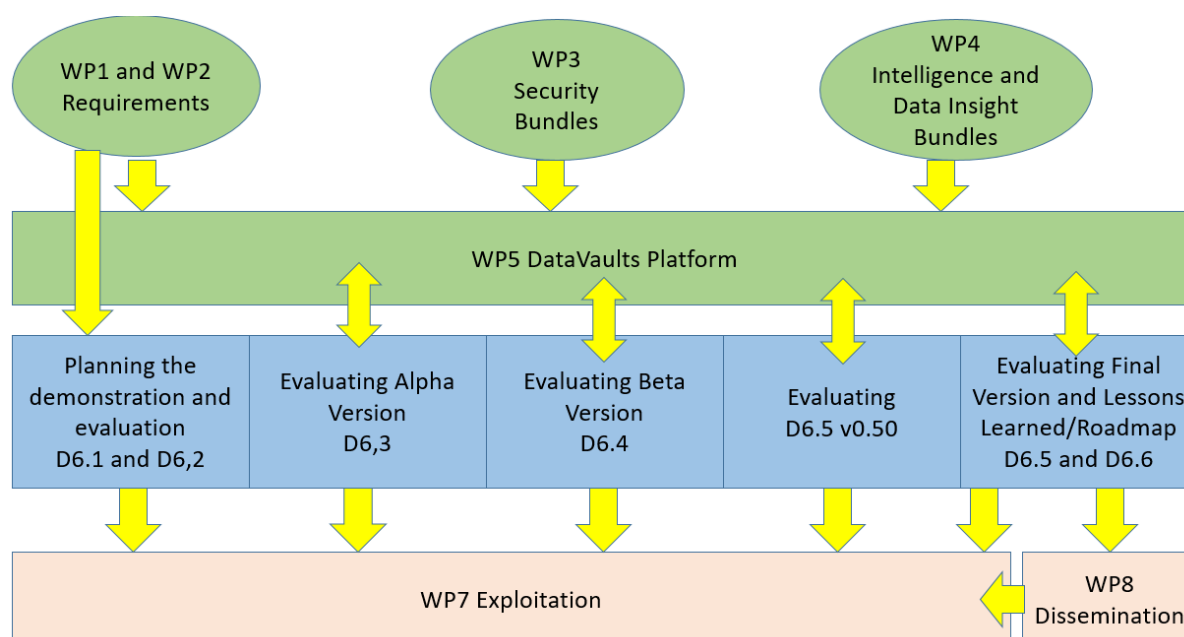


Figure 1 Relationship of D6.1 to DataVaults Project

The Table 1 below, indicates some of the foundations for Task 6.1.

WP/Task	Link to this deliverable
D1.4 has determined the user-requirements of the full range of stakeholders in the project.	This document establishes the mechanism for ensuring that all these requirements are met, and that the outcome of the project is as planned from the outset.
Task 1.3 Evolution of the MVP. DataVaults has adopted the approach of Most Valuable Product development that in its core is oriented at validating the envisioned solution, instead of identifying problems. In essence, the DataVaults MVP represents the overall mind-set and process adopted for product development to consider user expectations, deliver actual value and validate the methodological ideas and hypothesis.	The process towards developing the DataVaults MVP depends heavily on having a clear definition of the scope and purpose of the project, by fleshing out the actual value of the proposed solution for the end users. This will contribute to forming the “story” of DataVaults and in raising further questions to be answered.
Such a market need elicitation will derive the user stories in the DataVaults product backlog and the MVP of the project’s platform and pilot cases; that, in turn, constitute	“A requirement is a statement of a customer need or objective, or of a condition or capability that a product must possess to satisfy such a need or

representative (candidate) customers of the end-product. The objective of this phase is to develop a truly innovative product that meets the requirements of the users in a cost-effective and time-efficient manner, which we will be verifying.	objective. A property that a product must have to provide value to a stakeholder”. [2] This deliverable will provide a mechanism to help provide the answers to whether the requirements have been satisfied at the end of the project.
WP2. Security Aspects, Privacy Considerations, Value Generation.	Generated questions to be answered in the evaluation.
Task 5.1 is devoted to systematically aggregate and analyse the user requirements of all stakeholders involved in the DataVaults value chain, so as to conclude on the requirements that should be met by the DataVaults platform.	Provides the framework for the technical validation.
The assessment of the value of the DataVaults functionalities that have been derived from the DataVaults Methodology and the respective scenarios as a set of homogenised features.	The expected business value of these features is assessed by the demonstrators through a voting procedure. The technical partners on the other hand will also vote on the value and complexity of the features from the view of implementation, thus highlighting any technical prerequisites and constraints. (D1.3)
WP7 exploitation strategy	This helps to shape the discussions of what constitutes success in realising the business values and developing an exploitable product.

Table 1 Foundations for D6.1

2 EVALUATION METHODOLOGY

2.1 INTRODUCTION

The introduction began to set out the ethos underpinning the DataVaults methodology, which we will now provide in more detail in this section. That ethos, founded on the decision to utilise an agile software development path, embraced an iterative approach which is strongly dependent upon good interaction and communication between all the project team, the demonstration sites and the third parties which we are involved with.

Just as the requirements evolved in WP1 and continue to evolve through a collaborative and iterative interaction between self-organising and cross-functional teams, a similar approach to the evaluation of the project will be taken, having the demonstration sites as partners and the extended reach of the Third-Party stakeholders as customers and potential collaborators

The approach advocates adaptive planning, evolutionary development, early delivery, and continual improvement and it encourages rapid and flexible response to change.

2.2 EVALUATION DEFINED

The literature on this topic is wide and varied as mentioned above, but a definition used by the EU is that evaluation is the:

“Systematic and objective assessment of on-going or completed interventions (actions/policies), their design, implementation and results according to the following criteria: relevance, effectiveness, efficiency, sustainability, impact, coherence and EU added-value. It assesses how well a specific measure has worked (or is working) and whether it is still justified or should be changed.” [3]

The European Evaluation Society cites the OECD definition of Evaluation as *“The systematic and objective assessment of an on-going or completed project, programme or policy, its design, implementation and results. The aim is to determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability. An evaluation should provide information that is credible and useful, enabling the incorporation of lessons learned into the decision-making process of stakeholders. Evaluation also refers to the process of determining the worth or significance of an activity, policy or program. An assessment, as systematic and objective as possible, of an initiative”*. [4]

A definition used by the Magenta Book issued by the UK Government describes it as: *“Evaluation is an objective process of understanding how a policy or other intervention was implemented, what effects it had, for whom, how and why.” [1]*

2.2.1 The purpose for Evaluation

A common acronym is ROAMEF which stands for:

- Rationale – setting out the rationale for action in any particular area.
- Objectives – defining the objectives a policy or project aims to achieve.
- Appraisal – assessing the best ways of delivering it and estimating the costs and benefits.

- Monitoring – continuously checking progress in delivering the stated objectives.
- Evaluation – assessing the effectiveness and impact of the policy to see whether the anticipated benefits have occurred.
- Feedback – ensuring learning from the initiative is fed back into its implementation.

A well-designed evaluation should provide DataVaults with all the information we need and is able to match the scope and acknowledged complexity of the project.

In the work carried out in Work Package 6, we can broadly break it down into three rough phases in an evaluation, although later chapters of this deliverable will break this down to numerous discrete elements.

These are:

- Evaluation assessment or framework (the planning phase);
- Evaluation study; and
- Decision-making based on findings and recommendations.

2.2.2 Different approaches to carrying out an evaluation

There are a variety of accepted types of evaluation. In the DataVaults case we will be combining aspects of value from several, wherever they may shed light on the project.

2.2.2.1 *Process evaluations*

These look at how a project was delivered. They typically include a mixture of quantitative and qualitative methods used to understand:

- The programme's financing and resourcing.
- Perceptions of quality and effectiveness.
- And facts and figures on the carrying out of the project.

2.2.2.2 *Impact evaluations*

Impact evaluations look at the difference a project has made:

- What were the observed outcomes, such as technological development, or business opportunity?
- How much of any observed change in outcomes can be attributed to the project?
- How did changes affect the different stakeholders?
- Were there any unintended outcomes?
- Did the project achieve its objectives?

2.2.2.3 *Economic evaluations*

Economic evaluations, which are less suited to DataVaults needs, look at whether the benefits of a project justifies its costs. They come in two forms:

- A cost-effectiveness analysis estimates the total cost per unit of outcome achieved.
- A cost-benefit analysis places a monetary value on the outcomes.

2.2.2.4 *Outcome evaluation*

An outcome or summative evaluation is concerned with:

- Investigating whether the project achieved the desired outcomes and what made it effective or ineffective.
- Making mid-course adjustments to the planned effort.
- Assessing if the effort is sustainable and replicable.

2.2.2.5 Resources

What is missing from a standard approach to evaluation is the determination of what resources will be required to conduct a particular evaluation and the coverage of the allocation of resources. What it will cost. This is because this is clearly established in the DoA- both the amount of time available and the allocation between partners. In fact, WP9 will monitor this aspect closely. But a judgement had to be taken into how the specific elements of the project should be evaluated and which were the most suitable approaches. This was fine for the tangible results- the software development, the successful operation of the demonstrators etc.

But for the high level goals this is more complex and difficult to progress. The issue lies around how a project can evaluate how a contribution was made to a particular wider goal such as growing the data economy or encouraging greater use of personal data, given the wider environment DataVaults is working within.

Resources could have been spent on trying to assess this in more scientific ways, attempting to separate the contribution made by DataVaults to the process. But it was determined to be of more value to ignore this “*ante*” position of setting base lines etc. and to concentrate on demonstrating effect on other wider initiatives working to the same purpose.

In conclusion, DataVaults will essentially adopt a combination from all of the above, picking and choosing which provides more benefit and value to the project’s overall evaluation and impact assessment.

2.2.3 Impact Assessment

The title of this deliverable includes “impact assessment” and so it is worthwhile to set out how its meaning is interpreted in DataVaults. We can divide the results from DataVaults into those higher level goals, such as the contribution to EU Policy or to standards or to supporting the BDVA and the more specific goals linked to the running of the demonstration sites and satisfaction of individual location based goals. It is for this aspect of the evaluation of DataVaults at the local level that impact assessment is valuable.

Impact Assessment refers to the process of identifying and measuring the future consequences of the project. **Impact** can be seen as the difference which is brought about by the **project**, which may not be there without the **project**.

Its initial use was in ascertaining impact on the environment of activities being undertaken, but now it has a much wider meaning and it is this which we will adopt. Impact assessment in the DataVaults setting seeks to answer the simpler question of “Did our project have the desired impact?”

2.2.4 Phases in the process

1. DataVaults evaluation assessment phase identifies the main issues and questions to be addressed in the study and develops appropriate methods for gathering evidence on these.
2. Once specific terms of reference are developed, the evaluation study can begin. Data are collected and analysed to produce findings about the evaluation issues.
3. Measuring performance is an essential link in this cycle as there is a need to produce timely, relevant credible and objective findings and conclusions on DataVaults performance, based upon valid and reliable data collection and analysis.
4. These findings and subsequent recommendations form the basis on which decisions are made about the future of the project.
5. Ideally evaluations should present these findings and conclusions in a clear and balanced manner that indicates the reliability of the findings. [5]

2.3 DATAVAULTS EVALUATION: TOOLS AND TECHNIQUES

DataVaults is a complex project with many partners and external stakeholders. The evaluation process will adopt a string of techniques and tools to extract the information we require to make sensible judgements both during the iterations of the project platform and at the end of the project. These techniques and tools will be returned to in detailed sections later in this document. Below is essentially a list of the set or system of methods and procedures we will be utilising in order to derive the questions which we wish to answer.

Needless to say, the DoA establishes many of the building blocks and the basic conditions we will start from.

2.3.1 Overview of approach

Later chapters of this document cover the different aspects of our evaluation, referred to below, in greater detail. For the sake of completing the description of the methodology which we employed, we will mention these aspects which we have adopted, whilst still awaiting their detailed description, in order to set out the steps we have adopted, which cover the following stages:

- We have defined a high-level logic model for the project, based on setting out the objectives and intended outcomes. This manifested itself in the DataVaults “Theory of Change”, with “evaluative thinking” permeating the project at all levels and stages.
- We have correlated the requirements we processed with the DoA and remain open to amend the project to embrace any elements we discover to need adjusting. For example, whether the piloting covers all the identified Third Party requirements.
- We have defined the “audience” of stakeholders.
- We have identified the objectives of the evaluation and the research questions to be answered and defined the scope of the evaluation.
- We have identified the appropriate evaluation approaches.
- We have defined the monitoring framework and considered what data is required to answer the evaluation’s research questions, whilst identifying data sources.

- We have defined the governance around the evaluation in tandem with the design of pilot operation.

2.3.2 Evaluative Thinking

Essentially evaluative thinking is the process reflecting how we approach the evaluation. In the DataVaults case, at the preparation stage for conducting an evaluation, we were able to rely heavily upon the DoA, as well as from the experiences gained through the first year of the project. A well-rounded impression was formed of what we were trying to achieve, and a “voice” adopted for describing and communicating this.

We carried out extensive desk research regarding options available to the project team in tandem with the DoA as the foundation, in order to establish the DataVaults “Theory of Change” (TOC). This is covered at length in section 3.2 but a definition is that a **Theory of Change** explains the links between activities and outcomes and how and why the desired change is expected to come about, usually based on past research or experiences and in this instance, the thinking behind the evolution of the DataVaults project, brought together in the DoA.

The project’s TOC at this design stage was prepared, but with a view to making amendments if required as the evaluation itself progresses. This process of checking that the initial Theory of Change still holds true will continue throughout the project, with potential amendments to be made prior to the final evaluation process, based on feedback received.

Figure 2 illustrates the phasing of a typical evaluation process that reflects evaluative thinking.

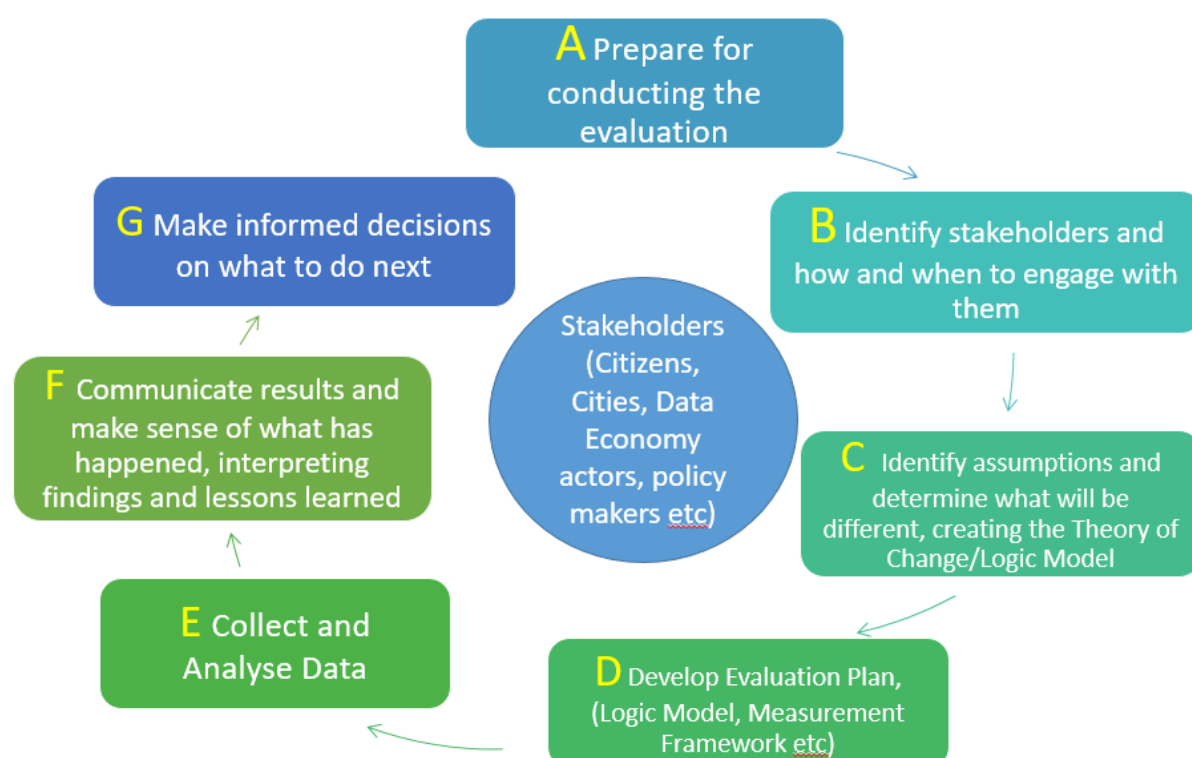


Figure 2 Phases of evaluation process that reflects evaluative thinking.

2.3.3 Summarising the Assumptions made

Several assumptions, some referred to earlier, were made from the outset in starting to draw up:

- i) The DataVaults Project and Pilots Evaluation and Impact Measurement Plan.
- ii) The evaluation framework and validation methodology.
- iii) In defining the various practices for recording feedback from the demonstration activities.
- iv) In the design of a set of test-cases to be executed by the demonstrator partners.

These assumptions included:

- That the principles of evaluation adopted would go hand in glove with the software approach- a community approach which is iterative. This iteration had been set out formally in the stages of evaluation described in the DoA, covering the alpha and beta stages, as well as the final results.
- That the evaluation process should form a solid basis for dialogue and for it to be used as a communication tool, providing a framework for interactions between stakeholders, all based on a shared understanding and vision.
- That there will be flexibility of approach, not being reliant on any single one of the numerous models portrayed in the literature, as there is no “one size fits all” approach or a “correct” way to do it.
- That the evaluation process should also be flexible and adaptable as projects don’t exist in a vacuum and events can affect their implementation and outcomes. Therefore, evaluators and implementers must be flexible and work together to adapt to such events and respond to the needs of stakeholders.
- Taking different perspectives and utilising “mixed methods”, which intentionally use two or more kinds of data gathering and analysis tools — typically a combination of qualitative (e.g., focus groups and interviews) and quantitative (e.g., multiple choice surveys and assessments) — in the same evaluation, helps to capture the reality and outcomes experienced by stakeholders.
- Acknowledging the necessity to have made an early start, as planning for evaluation should begin the moment any project was conceptualised.
- Demonstrators will need to go beyond their immediate goals and identified requirements and heed the wider project goals.
- Evaluation should be designed to address real issues and to provide project team members and stakeholders with reliable information to address problems and to build on strengths and opportunities. Evaluation should invite multiple perspectives and involve a representation of people who care about and benefit from the project.
- We are not trying to compare or rank the demonstrators, but to extract as much information as possible from each of them to best answer some of the higher level questions we are interested in.

2.4 MONITORING AND EVALUATION FRAMEWORK

Typically, a monitoring and evaluation framework looks at:

- **Inputs:** Which are the resources required to achieve the project objectives, which in the case of DataVaults, are pre-determined within the DoA.

- **Activities:** Again, these are clearly set out in the DoA.
- **Outputs:** This is the direct result of the activity, observable by the end of the activity. Generally technological progress, or increased knowledge would be looked at.
- **Outcomes:** These are the changes or benefits that result to the project stakeholders.
- **Impacts:** These are the final, wider changes that result from the project to the overall programme set out in the Call and contributions to higher level goals for the EU.

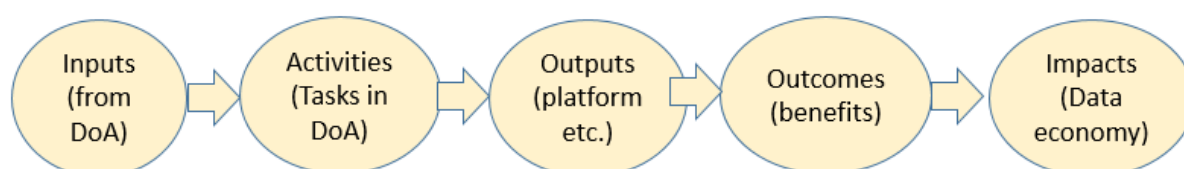


Figure 3 Typical Monitoring and Evaluation Framework

2.5 IDENTIFICATION OF STAKEHOLDERS AND THEIR ENGAGEMENT STRATEGY

For the DataVaults evaluation process to be a collaborative, useful learning process, all stakeholders had to be identified and engaged accordingly to provide multiple perspectives about the main issues that could affect the evaluation, and about what they want to know from the evaluation. This categorisation was equally valid and required for all aspects of the project, cutting across WPs. Embracing all views reduced the potential for missing important questions and issues of stakeholders, who were not included in the design and planning process.

Steps taken included the following:

- Identification of stakeholder roles in evaluation planning, implementation, interpretation of results and decision-making about next steps.
- Reviewing the list of stakeholders which the project as a whole produced, to ensure all appropriate stakeholders were included. [6]
- Creating a plan for stakeholder involvement.
- Identification of areas for stakeholder input.
- Bringing the stakeholders together as needed and creating the opportunities and structures for this to occur.
- Targeting key stakeholders for regular structured participation in the process.
- Involving stakeholders in the creation of the evaluation questions

Points for consideration included the following:

- Who needed to be involved in the development of the DataVaults Logic Model and Theory of Change?
- How do we engage with people getting them to become and then remain involved?
- What information is required or already held to make a start?
- How will we capture and share learning as the project progresses?
- How do we articulate and test the underlying assumptions of the project?
- How will we communicate with and capture feedback from the demonstration site communities?

- What are the specific requirements of the EU as a stakeholder?

2.5.1 Governance of the evaluation

In any evaluation framework, it is necessary to establish the governance structure. This is set out in “Section 5.3 DataVaults Evaluation Team.” The governance of the evaluation process was created around several building blocks. The corresponding task of planning and operating the demonstration sites was paramount and had to match the planning of the evaluation. The governance structure was built around this inter-relationship, alongside the structuring of the interaction with the identified stakeholders.

2.6 PROCESS OF CREATING THE THEORY OF CHANGE AND LOGIC MODEL

This underlying intent of this stage of the methodology, in creating the DataVaults Theory of Change and Logic Model, was to identify the assumptions and to set about determining what will be different at the end of the project. The concepts of the DataVaults Logic Models and Theory of Change are covered in detail in Chapter 3 but are touched on below in terms of their place in the methodology.

2.6.1 Logic model and Theory of Change

A logic model is a graphic that sets out a programme’s expected path. It is a graphic representation of the theory of change that illustrates the linkages among resources, activities, outputs, stakeholders and short, intermediate and long-term outcomes for the project. It shows the relationships between each step and a framework for understanding how best to monitor and evaluate a programme. A logic model is a living document for the duration of the project, with a particular emphasis on the actual process of logic modelling, contributing to the shared understanding required for DataVaults. Section 3.6 deals with a more refined version which is that of Benefits Logic.

Figure 4 in section 3.3 depicts a typical simple logic model, demonstrating what data needs to be captured through monitoring and evaluation and instead of just focusing on the final results and objectives it shows the expected shorter-term outputs and outcomes.

2.7 EVALUATION QUESTIONS

The logic model also helps to generate the evaluation questions by enabling different aspects to be covered at different stages of the project. The logic model acts like a hypothesis: It allows the project team to see which stage of development we are in, with regard to the iterations within the project and therefore what types of questions to ask. It also helps craft specific questions.

For instance, without a logic model, you could simply ask the question, “*Did the project achieve the intended outcomes?*” With a logic model, we can see that only certain outcomes should be expected after a certain month of implementation. Thus, the questions can be more precise and easier to answer.

The formulation of the evaluation questions was shaped by asking:

- Who does the DataVaults project benefit?

- What is the effort intended to do?
- When do the activities occur?
- Why the effort is important?
- How the effort will bring about the desired change?

2.8 MEASUREMENT FRAMEWORK

“Measurement is the first step that leads to control and eventually to improvement. If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.” [7]

A measurement framework was generated from the logic model. A measurement framework helped to determine how to assess the progress toward achieving outcomes. The measurement framework includes seven main components: outputs; outcomes; indicators; measures of change; data collection methods; data sources; and data collection frequency.

The mixed approach of utilising a wide range of quantitative and qualitative evaluation methods for measuring the impact of the project was adopted as a single method will rarely be sufficient to capture the full impact of a project, so by bringing together multiple methods provides a more complete picture of impact. The use of qualitative methods alongside quantitative analysis helps demonstrate why observed impacts are happening; they tell the story behind what is happening through the logic model.

2.9 DEVELOPMENT OF THE EVALUATION PLAN

2.9.1 Bringing together the results from the tools adopted

In summary, we utilised the information from the logic model, evaluation questions and the measurement framework, alongside the explanation of how we intend to collect and analyse data within that framework, to create the evaluation plan. This was complemented by feedback from stakeholders and the determination of success criteria, alongside the explanation of how we intend to collect and analyse data within that framework, to complete the development of the evaluation plan.

2.9.2 Stakeholder input into evaluation plan

The following questions were asked of the stakeholders in order to shape the plan:

- What results do you expect from DataVaults?
- What does success look like and how do you know when you have achieved it?
- What factors might help or hinder achieving that success?
- Who or what are the best data sources?

Chapter 6 covers this aspect of the evaluation process

2.9.3 Communication

It was important that we included in the plan, a strategy to use and communicate the findings. This is also covered in Chapter 6. As apparent throughout the project, good communications within the project and with external audiences and stakeholders is vital. The project wide

Dissemination Strategy and Exploitation Strategy are key elements for the necessary communications within the evaluation strategy.

2.10 COLLECTION AND ANALYSIS OF DATA

The evaluation framework of D6.1 will be set in operation once the operation of the demonstrators starts at M19. Extensive data collection, regarding the experience of the demonstrator partners with the DataVaults platform, will be conducted. The data collection will meet the guidelines of the predefined evaluation framework in order to ensure the high quality of the feedback gained and the consistence of the evaluation activities. Chapter 8 covers this aspect of the methodology. Similarly, there is input from WP10 covering the Ethics Requirements available to take into consideration. This input also includes a Risk Register for each of the demonstration sites, in relation to data processing.

In addition to this evaluation process in WP6, WP9 will gather feedback in order to monitor the running of the overall project and its allocation and use of resources.

“Monitoring seeks to check progress against planned targets and can be defined as the formal reporting and evidencing that spend and outputs are successfully delivered and milestones met.” [1]

2.11 ITERATIONS AND THE THEORY OF CHANGE

Section 1.3 above, sets out the iterative nature of the project.

In the earlier stage of the project, the Theory of Change was used primarily as a design tool, but as the project matures, it will morph into a more dynamic tool as part of the evaluation process, responding to this iterative nature of the project.

During the early stages of the evaluation process the TOC at the “project evaluation design” stage was discussed with key actors involved in the implementation and execution of the project. Subsequently, the Theory of Change can be seen as something running in the background. But these discussions will continue as the project evolves. Revisions and updates to the TOC are made to reflect any changes in the project’s intended results or intervention logic and to take into account any changes in external context of the project that may influence the causal pathways and the changing needs and priorities of stakeholders.

For example, in the course of a project’s implementation, some project outputs or components might have been amended, cancelled or added, in order to respond to external changes (or misjudgements at design) regarding, among other things, stakeholder needs and priorities, resource availability, partner capacity and risk factors.

As the iterations take place, the TOC at this stage of evaluation should reflect these changes, to the extent that these have been formally captured and agreed in project revision documents, minutes etc.

For example, the TOC may need to respond to a variety of potential changes in circumstances:

- The causal linkages between results and the other results statements in the TOC can be made explicit and, where necessary, adjusted.
- Intermediate results can be added where necessary.
- Any new drivers and assumptions might be added and their role in the change processes explained.
- New stakeholders or eco-systems of interest to DataVaults may have been identified or existing ones may be affected by changes.

At each iterative stage there is a requirement to discuss the revised TOC with the main stakeholders involved with the execution and implementation of the project to make sure that they have captured accurately the updated intent of the project and they agree with it.

The interim evaluation findings indicate whether the theory of change, is true. Returning to the TOC at this stage allows a check to see if what was expected to happen, actually did. If not, an assessment can be made of where the effort did not unfold as expected and what improvements are needed, and subsequently, what adjustments might be necessary for the measurement framework and evaluation plan.

The next chapter will look at the DataVaults Theory of Change in detail.

2.11.1 Evaluation Reports

The deliverables referred to in section 1.3 above, in relationship to the iterative nature of the demonstration phase, provide the main opportunities to communicate results and discuss and emphasise what has actually happened in the project and provide the basis for interpreting findings and facilitating learning. The data collected will contribute to an overall assessment of DataVaults.

The benchmarking and impact assessment which will be provided based on the requirements and elaboration of the strengths and weaknesses of the services will need to be shared widely and rely on a good communication strategy. The methodology and communication strategy will need to be refined as the project progresses and results become available.

This reporting is to enable us to make informed decisions in regard to the improvement of our actions and in shaping the next steps, both at each iterative stage and for the eventual sustainability for DataVaults. The reporting will be crucial for defining the next steps in the project.

2.11.2 Lessons Learned

The methodology also needed to take into account how we approach gathering the “lessons learned” in the next stages of the project. The reporting process will be crucial for the interpretation of findings and for deriving the lessons learned.

We will finalise this aspect of the methodology as the project progresses. But due consideration will be given to how we ensure that they are gathered and valued.

2.11.3 The overall Importance of Evaluative Thinking in the Methodology

As set out in the methodology, it is necessary to make an early start on the evaluation process. And this meant that planning for evaluation should begin the moment new strategies, initiatives and projects are conceptualized. Whilst Work Package 6 only started at M12, the norm for evaluative thinking to begin as soon as the project starts / when it is being devised and written, was the case with DataVaults. Whilst Work Package 6 spans the demonstration activities and monitors them, the ongoing work in Work Package 1 can be seen as a direct contributor to the evaluation process, determining the requirements, which in turn will be the focus for evaluation. It is a continuous flow of work which all contributes towards designing and preparing the activities which will prove whether what was envisaged at the project design stage in the DoA works, what was set out to be accomplished in it was right and that the next stages are designed to show we did it correctly and successfully.

Evaluative thinking is how it is intended to approach the evaluation and how to adopt the most suitable approach and methods. The purpose of evaluation is to facilitate learning and improve the project or initiative. This learning happens through a process of collecting and summarising evidence that leads to conclusions about the value, merit, significance or quality of an effort. Underlying evaluation is a way of thinking about what results are expected, how results can be achieved and what data or evidence are needed to inform future actions so that results can be improved. It helps tell the story of the project through a continuous cycle of asking, planning, and acting, reflecting and improving.

At its core are dialogue, reflection, learning and iteration to improvement. It is necessary to consider evaluation not just as an inquiry that leads to a judgment (was the project carried out as expected) but also as evaluative thinking, which will make the process more comfortable for all stakeholders participating.

Evaluative thinking is about understanding- using a systematic process of collecting and analysing data instead of a set of disorganised, random opinions- and telling the story about the project. It is based on the belief that a systematic process is valuable and necessary. This is clearly apparent in such a complex project as DataVaults. This involves identifying assumptions about what we think works and what doesn't work and why. Posing thoughtful questions about what we expect to see differently during and after the implementation of the planned effort, pursuing deeper understanding through reflection and dialogue, communicating what was learned without underestimation or exaggeration, and making informed decisions in preparation for action and gathering the lessons we will have learned.

The evolution of the user-stories and requirements of stakeholders created and gathered in WP1 is indicative of this approach. They formed a solid basis for discussion and evaluative thinking as they matured into technical decisions. WP1 set out to deliver the overall DataVaults Methodology, defining high level usage scenarios making the overall concept more visible and understandable to all and becoming the driver for the technical discussions to follow.

Thus, from above, it follows that an evaluation process that reflects evaluative thinking is the systematic process of providing a narrative of the project, enriching the DoA, by:

- Identifying the assumptions about how we think the project will unfold and develop.
- Looking towards what changes we might expect to see, both during the DataVaults implementation and after.
- Shaping what data to collect and providing a focus for the analysis of the data to understand what happened.
- Shaping the communication and interpretation of, and the reflection on the results.
- Making informed decisions to improve and learn from to influence the sustainability of the project and whatever may come next.

As emphasised in the previous sections, the evaluative thinking should directly lead to having an evaluation process emphasising utility, where our findings will be practical and useful for all end-users and subsequently inform decision-making and capacity building strategies for all stakeholders. Evaluative thinking will focus on designing and using our logic models to illustrate how the DataVaults project will create change with a design that is driven by the questions we have thought through. Significantly, the adoption of evaluative thinking will impact the demonstrations. What could be a narrow perception of achieving a successful piloting of locally valuable applications will be widened to embrace the knock-on effect of these actions on the wider goals of the project and in particular upon prospective third-party data users. Evaluative thinking will contribute to having richer demonstrations, which will be constantly iterative, supporting new scenarios and willing to extend and adapt the existing starting premises which have evolved.

3 DATAVAULTS THEORY OF CHANGE AND LOGIC MODELS

3.1 INTRODUCTION

This section describes in detail and sets out the advantages of including in the DataVaults evaluation framework, the combination of a Theory of Change and a Logic Model referred to earlier, as key tools for enabling the evaluation to be as comprehensive and successful as possible. Their use is pivotal to the whole process. Although the two will be intertwined, for simplicity we shall initially cover the advantages of them separately.

Theory based evaluation is an approach to evaluation and not a specific method or technique. It is a conceptual analytical model used to structure and undertake analysis in an evaluation. The Theory of Change explains how an intervention is expected to produce its results.

We will proceed to set out the mechanism by which they will help to guide us through the evaluation process, outlining the steps needed to be taken to utilise these methods for planning and undertaking the evaluation. Alongside D6.2, they will help shape the demonstrations.

3.2 THEORY OF CHANGE: THE CONCEPT

A **Theory of Change** explains the links between activities and outcomes and how and why the desired change is expected to come about, usually based on past research or experiences and in this instance, the thinking behind the evolution of the DataVaults project, brought together in the DoA. A catalyst for bringing together these past experiences and past research lies with the projects we have identified with, both in terms of those already referred to in the DoA and Exploitation strategy (D7.1 and D7.2) and those we have subsequently engaged with which are set out in the project's dissemination tracker, maintained within WP8.

A definition is that a Theory of Change evaluation *“involves the specification of an explicit theory of ‘how’ and ‘why’ an initiative might cause an effect which is used to guide the evaluation. It does this by investigating the causal relationships between context-input-output- outcomes-impact in order to understand the combination of factors that has led to the intended or unintended outcomes and impacts.”* [8] In the literature, Theories of Change are referred to by a variety of names including “programme theories”, “impacts pathways” and “pathways of change”.

Theory of Change is a method and an approach that in the DataVaults case has been used for designing and monitoring the project interventions and as a framework for use in the evaluation. We start out with a sequence of events and results (outputs, immediate outcomes, intermediate outcomes and ultimate outcomes) that are expected to occur owing to the intervention. It describes the processes of change by outlining the causal pathways from outputs (goods and services delivered by a project) through direct outcomes (changes resulting from the use of outputs by key stakeholders) through other ‘intermediate states’ towards the eventual impact. This process of change is explained by showing these causal linkages in an intervention, its outputs, direct outcomes, ‘intermediate states’, and longer-

term outcomes and this is commonly referred to as the “programme logic” or “logic model.” This is the basis for our DataVaults Project Logic Model. The identified changes are mapped as a set of interrelated pathways with each pathway showing the required outcomes in logical relationship with respect to the others, as well as chronological flow.

The Theory of Change should clearly identify the main stakeholders involved in the change processes and what role they play in, and/or how they are affected by the changes. This is a key element. It needs to be discussed and agreed by key actors so that it represents a shared understanding that describes the intervention. It essentially reflects a negotiated understanding or interpretation of the project intervention logic – it is both contextual and temporal. It should also be regarded as dynamic - subject to changes/modifications as contexts change over time. The earlier process of requirements capture in WP1 reflected a similar process of reaching consensus with the stakeholders.

However, for evaluation purposes, the original stated targets and intended results of an intervention should remain apparent in the Theory of Change, with the results that stakeholders are accountable for remaining explicit.

For presentation purposes, it is a combination of a narrative alongside a diagram which can be used to show an overview of the causal pathways, the cause-to-effect relationship between different results / changes, and the drivers and assumptions that apply along the causal pathways. The narrative, however, will explain how or why one result is expected to lead to another, and should also present the roles of the main stakeholders in the change processes and how they can be affected by the changes resulting from the project intervention. The theory-based approach argues that the “logic of the logic” is the important feature of logic models; it focuses on the connections (which can be thought of as the “short-cycle” logic) between the boxes in a visual logic model rather than the “long-cycle” logic of the results chain.

Simply put, theories of change explain how the project is expected to bring about the desired results rather than just describing the results. Theory-based evaluation has evolved over a period of time and is now considered mature. But, there is wide variety in the terminology and the concepts. But, there is also agreement in the main messages and on the value of theory-based approaches. When dealing with high levels of complexity and uncertainty, theory-based evaluation offers a robust approach to measuring impact. The logic model is a key tool to support this approach.

In summary, Theories of Change link outcomes and activities to explain HOW and WHY the desired change is expected to come about. In contrast, the complementary logic models, which we will turn to next, graphically illustrate program components such as inputs, activities and outcomes.

3.3 LOGIC MODELS: THE CONCEPT

A **logic model** is a graphic representation of the Theory of Change that illustrates the linkages among resources, activities, outputs, audiences and short-, intermediate- and long-term

outcomes. Essentially, a logic model helps with evaluation by setting out the relationships and assumptions, between what a project will do, and what changes it expects to deliver [9]. Logic models are typically used in theory-based evaluation, which is designed to explicitly articulate the underlying theory of change which shapes a project. Essentially, it shows how the project will achieve its outcomes and impacts through a series of activities. Teasing out the logic pivotal to the project. From an evaluation perspective, using a logic model enables engagement in the process from the outset of the project, building on the vision and aims of the project and will be beneficial to the iterative approach of DataVaults as well as for the final evaluation stage. Generally, they can help the project focus on the most critical outcomes, bring out key metrics during the design process and help determine what data should be collected and to provide insights into how the project is evolving and what might need to change. [10] [11]

A logic model is often expressed in a tabular format, such as represented in Figure 4 below:

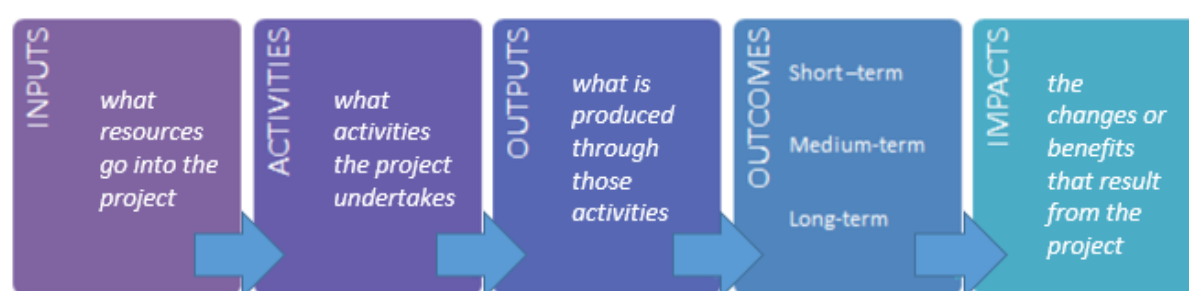


Figure 4 Example of a Logic Model

In DataVaults, interaction with the stakeholders is extremely important (see Chapter 6) and using a logic model will help to reduce potential misunderstandings whilst ensuring that activities are focused on the outcomes to be achieved. “The process can also help to bring together stakeholders who will inevitably have different perspectives and possibly conflicting agendas or imposed targets” [12] [1]

The literature reflects a wide variety of differing approaches, with there being no wrong or right way. But we will use a flexible approach tailored to meet the demands of the project, cherry-picking what is of most use to the project. We will embrace a variety of aspects which will enable us to capture the perceived benefits of using a logic model, which are essentially that it able to help:

- Tell the project’s story and vision within a structured framework
- Enable the development of a shared understanding amongst all the stakeholders
- Provide another focal point to help the overall communication process.
- Act as a check list to identify gaps and inconsistencies
- Identify the key metrics and data requirements and focus on the most significant outcomes and activities
- To support an iterative approach and further understanding of progress or lack of it
- The capture of key lessons learned

Logic models are not evaluation tools; they are learning and management tools that should be used throughout the life of a project. A logic modelling process should facilitate effective

planning, implementation, evaluation and improvement of efforts made. As McLaughlin and Jordan note [11], creating a logic model enables you to set out the programme’s “story”, detailing:

- What are trying to achieve and why is it important?
- How will you measure effectiveness?
- How are you actually doing?

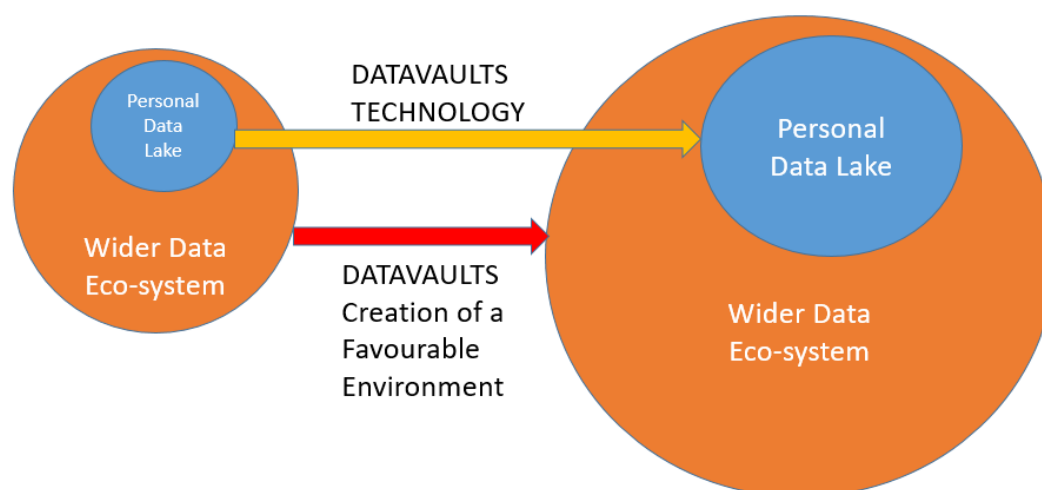
This dovetails well with the approach dictated by the adoption of agile software development and user stories in determining the DataVaults’ requirements.

3.4 THE DATAVAULTS THEORY OF CHANGE MODEL

We have covered the general theory underpinning a Theory of Change above and it is now necessary to outline what this translates to in the case of DataVaults and the approach taken to create the DataVaults Theory of Change model.

Figure 4 above sets out the general process for developing Logic Models and this will be a basis for progressing the development of the DataVaults Theory of Change. At this stage we are identifying the assumptions and determining what changes we anticipate seeing and what will be different at the end of the project, essentially creating the theory of change and logic model for the project.

In general and at the highest level, we can say that our Theory of Change model is based on the logic of the DoA. The key pivotal assumptions are that the new software will create the described changes values and opportunities and lessons to learn which will result in the achievement of two interrelated goals. The first is that our work will produce an increase in availability of personal data for re-use. The second is that this in turn will lead to an overall stimulus to grow the data economy, as depicted in Figure 5 below:



The basic concept is that if we supply the technology and conditions to grow a “personal data lake”, this will act as a catalyst in the growth of the profitable eco-system surrounding it.

Figure 5 Underlying concept to DataVaults Theory of Change

3.4.1 Preparing the Theory of Change at the Design stage.

At this stage, we are looking at the creation of the Theory of Change. Things will change at the later stage when the project's interaction and relationship with it will evolve as the project matures and the Theory of Change will be brought into use for help in scrutinising the progress of the project. The following stages can be identified:

1. A first stage in the process is the scrutiny of the narrative description of the DataVaults project and to extract from this all the relevant material to make a start.
2. An examination of the anticipated results and their causal logic from the project DoA and the drivers and assumptions from the narrative sections from the DoA and in particular covering the critical success factors and risks identified.
3. Creation of the comprehensive list of stakeholders- from the DoA to start off with.
4. Capturing the intended causality of the intervention at the time of its formal approval. It should describe a logical sequence of direct outcomes, intermediate states and impacts and the identification of appropriate, assumptions, drivers and indicators along each causal pathway, making sure that all the main causal pathways have been identified alongside the project goals and objectives, anticipated project outcomes, project outputs etc.
5. It is important that these results statements feature or are clearly referenced in the Theory of Change. This is to ensure that the results for which the project are held formally accountable are clearly presented and form a part of the evaluative framework.
6. We should clearly articulate the expected impact from the project derived from the project purpose or goal / objective statement, it should be comprehensive, with all the main causal pathways being represented and the causal linkages between results made explicit.
7. The Theory of Change narrative should explain how one result is contributing or leading to the next with rationale statements why one outcome is a pre-requisite for another.
8. It should be plausible.
9. Intermediate results should be added where the 'leap' from one result to another misses out important intermediary steps. Most frequently, these will be 'intermediate states' between direct outcomes and impact.
10. It should be complete, any missing drivers and assumptions are added and their role in the change processes explained.
11. Any missing stakeholders involved in the change processes are identified as well as how they affect or are affected by the changes.
12. Interdependencies between causal pathways are identified.
13. Finally, it should be measurable. The Theory of Change should present (or clearly reference) indicators for the direct outcomes (as a minimum) and, ideally, for the intermediate states and impact in the main causal pathways.

The Metrics and the Measurement framework will be covered in Chapter 4.

All the above become components of a narrative for the project. Returning to the basic concept, questions raised in respect should include:

- How do we grow the personal data lake? Did what we say would work, actually work?
 - How do we grow the wider data economy eco-system? Did what we say would work, actually work?
 - How do we make the demonstrations become catalysts for new waves of adoption?
- [13]

3.4.2 DATAVAULTS Theory of Change

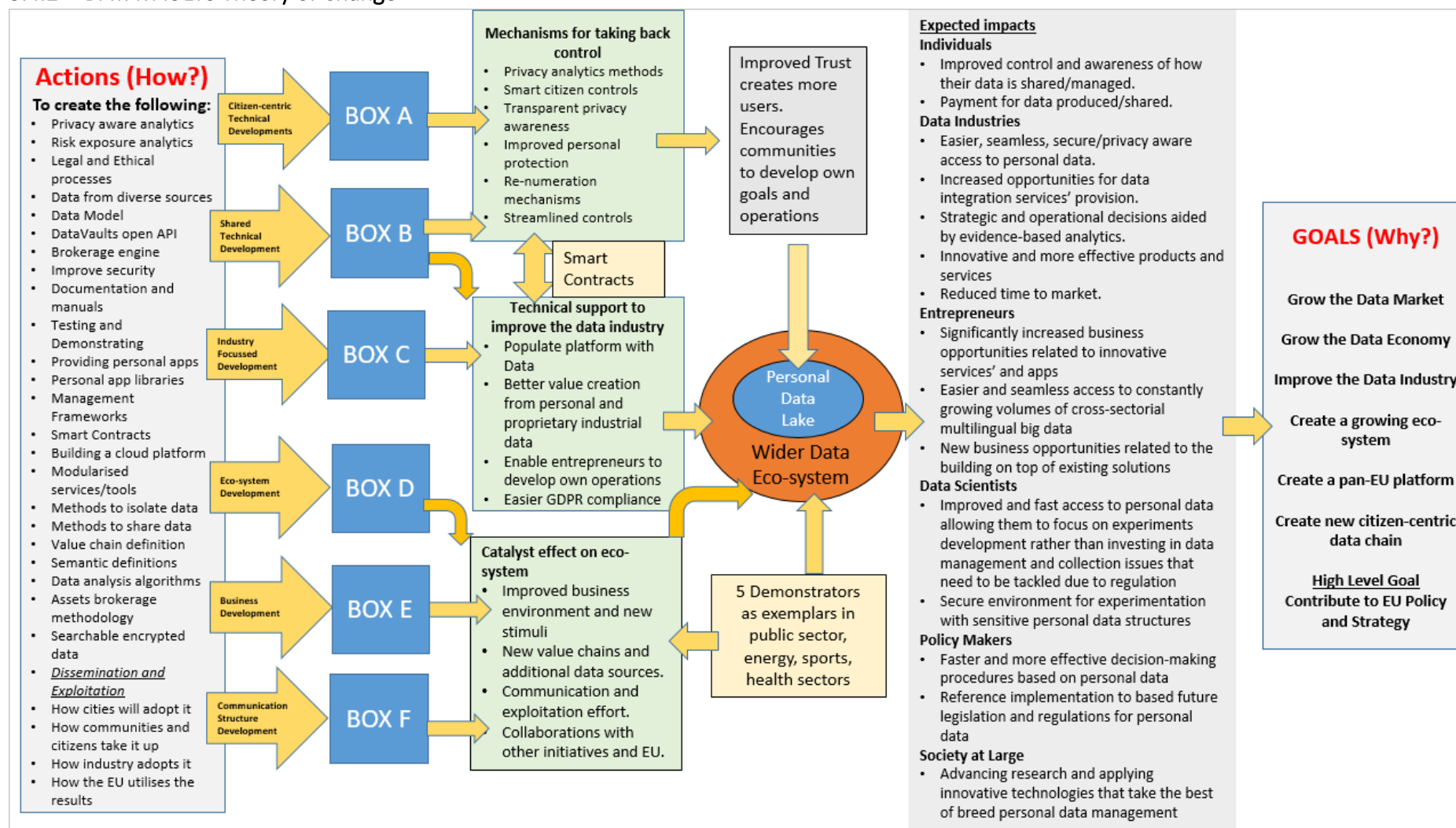


Figure 6 The DataVaults Theory of Change.

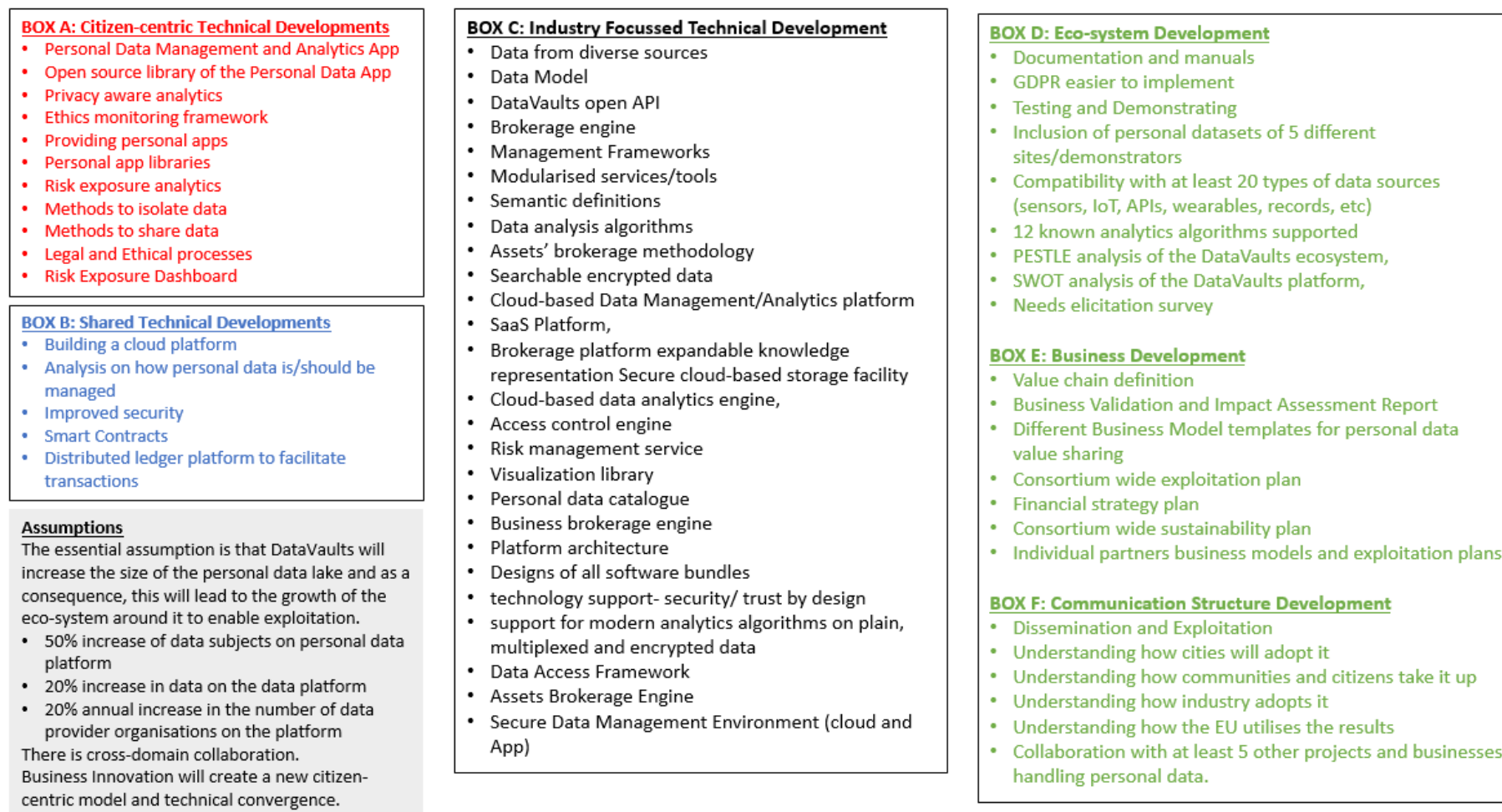


Figure 7 Key to the “Boxes” in previous figure

3.5 CREATING THE PROJECT'S LOGIC MODEL

This section sets out some general principles which the project team will need to take into consideration when creating the DataVaults Project Logic Model. We need to incorporate the underlying assumptions, or theory underpinning the project, which articulates how undertaking the various tasks in the Description of Work (interventions and mechanisms) will resolve the problems and achieve the goals which DataVaults is targeting. [14] [15]

The Theory of Change shows the big picture with all the possible pathways and is messy and complex. The Logical Framework on the other hand shows the neat and tidy pathway which the project deals with. They are both based on the same set of assumptions made by the project and so can share many aspects of the approach taken.

Typical stages in developing a logic model which DataVaults had to consider included the following:

	Stage	What this entails
1	Collection of information needed to develop the model.	This involved working with multiple sources, including; DataVaults DoA, Deliverables, other documents, intense interaction with stakeholders, identified projects and published literature. It includes the basic programme EU programme and policies and the contextual information - social, political, ethical, legal.
2	Description of the problem(s) which DataVaults aims to address and the context in which we are working, and in particular, the factors which contribute to the problem.	This entails implementing the stakeholder engagement plan covered in Chapter 6 below in order to gauge the problems. Examples of methods which were available included the semi-structured interview protocol (SSIP) approach, designed to assist evaluation teams to collect perspectives from project teams and stakeholders, to inform the logic model which was developed by Gugui and Campos. [10]
3	Definition of the individual elements of the logic model.	Following on, it was possible to introduce the plausible theory of change in the previous section, which essentially links together the outcomes, activities, outputs and inputs. "At this stage, it may be helpful to ask constructively challenging "how" and "why" questions to articulate what you are doing and why". [16]
4	Construction of the model.	From the definition to the generation of the elements and to the construction of the logic model became and continues to be an iterative process. All the elements gathered, were translated into outcomes, activities, outputs at individual, organisational, system and community levels and the inputs.
5	Verification of the model,	Again, working closely with stakeholders, which sets the tone for continuous review, we looked at whether the DataVaults Theory of Change, setting out why our

		activities will lead to desired outcomes, is feasible and also, which activities are most critical for achieving outcomes?
6	Iterative adaption of the model	<p>The stages for doing this included:</p> <ul style="list-style-type: none"> • Identifying and removing those elements which were unclear, unrealistic or meaningless; • Prioritising our intended outcomes, to identify the most critical outcomes and therefore where to focus evaluation • Presenting the graphical and tabular logic models to organise the information collected in this process.

Table 2 Typical Stages in developing a logic model

3.6 BENEFITS LOGIC MODEL

Since their introduction, various adaptations to the basic premise have emerged to overcome perceived weaknesses in the initial approach. An approach pioneered by the Canadian Government widened the scope from a simple query as to whether a project had been delivered on time, within budgets and achieving the set targets to one which further scrutinised whether the perceived business benefits were also realised. It is this approach which is of greater value to DataVaults and which we will adopt.

A Benefits Realisation approach embraces a set of activities, methods, processes, and tools for understanding, planning, tracking, managing and realising desired outcomes from IT initiatives or projects. It sets out the factors in the realisation of intended outcomes or benefits including business functions beyond the narrow IT project. The logic of the process to realise such benefits is represented by a 'Results Chain'. This further contributes to the management of stakeholder expectations [17]

Taking this a stage further, we can illustrate how benefits are linked to the demonstrator's success criteria and performance indicators as shown in the Figure 8 below.

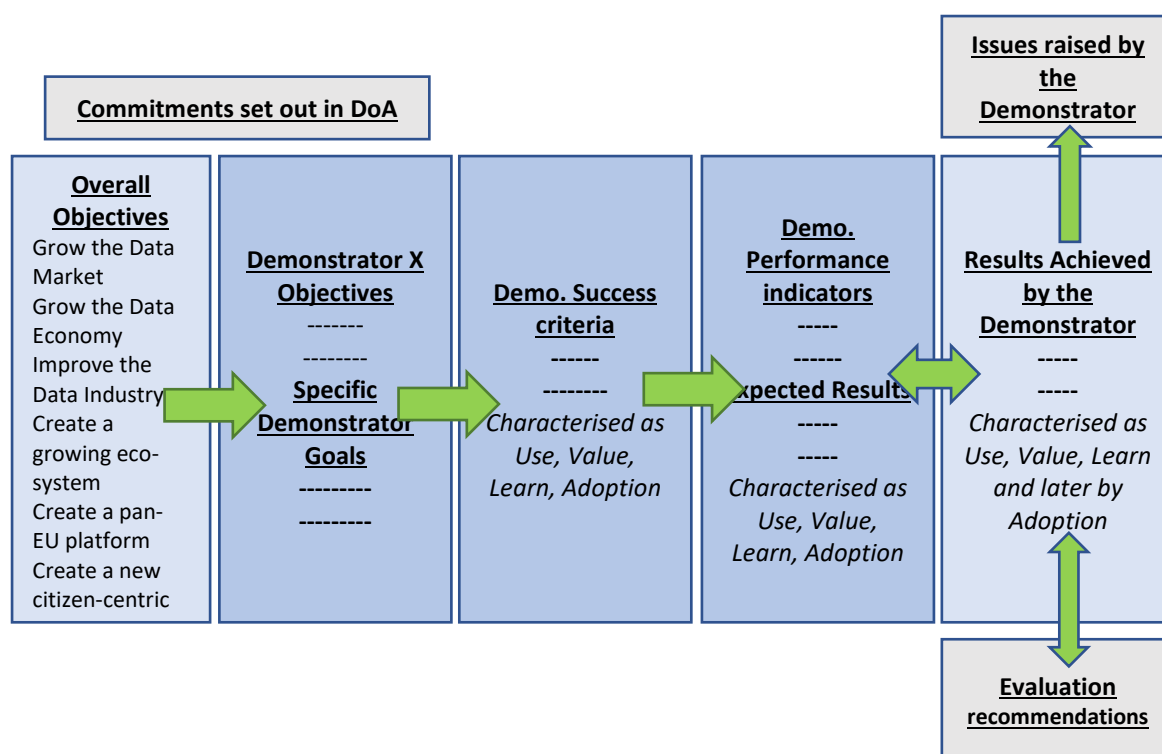


Figure 8 DataVaults Benefit Logic Model

The Evaluation Plan will reflect this Benefit Logic Model approach.

USE	Measurable results related to the use of the services demonstrated (number of users, uptime of the services etc.)
VALUE	Results linked to the technical or business value added as a consequence of using DataVaults enabled services (service provider estimations, user's satisfaction etc.)
LEARN	Lessons learned from the technical and business perspective and effect on future policy.

Table 3 Definitions of USE, VALUE and LEARN

4 EVALUATION CRITERIA AND MEASUREMENT FRAMEWORK

4.1 USE OF THE THEORY OF CHANGE TO INFORM EVALUATION CRITERIA

There is a difference in the use of the DataVaults Theory of Change from the time it is being developed as a tool for shaping the evaluation process, to when the evaluation process has started. At the design stage, it helps formulate the questions to focus upon. But at the evaluation stage, its focus shifts and one aspect of this can be seen in its use to inform the evaluation criteria. Questions can be raised which help address the following topics:

- Strategic Relevance.

To what extent does the project meet the needs of the EU and what lessons learned may be of value to it. How do we meet the high level policy goals promised in the DoA?

- Quality of Project Design.

How well were stakeholders involved during the project design processes? At the evaluation stage we will need to assess the quality of the stakeholder analysis in the project documentation, by verifying whether key stakeholders have been properly identified and assess whether sufficient analysis is provided on how different stakeholders can affect or be affected by project results. This includes the nature of relationships that exist among stakeholders and how they were incorporated into the project design in their various roles. On the basis of the assessment of the project focus and the stakeholder analysis, it will then be possible to pose questions to assess how well the most relevant stakeholders were involved during project design.

- Effectiveness: Achievement of outputs

While the assessment of achievement of outputs should cover all the DataVaults project's outputs as set out in the DoA, and those outputs added by possible project revisions, it will be impossible to assess all project outputs with the same level of detail. The Theory of Change at the evaluation stage can be used to determine which project outputs are most essential for achieving the project's direct outcomes, and also may provide insights to assess the minimum characteristics and quality requirements for the project outputs so that they are fit to provide their expected contribution to the overall project outcomes. The assessment of the achievement of outputs can then focus on the most critical outputs and verify whether these meet the requisite characteristics and quality. D1.3 provides further guidance in this respect in the structuring of the Maximum Value Product.

- Achievement of direct outcomes

Direct outcomes are defined here as changes resulting from the use of project outputs by key stakeholders. The direct outcomes of the project are expected to result directly from the outputs, so the accountability of the DataVaults project team for their

achievement is high. Outcomes are often changes in capacity and behaviour at the individual, industrial and institutional levels and this will hold true for DataVaults. [18]

- Internal logic of the project and its Impact

The Theory of Change at the evaluation stage can be used to assess the internal logic of the project. The evaluation will also verify whether the project outputs are logically connected (from cause-to-effect) to the intended direct outcomes. It is also used when assessing the extent to which direct outcomes have been achieved and whether all necessary drivers and critical assumptions have been adequately considered. It can also be used to assess whether the direct outcomes are logically connected along the various causal pathways to the intended impact.

The Theory of Change assists the evaluation team to make an informed judgment on how likely it is that the project will contribute to intended impacts. If the internal logic of the project is strong, outcomes have been achieved, all drivers and assumptions are in place, and progress towards intermediate states and possibly impact at a smaller scale have been demonstrated, it is highly likely that the intervention will contribute to impact.

On the other hand, if there are flaws in the internal logic of the project, some key outcomes have not been achieved, certain drivers or assumptions are not in place, or there is very little evidence of any progress towards intermediate states and impact, the likelihood that the intervention will contribute to impacts such as increasing confidence or accelerating the data economy will be much lower.

- Catalytic role, replication and scaling-up

For assessing the replication potential and the roadmap to take-up of the project, using the Theory of Change, the evaluation will focus on those direct outcomes, drivers and assumptions that are most necessary for replication and take-up of project results. Thus it can be checked to see whether replication and up-scaling have been built into the causal pathways and whether the necessary drivers and assumptions promoting replication and take-up have been adequately considered in the project's intervention logic. It is expected that those most valuable in this process towards sustainability will be present and playing their role in further take-up of the projects results.

The reliability of this assessment can be enhanced by looking for early evidence of replication or up-scaling during the project lifetime.

- Formulation of recommendations to enhance replication

The Theory of Change may also be used in offering a 'prediction' of how the project might be adjusted to maximize results in a different implementation settings. This is where demonstrations morph into the basis for a spreading eco-system and raises questions of how we can engage with wider evolving eco-systems, which the demonstrators are on the fringe of.

- Sustainability

The assessment of sustainability is concerned with verifying whether the necessary conditions are in place for the continuation of the project benefits after DataVaults has ended. The Theory of Change during the evaluation process can be used to inform an assessment of whether sustainability has been built into the causal pathways and whether the necessary drivers and assumptions affecting sustainability have been adequately considered in the creation of the project's intervention logic and subsequently translated into action during the implementation phase.

- Ethical and social safeguards

The Theory of Change at evaluation can be used to monitor the ethical and privacy issues arising from work carried out in WP2 and in WP9, complementing the monitoring of the Ethics and Data Management Plan which is set out in D9.2.

Further, Appendix B contains the Ethics Committee Report and an ethics risk assessment in relation to data-processing has been carried out at all the demonstration sites and is reported in D10.2.

- Stakeholder participation and cooperation

The Theory of Change at the evaluation stage can verify whether it includes a satisfactory approach for sharing information and encouraging cooperation with partners, national/local project stakeholders and other EU projects and programmes once the demonstrations have started. In using the Theory of Change at the evaluation stage, stakeholder analysis should assist in the identification of the key stakeholders along with their respective roles, capabilities and motivations in each step of the causal pathways from activities to achievement of outputs, direct outcomes and intermediate states towards impact. Will we have engaged with the eco systems we are aligned with and mirroring the current strategic activity from the Commission, for example?

4.2 VERIFICATION AND VALIDATION

The title of Task 6.1 is “Project Verification and Validation Framework.” Whilst “Verification and Validation” are referred to in relation to the Technical, Business and Science and Innovation Objectives and elsewhere in the DoA, for clarification it is worthwhile defining them here:

- **Verification** is the evaluation of whether or not the DataVaults service/system complies with the determined requirements and specifications and conditions set out in the DoA, as well as in regulations such as GDPR.
- **Validation** is the assurance that a product, service, or system meets the needs of the customer and other identified stakeholders. It also involves acceptance and suitability with external customers and potential customers.

Verification is done by the project team to ensure that they are on the right track and working as per the agreed specification and process whereas Validation is the assurance

that the deliverable meets the customer's need. Whilst Verification is an internal process done within the project by the project team, Validation is more an external process done by the potential end-users and identified stakeholders.

The main differences between these two terms are:	Verification	Validation
To Ensure	Specifications are Met	Needs are Met
To Build	Solution correctly	Correct Solution
Done by	Project and Solution Team	Stakeholders and Business
Uses	Peer Review and Inspection	Continual confirmation and Requirement walk through

Table 4 Differences between verification and validation

4.3 DEVELOPMENT OF EVALUATION QUESTIONS

We are moving on from the logic model and evaluation criteria to the evaluation questions raised and then on to the measurement framework required for them to be answered.

4.3.1 Questions raised via the Logic Model

The next stage of the process is to utilise the logic model to help formulate the questions which we will need to answer in order to carry out the evaluation. The method was to take the logic model and go through it asking five basic questions to start the formulation of the evaluation questions themselves.

Who?	Who was the project designed to benefit?
What?	What was the effort intended to do? What was the context within which the effort took place and how could it have affected its implementation and outcomes?
When?	When did activities take place? When did the desired changes start to occur?
Why?	Why is the effort important to the stakeholders involved? Why might it be important to people outside the project?
How?	How is the effort intended to affect the desired changes or bring about the desired outcomes?

Table 5. Types of questions suggested by logic model

4.3.2 General categories of evaluation questions

In relation to the activities undertaken during the project, a further set of guidelines for assisting in the formulation of the DataVaults evaluation questions can be seen in Table 6 below:

Aspect of Effort	Example of Evaluation Question
Theory of Change and Logic Model	Was the theory of change and logic model correct? What aspects of the theory and logic model did not happen in practice? And why or why not?
Implementation	Was the effort implemented as intended? Why or why not?
Results and Outcomes	To what extent did the effort lead to the anticipated results? What was the change and to what extent did the effort contribute to the change? What difference did the effort make to the stakeholders and wider community?
Context	What other factors could have influenced the project's implementation and outcomes?
Learnings	What worked and what did not? What were unintended consequences or benefits?
What Next?	Can the effort be scaled up? Can the effort be replicated elsewhere? Is the change self-sustaining or does it require continued intervention? Are we able to satisfy any business related queries?

Table 6 Examples of categories of Evaluation Questions

4.3.3 Identification of Questions arising from the Project's Existing Documentation

An exhaustive process of trawling through all of the project's existing documentation was undertaken and the result of this was that attention was drawn to all the potential questions capable of being asked. The results of this exercise, essentially designed so as to make sure nothing was overlooked and as guidance as to what questions had already been raised to follow up on, can be found in "Appendix C. Scoping the Evaluation questions." Responsibility for providing answers to the questions, grouped under various headings, was allocated to the appropriate partners/WP leaders.

No question was ignored for the sake of this exercise, which provided a check-list to return to at the end of the question selection process. Whilst WP1 and WP2 deliverables touched on detailed requirements which will need proof of satisfaction, the WP3, WP4 and WP5 deliverables were the root for steering the technical validation and specifically, Task 5.5- Technical Verification and Integration Testing.

The DoA along with WP7 and WP8 added further questions to the above, but in addition, provided the guidance as to the higher policy and programme goals and questions to be raised in relation to their satisfaction.

4.3.4 Use of quantitative methods

At the most basic level, quantitative methods are concerned with “what? -who? -and when?” Therefore, we need to consider quantitative methods as our evaluation questions will include inquiries about who participated and benefited from the project, what lessons were available to learn from, what changes were brought about by our project; and when the changes occurred or are anticipated.

4.3.5 Use of Qualitative Methods

At the most basic level, qualitative methods are concerned with “why and how?” and are useful for in-depth study of a particular issue rather than a broad study.

4.3.6 Use of Mixed Methods

Over the past three decades, a trend in evaluation has been to shift toward mixing quantitative and qualitative methods into a single evaluation called “mixed method evaluation.” This approach seeks to combine the strengths and dilute the weaknesses of the two methods, Combining them can lead to a stronger, more complete evaluation than a conventional evaluation that uses only one method.

A mixed method evaluation systematically integrates two or more evaluation methods, usually drawing on both quantitative and qualitative data, such as using surveys and focus groups in one evaluation study.

4.3.7 DataVaults Questions

The eventual questions were determined along with the allocated responsibility for answering them and these can be found in the Evaluation Plan itself, which is in Appendix A.

It needs to be stressed that this will become a living document and it will be regularly updated.

As the project evolves, the iterative nature of it will be reflected in the nature of the questions posed, with some being added as the likelihood of a response increases with each iteration and in accordance with the increasing maturity of the project.

4.4 MEASUREMENT FRAMEWORK

4.4.1 Introduction

We have developed our Logic model and our Theory of Change which underpins the evaluation process and this led us to the range of questions requiring an answer. This section now turns to a description of another tool in the preparation of an evaluation, the DataVaults Measurement Framework. Developing such a framework allows us to determine **how** to assess progress toward achieving outcomes and answer the evaluation questions. It helps to give a clearer picture of how to conduct the evaluation, whilst providing a further opportunity

for stakeholders to further define outcomes. With it, consideration can be given as to what the outcomes mean in more concrete terms.

What is important to know, is when there is progress toward the desired outcomes and how that progress will be measured, be it in descriptive terms, in a numerical format as totals or as percentages, etc.

4.4.2 Key Components of the Measurement Framework

A measurement framework generally consists of seven basic components.

- **Outputs** are direct products of activities and may include types, levels and targets of services to be delivered by the project. Generally speaking, outputs are the goods, products and services that are delivered.
- **Outcomes** are the immediate, intermediate and long-term changes or benefits to be documented and these are gleaned from the logic model.
- **Indicators** are markers of progress toward the change which DataVaults should make.
- **Measures of change** are values - quantitative and qualitative - that can be used to assess progress made.
- **Data collection methods** are the strategies for collecting data. This could include quantitative methods, such as conducting surveys or analysing existing data, or qualitative methods, such as conducting interviews or a document analysis and is covered in Chapter 8.
- **Data sources** are the locations from which or people from whom we will obtain data.
- **Data collection frequency** is how often we plan to collect this data.

4.4.3 The Measurement Framework

Having identified the outputs and immediate, intermediate and long-term outcomes, the table below can be populated.

Output/ Outcome (Specific outputs or changes derived from the Logic Model)	Indicator (Markers toward Progress)	Measures of Change (Value for assessing progress)	Data Collection Methods (How data will be Collected)	Data Sources (Where data will be obtained from)	Frequency of Data Collection (How often data will be collected)
Output (each output and outcome is listed in the first column) Having listed them, a clear plan can be made for assessing progress toward that particular output or outcome by completing the other columns.					

Table 7 The Measurement Framework

A variety of factors need to be taken into account when progressing with this task. These include the following:

- Contextual factors need to be acknowledged, both positive and negative.
- Realistic indicators and measures of change should be identified.
- As continually stressed, key stakeholders should be involved enhancing opportunities for feedback.

The measurement framework becomes a living document. It is a tool for planning, but should be regularly modified, based on changes in the project's progress and activities, or based on information gained from the data collected. The logic model and evaluation questions are designed to be adjusted and these changes should be subsequently reflected in the evaluation plan.

5 CREATING THE EVALUATION PLAN

5.1 INTRODUCTION

An evaluation plan sets out the proposed details of an evaluation - what will be evaluated, how and when.

This evaluation plan includes information about what the evaluation is trying to do, (previous sections have reflected on what is to be evaluated, the purposes and criteria of the evaluation and key evaluation questions) and how it will be done (what data will be collected, how and when, how data will be analysed, synthesized and how and when results will be reported). We have already set out the factors which will determine how the evaluation process is carried out and determining the Evaluation Plan. These include the overall purpose for evaluation, the DataVaults Evaluation Methodology, Logic Model and Theory of Change, the general approach to measurement and the identification of key questions which require an answer, utilising both quantitative and qualitative methods. The logic model puts into effect the project's theory of change. During the evaluation, we will collect data to test the theory.

This section sets out how to provide an evaluation plan which is a written document that describes how an evaluation will be managed. It clarifies the steps needed to assess the outcomes and processes of the project. The evaluation team and the stakeholders have agreed on the contents of the evaluation plan.

“An effective evaluation plan is a dynamic tool, or a ‘living document’, that should be updated on an ongoing basis to reflect changes and priorities over time.” [19]

The **DataVaults Evaluation Plan** itself is a living document and can be found in **Appendix A**.

The creation of the Evaluation Plan is intrinsically linked to the planning of the demonstration activities, the planning of which is the focus of Task 6.2, with its Deliverable, D6.2 Pilot Scenarios and Implementation Plan. The timetable will be determined by the requirements for the demonstrations identified in this task, alongside elements set out in the DoA.

Similarly, some of the results and benefits from the evaluation will be closely linked to Task 6.9-“Scale-up Activities, Best Cases, and Replication Roadmap”. Here, many of the “lessons learned” from the project, regarding the implementation, operation and execution of the demonstrators, will be generated and will be incorporated into “What comes next”. They will be formulated as methodological adoption guidelines for the further exploitation and utilisation of the DataVaults platform. This will further contribute to the exploitation of the project by suggesting follow-up activities for further population of the platform with data and for bringing on board other entities.

The evaluation itself will cover three phases: Evaluation of the Alpha Platform version, Evaluation of the Beta Platform version and the Final Evaluation and impact assessment.

5.2 PLANNING THE EVALUATION

Many of the steps which are recommended when planning an evaluation have already been carried out above.

What is required to complete the Evaluation Plan itself is to cover the following remaining steps:

1. Determine who will be involved. This is shaped by the discussion on the role of the stakeholders which is covered in detail in the Chapter 6.
2. Preparation and maintenance of the plan.
3. Set milestones and manage time in relation to the DoA.
4. Allocate the use of the resources set out in the DoA.
5. Consider how the evaluation findings will be disseminated and used.

5.3 THE DATAVAULTS EVALUATION TEAM

All partners will be involved in the evaluation process either directly as main actors in the demonstration planning and demonstration activities, or having a direct involvement in assuring that the full potential for the exploitation process is realised.

The demonstrations are structured in such a way that each demonstration site has been paired with a technical partner and these five technical partners will interact with DTU to bring the various experiences together and to be able to make changes where identified and share lessons learned. Given the overlap with the roll-out of the demonstration process and the requirement for the demonstration sites to be capable of providing answers to all the evaluation questions identified, it is vital for a close relationship between the two tasks to be created and hence the steering group will cover this overlap.

A third element is in ensuring that those stakeholders which are outside the project, actors in the data economy, smart cities etc. are engaged in the evaluation process, and this holds true for the stakeholders linked to the five demonstration sites. Hence the WP leaders of WP8, ensuring good communication and interactions and WP7, keeping exploitation to the fore, will contribute alongside the WP5 Leader. The demonstration sites themselves will join as required, but also have the option of joining in wherever they wish to participate. Figure 9 below reflects this structure.

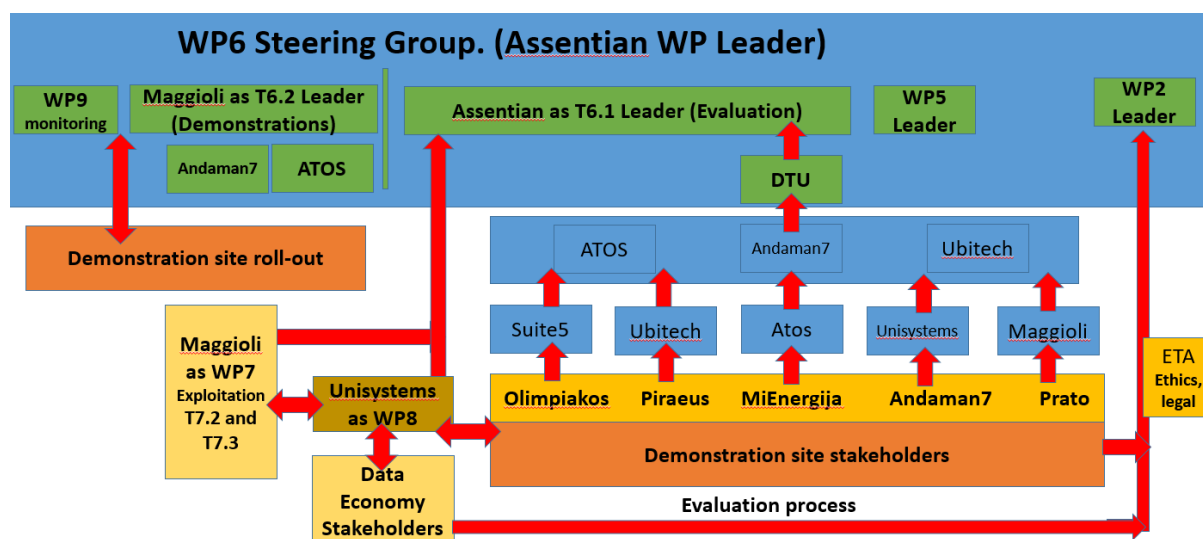


Figure 9. Structure of evaluation team

5.4 CONTRIBUTION BROKEN DOWN BY INDIVIDUAL PARTNERS

Major Partner contributions to Evaluation Process.		
Partner	Overall Role within WP6	Contribution to Evaluation
Assentian	WP Leader. Task 6.1 Task leader for Evaluation Framework and for Task 6.8 Demonstrators Evaluation and Impact Assessment.	Lead Role taking a general coordination role. Ensuring that the demonstrations cover all identified aspects needing to be evaluated, whilst taking into account that exploitation pathways are being covered. Leading role in evaluation from the perspective of achieving higher level goals. Steering Committee.
Maggioli	<p>Task 6.2-Task leader for “Demonstrators Baseline Activities, Operation Planning and Coordination.”</p> <p>Task 6.9-Task Leader for “Scale-up Activities, Best Cases, and Replication Roadmap”.</p> <p>Technical support for Prato Demonstration site.</p>	<p>Major role in aligning demonstration planning and implementation with evaluation process. Leading role in evaluation from a business perspective.</p> <p>Utilisation of evaluation lessons learnt into Task 6.9 “Scale-up activities and Road Map”. Leading role in evaluation from a business perspective.</p> <p>Assisting Prato demonstrator with the technical evaluation. Steering Committee. Technical Committee.</p>

Suite 5	Core partner alongside Maggioli in Tasks 6.2 and 6.9 Technical support for Olympiacos Demonstration site.	<p>Important role in aligning demonstration planning and implementation with evaluation process. Work on the parts that have to do with evaluation metrics for the operation, performance and acceptance of the platform etc.</p> <p>Utilisation of evaluation lessons learnt into Scale-up activities and Road Map. Leading role in evaluation from a business perspective. Assisting Olympiacos demonstrator with the technical evaluation. Steering Committee. Technical Committee.</p>
Fraunhofer	Core partner in Task 6.2- “Demonstrators Baseline Activities, Operation Planning and Coordination.”	Role in aligning demonstration planning and implementation with evaluation process. Steering Committee.
ATOS	Core partner in Task 6.2- “Demonstrators Baseline Activities, Operation Planning and Coordination.” Technical support for MiWenergia Demonstration site.	<p>Role in aligning demonstration planning and implementation with evaluation process.</p> <p>Leading role in evaluation from a business perspective and in covering the non-security related technical aspects. Assisting MiWenergia demonstrator with the technical evaluation. Ensuring all the requirements identified in WP1 are covered, all the data sources and the APIs identified are included etc. Steering Committee. Technical Committee.</p>
ETA	Core partner in Task 6.2- “Demonstrators Baseline Activities, Operation Planning and Coordination.”	Role in aligning demonstration planning and implementation with evaluation process. Emphasis on role of citizens as stakeholders, on legal and ethical issues and on GDPR recommendations per pilot. Steering Committee.
Olympiacos	Task 6.3 Demonstration site.	Evaluation of demonstration activities.
Piraeus	Task 6.4 Demonstration site.	Evaluation of demonstration activities.

Ubitech	Technical support to Piraeus.	Technical support to Evaluation of demonstration activities. Covering those aspects not related to security. Technical Committee.
Andaman 7	Task 6.5 Demonstration site.	Evaluation of demonstration activities. Steering Committee. Technical Committee.
UNISYSTEMS	Technical support to Andaman 7.	Technical support to Evaluation of demonstration activities. Leading role in ensuring the communication between all stakeholders is strong and that communication supports the business evaluation, including the formation of an Industry Group representing stakeholders. Planning and coordinating the interaction with stakeholders. Technical Committee.
MIWENERGIA	Task 6.6 Demonstration site.	Evaluation of demonstration activities.
Prato	Task 6.7 Demonstration site.	Evaluation of demonstration activities.
DTU	Core partner in Task 6.1- Evaluation Framework.	Coordination of input/responses to technical evaluations. Technical link with the use case partners. Assistance with the definition of specific KPIs and directing the aspects of the evaluation plan for the security and trust enablers of DataVaults - especially when it comes to the attestation aspects and the use of TPMs for providing secure and lightweight management of the Blockchains operations. Steering Committee. Lead Technical Committee,
IFAT	Technical viewpoint	Input into and use of lessons learned and scale up activities in relation to WP7, Exploitation activities and feedback related to the evaluation of the business case.
IFAG	Technical viewpoint	Input into and use of lessons learned and scale up activities in relation to WP7,

		Exploitation activities and feedback related to the evaluation of the business case.
TECNALIA	Technical viewpoint	Input into and use of lessons learned and scale up activities in relation to WP7, Exploitation activities and feedback related to the evaluation of the business case.

Table 8 Partners' contribution to the Evaluation Planning.

The skill set required to implement the Evaluation Plan is present within the consortium, with members having carried out similar tasks on numerous occasions.

5.5 INVOLVEMENT OF STAKEHOLDERS

Here we can briefly reflect on the general role of stakeholders before returning to the specific details of stakeholders in Chapter 6.

Stakeholders are those affected by the results of an evaluation. They need to be engaged with at the outset, but may be involved at any stage and could include those providing funding, developing or implementing the intervention, supporting the evaluation, or using the evaluation findings. Stakeholders clarify what will work in practice and where barriers may lie.

The following questions may help identify relevant stakeholders.

- Who is involved in the intervention including staff, service users and funders?
- Who needs to be involved to carry out the evaluation?
- Who needs to be involved for any change to take place as a result of the evaluation?
- Who will be affected by any change stemming from an evaluation?

A range of stakeholders were required to be involved in the initial evaluation discussions to ensure a broad outlook, rather than ending with an evaluation process which may only address the narrower requirements of a few of the stakeholders.

Having identified stakeholders at the beginning of the project (and earlier in the writing of the proposal) we needed to consider at what stage and at what level is the involvement of different stakeholders required. The question was raised as to whether there needed to be a structure to ensure representation such as on a steering group, representation at the demonstration sites, Data Industry input, etc. and how the engagement with the evaluation teams was to occur.

Similarly, patterns and mechanisms for engagement were discussed, in regard to levels of participation, whether they will attend stakeholder consultations or take part in interviews or focus groups as part of the evaluation. It was also noted the importance of involving stakeholders in the dissemination stages of the evaluation. In current circumstances of restricted face-to-face contact, the discussion regarding most suitable online tools is

important. Additionally, it was noted that there is a need to have involvement of those who will use the findings of the evaluation for whatever purpose.

5.6 ANSWERING THE EVALUATION QUESTIONS AND MEETING THE EVALUATION OBJECTIVES

An evaluation usually addresses questions about whether and how the aims and objectives of an intervention were achieved. The evaluation questions are critical because they shape what data is needed and how they will be analysed. Chapter 4 established an exhaustive process for determining which of the wide array of questions which we initially identified, should have resources dedicated to their being answered. Having defined the evaluation questions within a context of specific objectives for the project, the work plan and outputs could then be agreed based on the resources available.

The work to be planned is very much shaped by the questions selected as this directly influences the methods adopted to answer them and which data needs to be gathered. Different methods are needed to address different questions and so this also involves specifying activities needed to answer the evaluation questions, in relation to the recruitment of participants, and for the collection of particular data and scheduling these etc.

5.7 ESTABLISH MANAGEMENT STRATEGIES

Like any project, it is important to keep the evaluation on track and ensuring emerging issues are dealt with in a timely manner. It is recognised that communicating well and early, within the team and with any external collaborators is crucial.

Not all challenges can be anticipated in the evaluation process. So it may need to be revisited and revised. Priorities can also change once the evaluation is in progress, especially if it is conducted over a long time period. In these cases, it is important to document what was changed and why, and note any implications of these changes for evaluation objectives and usefulness.

Again, these changes will be captured in the living document which is “*The DataVaults Evaluation Plan*” which will evolve as the project progresses as a living document to be maintained on the project document repository (see Appendix A).

5.8 TIMETABLE

A typical timetable for evaluation might include the following three phases:

- Ex-ante: Do the plans of the demonstrators focus on the right overall targets of the project?
- Midterm: Did the execution of the demonstrations take place according to the defined plans?
- Ex-post: Did the results of the pilots match the promised results?

In the case of the DataVaults project there is a slightly different approach to the three phases at which evaluation takes place. This is due to the agile software development method being

used for the development of the platform. The timetable, with a regular schedule of meetings, is laid out within the Evaluation Plan and reflects the iterative nature of the project set out in section 1.3.

6 DATAVAULTS STAKEHOLDERS

6.1 WHAT IS A STAKEHOLDER?

Regarding the evaluation process and the involvement of stakeholders within the evaluation framework, the starting point is the identification of all the stakeholders of significance to DataVaults at the outset.

A **stakeholder** can be categorised here as an individual, group or organisation that is actively involved in an initiative or project, or is affected by its progress and outcomes or has some influence on its process or its outcomes.

- Who is interested in the system?
- Who makes decisions?
- Who are the users, managers, developers, etc.?

Essentially, this is those who have the influence on the software requirements.

Examples of stakeholders are users of the system, operators of the system, developers, architects, customers and testers – hence, also people who are not involved in the development of the system, but use it later on, keep it in service or train the usage of the system. Additionally there are “political” and policy making stakeholders

6.2 STAKEHOLDERS AND DATAVAULTS

In dealing with the stakeholders in the evaluation process, there is already significant activity to build upon.

The Scenarios created in WP1, included all the necessary stakeholders and the identification of these stakeholders was a corner stone of this start of the development process. D1.3 embraced the outcomes from Task 1.3 which considered the requirements of all the stakeholders in order to contribute to both the demonstration scenarios and the high level scenarios for data sharing, whilst contributing to the definition of the Maximum Viable Product (itself an iterative process requiring further engagement). An extensive list of stakeholders was collected and their views will be regularly sought to finesse iterations of the software and its usage.

Within WP5, Task 5.1-DataVaults Platform Requirement and User Stories Elicitation is devoted to systematically aggregate and analyse the user requirements of all stakeholders involved in the DataVaults value chain, so as to conclude on the requirements that should be met by the DataVaults platform.

WP7 and WP8: D8.1 Dissemination, Communication and Stakeholder Engagement Plan set out a methodology which WP8 would embrace to engage with stakeholders, which would be shared with the exploitation managers in WP7, having their own relationships with stakeholders. Specifically, Task 8.4-Stakeholders' Outreach, Liaisons and Engagement Activities established that in addition to the standard dissemination and communication

activities, the DataVaults consortium will additionally be engaged in dedicated stakeholders clustering and decision makers engagement and awareness raising. These activities will target mainly the decision-making communities, namely the communities that hold more potential in commercially exploiting the results and applying them in daily practice and in regional or even national extent. Capitalizing on already formulated ecosystems, there would be proactive measures taken to enhance them with additional stakeholder groups, such as policy formulators, decisions makers, policy makers, organisations and initiatives focused on entrepreneurship, business support services, etc.

WP2: This WP could be seen as the natural home for taking into account many of the interests of the citizen as a stakeholder covering privacy and security concerns etc. but the citizen as a stakeholder will also be treated as also having economic and social behaviour. They will also be the users of the DataVaults services in their own right and also as consumers of the services offered by the demonstration sites.

It is natural for partners to engage with the stakeholders of most relevance to them, especially for the five demonstration partners. Each have well-defined interactions with their own stakeholders. The DataVaults individual partner's exploitation plans and potential scenarios based upon them set the lead in identifying the stakeholders which are most likely to be of most value.

Recognising the importance of making an early start in determining the key stakeholders, given the significance and important roles for stakeholders in most work packages, the cross-WP document referred to earlier, "Cross-project Stakeholder engagement approach" [6], was created in order to provide guidance on this aspect, recognising the importance of a joined-up approach across WPs.

6.3 STAKEHOLDERS AND EVALUATION

It is essential to a successful evaluation process that (a) stakeholders are engaged and active participants in the process; and (b) that the evaluation process and findings will be meaningful and useful to those ultimately responsible for improving and assessing the project results.

Involving the stakeholders in developing the questions in the early stages of the process is important. Effective evaluation questions can give guidance on how to examine the feedback and data collected to determine if the project is accomplishing what it should. Additional questions may be raised by them in the course of the ongoing dialogue.

Having stakeholders assist in developing the questions not only strengthens their "buy-in" and support, but their perspectives allows the project to look at itself and its evaluation process from a new angle.

At the evaluation stage, stakeholders can "hear" questions differently, especially if the questions' phrasings inadvertently suggest assumptions about the project, but with stakeholder involvement in establishing the questions to be asked, this risk is reduced.

Stakeholder Goals:

- Stakeholders will each have their own goals- which were elaborated in the creation of the scenarios provided to assist in the requirements capture process in WP1.

- These goals can be divided into more specific goals which requires the definition of more granular goals, with increasingly granularity as the project evolves.
- Goals were derived into concrete requirements

Essentially this is what should be implemented or achieved and what should be included in the evaluation process.

Task 1.3 stated that “The aim will be to *indicate all stakeholders’ points of view*, containing both functional and non-functional requirements, and to generate a high-level description of the expected behaviour of all sub-systems that are going to be specified and developed.” Scenarios were generated with a view to returning to them through the project. What was born in mind, whilst creating these high level scenarios, was the logic behind them, which is that they are expected to contribute to the overall success of the project, and this includes contributing towards a roadmap for the evaluation process. Collectively, they needed to be capable of covering all of the various types of data shared and all the phases of handling that data and include all the major features and components emerging from the project.

6.4 WHO ARE THE MAIN STAKEHOLDERS?

Figure 10 below illustrates the process of identifying the most relevant stakeholders, what their relationship with the project is and how and when they should be communicated with.

However, we are not starting from a blank canvas. Evaluation planning commenced at the outset of the project proposal, as did identifying relevant stakeholders. The DoA provides a solid starting point. The stakeholders come to the fore straight from the initial design of the project and subsequently throughout the project. Thus, guidance is well established from within the DoA, as illustrated in Figure 10 below. This will evolve as part of the Evaluation Plan, with stakeholders being put into a wide variety of categories.

Who is the stakeholder?	What is the best way to engage with the stakeholder?	How frequently should you communicate with them?	What is the stakeholder’s role?	What other special Considerations are there?

Figure 10 Identification of the stakeholders and engagement process.

6.4.1 Primary Personal Data Providers (Individuals)

This tier includes all the individuals which are generating and collecting their personal data from various services, devices and applications. It is these data which is considered “personal” and constitutes the core data of that is of interest to the DataVaults project. As well as the core function of supplying personal data, they act within the demonstrators in a variety of roles, as citizens, supporters and customers:

- Travelling
- Being tourists
- Attending sports and leisure events,
- Establishing businesses
- Consuming energy

- Interacting with health services

6.4.2 Economic Operators.

These are data seekers (also titled as 1st-tier economic operators), that look for enjoying business intelligence based on Primary Personal Data. In this tier, data seekers (organisations of any type) are able to work on the data of the first tier (primary data) and combine them with other types of data they have in order to create new datasets or relevant derivatives (insights, reports, etc.).

6.4.3 2nd-tier economic operators

Apart from these two main actors, DataVaults aims also to attract a third category. This can be seen as 2nd-tier economic operators that provide data and services based on analytics or data that is shared and generated by those economic operators, which belong in the core data sharing cycle (1st-tier).

Such stakeholders are interested in providing services that are based on data reused/resold/etc. In a typical scenario, the value generated by an organisation of this tier does not flow back to the data owners, as business deals are restricted between the Tier 2 (demand) and Tier 2 (supply) entities.

6.4.4 The European Commission

A primary stakeholder is the European Commission. The project has legal requirements with regard to the contract with the Commission, which need to be fulfilled in the high level scenarios and which will subsequently be evaluated. We can almost treat the DoA as another important, collective stakeholder for the project as a whole. In meeting the requirements set out in the DoA, we will be meeting those of the EU. In the same category, we can include the Standards Bodies shaping the European environment.

6.4.5 The project partners

Key stakeholders at this stage are also the members of the project team who have specific needs, again linked to the DoA, of what has to be achieved and what has to be demonstrated. Partner goals are best represented in the WP7 deliverables covering the exploitation of the project.

6.4.6 Overview of categories of stakeholder

A preliminary division into sixteen categories of stakeholder is:

1. Primary Data Providers.
2. 1st-tier economic operators / Data Seekers.
3. 2nd-tier economic operators / Data Services & Analytics Providers.
4. IT SMEs and Entrepreneurs interested in the DataVaults related technologies.
5. IT Large Scale Industries interested in the DataVaults related technologies.
6. Data Scientists, Researchers and Academia on relevant topics.
7. Standardisation Bodies on relevant topics.
8. Policy Makers on Data Privacy, Security, Trustworthiness.
9. Policy Makers on Big Data and Analytics.

10. Consortium Partner Networks (clients, collaborators, suppliers etc.)
11. Affiliated Projects, Clusters and Ecosystems.
12. Smart Cities and Communities.(through their associations and wide variety of groupings)
13. Industry Associations & Technology Clusters.
14. European initiatives and clusters (like BDVA/DAIRO and FIWARE).
15. Research communities, associations, federations (like IMS, EFFRA, IFIP, IEEE, NEM).
16. The general public as indirect beneficiaries.

6.4.7 Project affiliations

Although the project list will be expanded substantially as the project progresses, we already consider affiliation with projects identified at an early stage in planning the project and with their existing ecosystems and communities.

The WP8 Dissemination Tracker updates the list of projects where synergies can be exploited.

However, as the project has evolved and exploitation and dissemination plans started to be implemented, this list has expanded very significantly. So much so, a strategy has evolved as to how the new wider range of projects can be networked so as to share collective goals.

A new initiative, led by DataVaults has been established as part of the DG Connect, DG MOVE and DG ENER sponsored Smart Cities MarketPlace. This is the “Citizen Control of Personal Data” initiative. [20]

6.5 WHAT IS THEIR ROLE?

6.5.1 Stakeholders and the logic model

The literature recommended that logic models are developed collaboratively, with key stakeholders, as the process of developing the model creates shared understanding and expectations of the vision, activities, roles and responsibilities. It also adds to the vocabulary allowing for more improved communication within the project and within the evaluation process. [11] [9] [10] [1] Development of the logic model should be an iterative and dynamic process [21] and benefit from a coproduction approach, helping to keep it grounded. [16] As an iterative process, the key stakeholders should use the models to discuss, revise and keep communication lines open, and then feed in any learning or feedback. [12]

Whilst we cannot provide solutions answering all of the requirements referred to below during the course of a single project, it is worthwhile illuminating them as indicators of the direction we need to travel.

Individuals require:

- Improved control and awareness of how their data are shared and managed.
- Remuneration based on the data produced and shared.
- Better service provision through use of their data.

6.5.2 Data Industries require:

- Easier and seamless access to personal data, using secure and privacy aware guarantees.
- Significantly increased opportunities related to integrated data and data integration services' provision.
- More evidence-based analytics to support their strategic and operational decisions.
- Innovative and more effective products and services.
- Significantly reduced time to market for new products and services.

6.5.3 Entrepreneurs require:

- Significantly increased business opportunities related to innovative services' and apps.
- Easier and seamless access to constantly growing volumes of cross-sectorial multilingual big data.
- New business opportunities related to the building on top of existing solutions.

6.5.4 Data Scientists require:

- Improved and fast access to personal data allowing them to focus on experiments development rather than investing in data management and collection issues that need to be tackled due to regulation.
- Secure environment for experimentation with sensitive personal data structures.

6.5.5 Demonstrators require:

- Improvements to the services they currently offer.
- New methods of improving these services.
- Closer relationships with their citizens/customers as stakeholders.

6.5.6 Policy Makers require:

- Faster and more effective decision-making procedures based on personal data.
- Reference implementation to based future legislation and regulations for personal data.
- Contributions to European, national and local policy.
- Contributions to the standardisation processes.

6.5.7 Society at Large

- Advancing research and applying innovative technologies that take the best of breed personal data management.

6.5.8 DataVaults as a joined-up project

The stakeholders are instrumental to the design, demonstration and evaluation of the project. But, as D7.1 draws attention to the fact that the "DataVaults exploitation approach is not an isolated task but rather a linked one, in line with the objectives and progress of all other project activities."

In carrying out the demonstrations, each proposed feature can be judged and assessed alongside the anticipated business value of each feature for each user, organization and stakeholder. But, they should also be judged according to their significance at a wider project level as a feature may not be of enormous value for a particular demonstrator, or of

value to a particular stakeholder, but may be of much greater significance to exploiting the project as a whole.

6.6 WHAT IS THE STAKEHOLDERS ENGAGEMENT STRATEGY?

It is essential that following on from having a comprehensive understanding of who the wide range of stakeholders are, we ascertain the most suitable methods for communicating with them.

The intention is to:

- Listen to, negotiate with and bring together all the different viewpoints.
- Use the feedback to assist in the further development of DataVaults, leading to the optimal outcome
- Have as interactive a relationship with the identified stakeholders as possible in the evaluation process
- Demystify the evaluation and reporting by keeping the evaluation design, communications and process as simple to follow as possible.

However, engagement with the stakeholders is not an activity in isolation, simply to aid the evaluation process. It is intrinsic not just to the various aspects of the DataVaults project, but to all the day-to-day activities of the partners and in particular, the demonstration partners. Piraeus and Prato will constantly interact with their citizens, Olympiacos with their supporters, athletes and sponsors, and MiWenergia and Andaman7 with their customers and business contacts. Partners all exist within their own existing eco-systems.

WP8 is responsible for taking forward the stakeholder engagement and communication strategy, which is reported in the “cross project approach to stakeholders” and in the WP8 deliverable. Novel approaches will employ two specific stakeholder profiling methodologies, which comprise parts of the Platform Innovation Kit [22].

These are:

- The PIK Stakeholder Focus – Platform Service Canvas
- The PIK Stakeholder Persona Canvas Template

The second intends to adopt “Audience Segmentation – Persona Creation”. [23]

Within an evaluation framework and in the planning of the evaluation it is necessary to take into account the need for good communications. Particularly within the project team which is conducting the evaluation on behalf of the wider DataVaults project. In addition to this, good communication is required with those who will be using the services being demonstrated and those we wish to take up the services, be they citizens in their own right or as end users of the services being demonstrated. Adding to this are all the interested third parties who may subsequently utilise the platform. Thus, it is necessary to set out a communications strategy to steer this. D8.1 sets the overall plan upon which dissemination, communication, standardisation and community engagement activities will rely. The planning of the demonstrations and of the evaluation framework will throw up lessons for the revision of this plan at M18, whilst basing their own communication strategy upon it.

6.6.1 Communication Tools to be used

Within an evaluation framework and in the planning of the evaluation it is necessary to take into account the need for good communications. Again, WP8 will lead the communication process and set out the strategy. The DoA refers to “Various instruments for Reviewing/Evaluation of the system from users will be applied such as: Questionnaires/Interviews: Questionnaires will form the structured information that must be collected during the validation phase whilst Workshops/Interviews will be constituted from selected number of users from amongst the identified stakeholders”.

Customary Techniques for eliciting responses from stakeholders within the evaluation process include:

- Interviews
- workshops
- focus groups
- observations
- questionnaires
- existing documentation analysis
- User interface analysis
- Others

6.6.2 Communication of results

An important aspect of any evaluation framework concerns how we will communicate the results and how we will communicate the lessons learned alongside shaping the roadmap for future roll-out. Again, WP8 will take the lead.

6.7 SUMMARY

In summary, the key stages in relation to the stakeholders within the evaluation framework and in the evaluation process included:

- The identification of the stakeholder’s roles in evaluation planning, implementation, interpretation of results and decision-making about next steps.
- Review the list of stakeholders to ensure all appropriate stakeholders are included.
- Understanding and respecting stakeholders’ values.
- Creation of a plan for stakeholder involvement and a communication strategy.
- Identifying areas for stakeholder input.
- Bringing stakeholders together as needed.
- Targeting key stakeholders for regular participation.
- Involving stakeholders regarding the Theory of Change and Logic Model.
- Involving stakeholders regarding the evaluation questions.
- Contributing to understanding exploitation potential and sustainability.
- And crucially, a duty to assist the citizen as a stakeholder in providing guidance with striking the balance between privacy and security on one hand and economic gain or altruism on the other.

7 CONSIDERATION OF METRICS FOR THE EVALUATION PROCESS.

7.1 INTRODUCTION

We have identified a comprehensive list of questions in Appendix C. which will have subsequently been through a short-listing process by the project team, which determined the specific questions of most value to the project, which we needed to answer. Similarly, a process was undertaken to establish the most suitable metrics for these questions, whether they were precise questions such as whether a particular technical component performed as expected through to the determination as to whether the various higher level goals for the project were achieved. This section sets out the overall background to the selection of the most suitable metrics in response to the very wide range of questions posed. The finalised set of metrics derived from this framework will be produced within the Evaluation Plan itself.

To make the evaluation results more meaningful, we will also require a framework to help us make sense of our results, coming from several scenarios in five demonstration sites, in a more condensed and joined-up way. There are many techniques available to address this requirement and the following sections give examples of approaches we have considered. It will enable us to not simply take a narrow view on the performance of the technology and how well the demonstrators achieved their aims, but also how they contributed to the project as a whole.

Further consideration will be given as to how a wide variety of techniques can subsequently be brought to the project and how results can be summarised and collated in the most suitable and beneficial way, forming new metrics to gauge some of the higher-level goals we set for DataVaults.

The starting point for delivering the most relevant and useful metrics clearly comes from the evaluation questions which the project team and stakeholders have declared the most important in relation to the underlying questions which we have identified from amongst other filtering mechanisms including:

- The DataVaults “Theory of Change” elaborated in Chapter 3.
- The Benefit Logic model
- The Platform Business Model Canvas from DoA and the DataVaults Lean Canvas

The process of establishing the metrics to judge the technical achievements and the success of the five demonstrators along with the usability of the platform is relatively straight-forward and is based on making the right judgements of what to measure and how. Whilst the metrics associated with the Business Value created, alongside the levels of success attributed to individual partner’s exploitation plans will form a good source of evidence, we also need to address the achievement of the higher level goals as indicated in Figure 11 covering common criteria, below.

7.2 DIVISION OF LABOUR BETWEEN WP5 AND WP6

As the basic starting point for the evaluation process are the technical developments and to what extent they have been achieved, the testing process will generate clear metrics as to whether different features and technical components actually perform as expected.

Here we can set out the dividing line between the work in testing the technology in WP5 and testing the technical operation of the demonstrations in WP6.

The components of the platform will be covered by functional and integrated tests. This testing is part of T5.5 which follows the software development activities and will employ a software verification and testing framework to be used on all outputs.

The main difference between work carried out in WP5 and WP6 is that:

- In WP5, the focus is both on the finalisation of the very specific “user stories” to be demonstrated as part of the overall DataVaults framework and with further focus on the integration of all the technical artefacts (derived from the core research work-packages) into the actual framework itself.
- Whilst WP6 focuses on the deployment and use of this framework in the context of the envisioned use cases within the demonstration sites alongside the evaluation of the specific DataVaults functionalities, algorithms, services, etc., in terms of specific KPIs. It is these concrete KPIs which are at the heart of the technical evaluation, which needs to be conducted and documented in the context of WP6.

Thus the integration of the framework itself and the unit testing of each technical component will be carried out in WP5, whilst in WP6, most of the effort will be given towards the instantiation and integration of the DataVaults framework in the context of the use cases.

A set of technical KPIs will flow from WP5 from all the providers of the technical components of the DataVaults platform for each of their produced artefacts. The other main input from WP5 lies in the “fleshing out” of a concrete plan of what user stories will be evaluated during the two phases of the project implementation. To a great extent, the detailed schedule for the evaluation process is dependent upon the timing of the outputs from WP5.

Deliverable D5.1 provides the foundation for both the technical testing in WP5 and the evaluation of the technology in WP6. The variability of metrics being determined by the questions to be answered

The initial extensive range of potential questions can be categorised into the following categories, which in turn influence the metrics to be selected.

Category of Question	Description of Category
Those linked to WP2/WP9/WP10	These are questions, generally citizen-facing, which cover ethics, privacy, methods of data collection etc.
Business Model	These questions scrutinise the progress made in establishing the market approach to the further take-up of the product.

Product	These are in relation to making the required progress to produce a product
Communications	Questions here relate to satisfactory interactions with stakeholders.
WP5 Testing	These relate to the testing of the component parts of the platform which will be within WP5, and with the platform itself being addressed within WP6.
Demonstration	These questions relate to whether the demonstration sites have achieved their own objectives
Strategic	These address whether the higher level goals of the project are being met.
Non-functional requirements	These are the questions directly addressing the non-functional requirements identified

Table 9 Breakdown of questions requiring metrics

The priority of the questioning will alter as the project proceeds. Those aspect relating to the functionalities will be to the fore in the evaluation of the alpha and beta phases at M22 and M30, with the balance being shifted in favour of the business value aspects and the lessons learned in the later phases as the project and demonstration activities mature.

In monitoring the chosen metrics, it is important to reveal the sources of evidence used and the framework for reporting will include this aspect.

Examples of sources for gathering supporting evidence include:

- Feedback Forms
- Focus groups
- Logs from demonstration sites
- Logs from SPs involved
- User questionnaires
- Face to face interviews
- Online tools

We will return to this in a later section.

7.3 SMART METRICS

The over-riding principle is that we needed to define specific quantitative and qualitative metrics in a way to make them measurable, testable etc.

The well-known “SMART” approach was adopted, meaning that the metrics should be:

- **Specific** (Significant, Stretching and Simple) outputs and outcomes clearly state the issue of focus, target group and timeframe.
- **Measurable** (Meaningful, Motivational and Manageable) outputs and outcomes are ones which can clearly assess the change that has occurred.

- **Achievable** (Appropriate, Attainable, Actionable) outputs and outcomes take into account the scale and scope of outcomes that can be achieved based on time and resources available.
- **Relevant** (Realistic, Results-oriented, Rewarding) outputs and outcomes (immediate, intermediate and long-term) work towards the desired change in an incremental manner.
- **Time-specific** (Time-bound, Time-oriented) outputs and outcomes mean the expected timeframe for changes should be clear and realistic.

7.4 DETERMINING THE MOST RELEVANT METRICS

The demonstration sites have to decide which metrics, from an extensive list prepared collaboratively, are most relevant to their own situation and which specifications apply for them.

The methodology to follow is: MoSCoW: Must, Should, Could or Would.)

- **MUST**: Metrics that must be included to be considered a success.
- **SHOULD**: Represents a high-priority metric that should be included if it is possible. This is often a critical requirement but one which can be satisfied in other ways if strictly necessary.
- **COULD**: Describes a metric which is considered desirable but not necessary. It will be included only if time and resources permit.
- **WOULD**: Represents a metric that will not be implemented in a given version, but may be considered for the future.

7.5 METRICS TO ADDRESS FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

D5.1 provided an analysis of both the functional and non-functional requirements of the platform.

7.5.1 Functional requirements

A Functional requirement is the declaration of the intended functionality of a system and its components as reported by a hypothetical non-technical observer. The functional requirement is facilitating the development team to determine the expected behaviour or output of the system in the case of a certain input and in which a technical problem is addressed. Depending on the degree of efficiency, they can be split into “platform” and “demonstrator” oriented functional requirements. (See D5.1 DataVaults User Stories and Non-Functional Requirements)

In DataVaults, the functional requirements are placed under macro-functionalities (larger functional groups) that have been identified from the Epics, in order to provide a holistic view on the main operations that should be translated into technical requirements.

The results from the testing of these functional requirements will be available through the work carried out in WP5.

7.5.2 Non-functional Requirements

Non-functional requirements are the ones that define system attributes such as security, reliability, performance, maintainability, scalability and usability. Non-Functional Requirements are also referred to as system qualities and are of same criticality to functional requirement as they safeguard the usability and effectiveness of the entire system. [24]

In terms of the evaluation process, “Failing to meet any of them can result in systems, which fail to satisfy business or markets or user needs.” Again, the identification of the non-functional requirements was helped by the model proposed by ISO/IEC 25010:2011. [25]

D5. 1 identified thirty-nine non-functional requirements, each posing questions requiring metrics to be determined.

7.6 COMMON CRITERIA

The first step in utilising the Benefits Logic method, as described in Chapter 3, is to help define the metrics to be used is to scrutinise the pilot-specific criteria for success from the pilot’s goals, based on the pilot’s main objective and goals explained in the DoA .

Whilst recognising that each of the demonstration sites has its own characteristics and that the applications under scrutiny vary, we will endeavour to underpin this with as many common criteria as possible, to give added value from a project-wide perspective, However, there will be no point in making the demonstrations “jump through hoops” for the sake of it, if particular metrics and lines of questioning are not relevant or valid in a particular case. But the richer the contributions from the demonstrators that can be made to the overall evaluation of DataVaults, the better.

Scrutinising the collective achievements of the goals indicated by the various metrics with agreed common criteria will bring about joined-up results, as illustrated in the Figure 11 below.

7.7 CATEGORIES OF CRITERIA ON WHICH TO BASE METRICS

Services developed and run within the demonstration must adhere to the common criteria established to making the provision of a project wide view easier, wherever possible. Basically, from a technical perspective, the results to be met by the services built and run in the five demonstration sites should adhere to the criteria for reporting at the project level and which can potentially to be added to, including those already highlighted in D5.1.

Following the model based on ISO/IEC 25010:2011, we have identified a set of quality characteristics contributing to the software product quality which will need to be considered during the evaluation process. These will often require different metrics, depending upon who is being asked a particular evaluation question. Many of the questions raised will be capable of being answered from different viewpoints. And the answers will be radically different if the respondent is a business wanting to utilise the platform or a citizen sharing data or a software developer.

7.7.1 Quality Characteristics

- **Functional Suitability:** The demonstrations must provide the required functionality. The whole development must fit the functional requirements discussed throughout the project's development. There needs to be functional completeness, correctness and appropriateness.
- **Security and personal data protection:** Availability, integrity and confidentiality of data exchanged through the platform must be guaranteed, alongside non-repudiation, authenticity and accountability. It is extremely important for the success of the demonstrations and project as a whole to ascertain the "feeling" of the user on this aspect and the compliance with national and European regulations.
- **Performance Efficiency:** This includes Time Behaviour, Resource Utilisation and capacity.
- **Maintainability:** This includes modularity, reusability, analysability, modifiability and testability. The services and the infrastructure required to run them must be maintainable without incurring in "non-reasonable" costs.
- **Scalability:** The addition of new service providers and users should be easily dealt with by the system designed.
- **Flexibility:** The platform must be, desirably, designed in a way that allows future development and adaptation: implementation of new services, integration, etc.
- **Reliability:** The aim of the pilot is to run real-life services; the user of the services run within the pilot must perceive them as reliable. This entails maturity, availability, fault tolerance and recoverability.
- **Portability:** The solutions adopted should, as far as possible, be portable to different platforms and environments, being able to demonstrate adaptability, install-ability and replace-ability.
- **Usability:** DataVaults services must offer an acceptable degree of usability and they should comply with commonly accepted standards and be ethically acceptable. It should also be Citizen focussed, as alongside the technicalities of securing personal data, it is also vital that it is citizen-centric in design. The following need to be taken into account: Appropriateness, Recognisability, Learnability, Operability, User Error Protection, User Interface Aesthetics, and Accessibility.
- **Interoperability:** interoperability among all systems involved in the wider eco-system must be guaranteed as should **Compatibility** and co-existence.
- **Business value:** The piloted services should add some value to current services, enriching "services" with additional functions.

We will look at the issue of business value in the following section.

7.7.2 Quality in use criteria

"Quality in use" criteria are also set out in ISO/IEC 25010:2011.

The table below sets out the following characteristics.

“Quality in use” characteristic	Sub-categories	Comment
Effectiveness		Accuracy and completeness with which users achieve specified goals.
Efficiency		Resources expended in relation to the accuracy and completeness with which users achieve goals.
Satisfaction	Usefulness	Degree to which a user is satisfied with their perceived achievement of pragmatic goals, including the results of use and the consequences of use.
	Trust	Degree to which a user or other stakeholder has confidence that a product or system will behave as intended.
	Pleasure	Degree to which a user obtains pleasure from fulfilling their personal needs.
	Comfort	Degree to which the user is satisfied with physical comfort.
Freedom from risk	Economic Risk Mitigation	Degree to which a product or system mitigates the potential risk to financial status, efficient operation, commercial property, reputation or other resources in the intended contexts of use.
	Health and Safety Risk Mitigation	Degree to which a product or system mitigates the potential risk to people in the intended contexts of use.
	Environmental Risk Mitigation	Degree to which a product or system mitigates the potential risk to property or the environment in the intended contexts of use.
Context coverage	Context Completeness	Degree to which a product or system can be used with effectiveness, efficiency, freedom from risk, and satisfaction in all the specified contexts of use.
	Flexibility	Degree to which a product or system can be used with effectiveness, efficiency, freedom from risk and satisfaction in contexts beyond those initially specified in the requirements.

Table 10 Quality in use criteria

Figure 11 below makes the link between the objectives to the criteria upon which the metrics should be based.

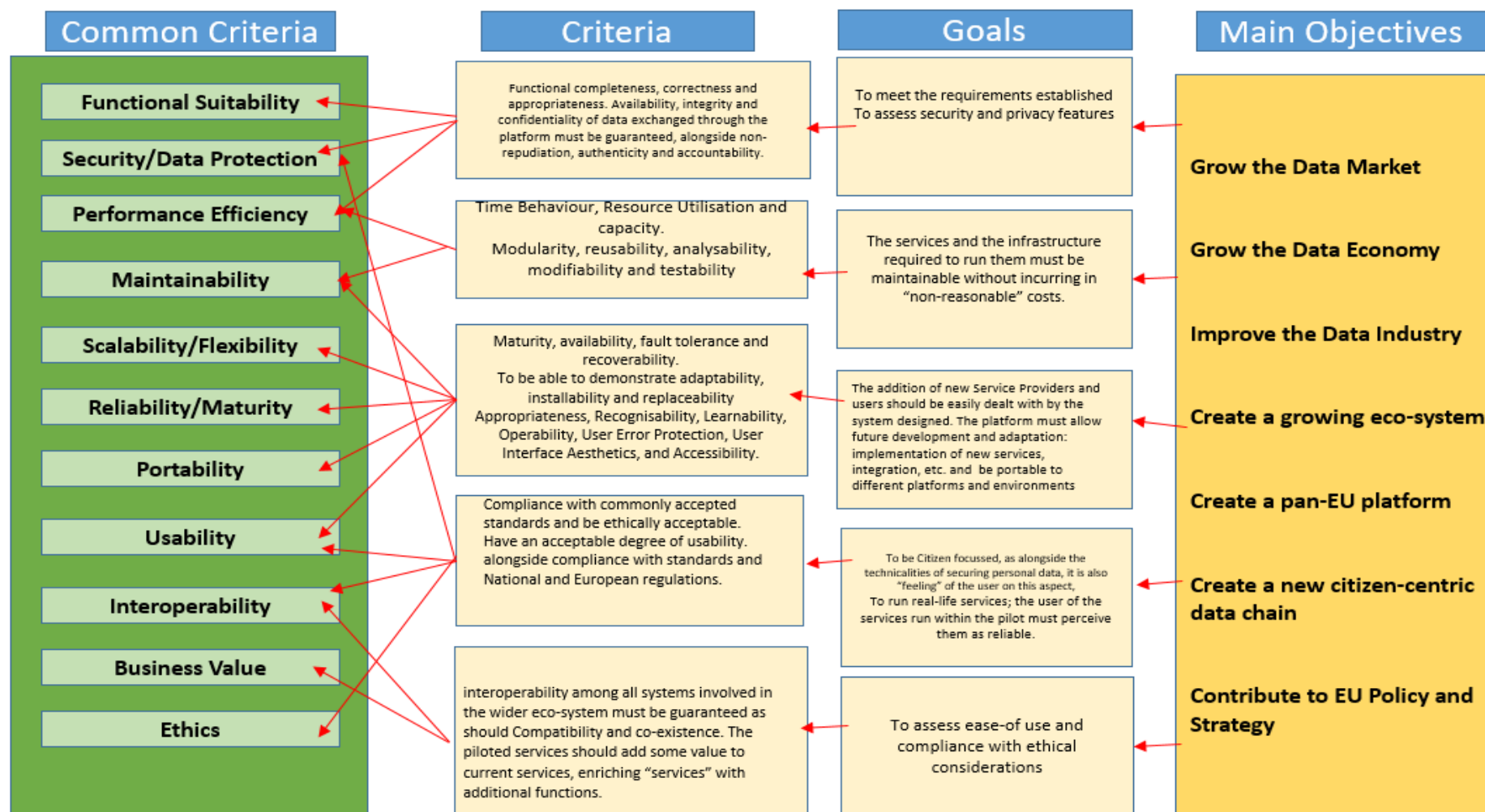


Figure 11 From Objectives to criteria for basing metrics upon.

7.8 BUSINESS VALUE METRICS

The metrics loosely described above, whilst also demonstrating value to business, will essentially reflect successful testing of the technology in the eyes of the stakeholders involved in the demonstrations. These will need to be complemented with more specific metrics geared to drive the exploitation and further take-up of the DataVaults technical results. Chapter 6 refers to the importance of involving stakeholders in the whole process. Here we will concentrate on those identified as crucial partners in the various stages of the Data economy.

These data seekers have been identified in the DoA as:

- Those involved in Storage and Aggregation.
- Those involved in Analysis and Production.
- And those regarded as the Consumers and End-users such as Government agencies, public organisations and enterprises of all sizes.

7.9 COMMON CRITERIA METRICS

Table 11 below indicates the format to be used with the ID column reflecting the categories listed in Figure 11, in the previous section.

ID	Description of Metric.	Success criterion	Result	Comment
Functionality metrics labelled F1, F2 F3 etc.				
Security S1 ,S2 S3 etc.				
Usability, U1,U2 etc.				
Business Value BV1 BV2 etc.				

Table 11 Common Criteria and Metrics

7.10 VALUE-DRIVEN DEVELOPMENT AND METRICS

Agile development methods focus rigorously on delivering business value early and continuously, as measured by running, tested software. This requires that the team focuses on product features as the main unit of planning, tracking, and delivery. From week to week and from iteration to iteration, the team tracks how many running, tested features they are delivering. They may also require documents and other artefacts, but working features are paramount. This in turn requires that each "feature" is small enough to be delivered in a single iteration. Focusing on business value also requires that features be prioritized and delivered

in priority order. Different agile development methodologies use different terminology and techniques to describe features, but ultimately, they concern the same thing: discrete units of product functionality.

Ongoing evaluation needs to be incorporated into this process and hence clear acceptance metrics will be required at each stage of the iterative process to ensure a smooth flow and to keep the project on track with the acceptance or rejection of each of these features as these discrete units of product functionality become available. As referred to earlier, we will have a living document as an Evaluation Plan. The approach is reflected in the evolution of the Maximum Value Product in D1.3 and in the activities of WP5 and the evaluation approach needed to provide metrics to monitor this.

7.11 METRICS IN RELATION TO HIGHER LEVEL GOALS

In addition to the metrics generated to cover the successful implementation and running phase of the demonstrators, the functionality and technical aspects of the platform and the personal app, their security and privacy, ease of use etc., we will also strive to bring on board the specific questions of utilising the measurable business values in relation to potential exploitation and sustainability goals. As well as for taking stock of the lessons learned. These will be augmented by combining a variety of other approaches to essentially shine as many torches upon the project activities and results as possible, to tease out information from a wide a perspective as possible.

7.12 NOVEL BUSINESS MODELS

Metrics will need to be designed to cover progress being made in designing novel collaborative business models once the demonstration planning phase is complete and D7.2 Interim Project Exploitation Report and Updated Plan is available. We will concentrate on this later in the project but the requirements for covering this topic should be reflected in the evaluation framework at this stage. This key aspect in the design and iterative process for the evaluation will be its potential to contribute to Task7.2-Novel Business Models Design for Personal Data Sharing and Task7.3-DataVaults Value Proposition and Platform Business Case Development. These will rely on the demonstrators to help to identify the value proposition, the real project's offerings and its placement towards defining eventually a business model that can carry forward the monetisation of the platform and its market entry. The demonstrators will give input to the project's value proposition and its business plan.

We would further anticipate that the lessons learnt from the project (with regard to the implementation, operation and execution of the demonstrators) will be generated, formulating them as methodological adoption guidelines for the further exploitation and utilization of the DataVaults platform, that will lead to activities for further population of the platform with data and for bringing on board other entities. (Task6.9)

As a guide to creating further questions and relevant metrics to be able to contribute to the business proposition for DataVaults, a typical approach would be to turn to a Business Model Canvas. But for DataVaults a slightly different approach has been adopted as the Business

Model Canvas was characterized as static, because it does not capture changes in strategy or the evolution of the project. [26] It is also regarded as being limited in that the template focusses on organizations and can become isolated from its environment and this is significant in the case of DataVaults working in an elaborate industry structure and in a social environment designed to be citizen-centric.

For this reason, instead of following the usual approach for business planning on the basis of the Business Model Canvas, the DataVaults consortium initially built the business model provided in the DoA on the basis of the Platform Business Model Canvas, which is an extension of the Osterwalder Business Model Canvas in order to cover the business aspects of a multi-sided platforms business, and consists one of the core models of the Business Innovation framework for digital platforms and ecosystems. [22]

Subsequently, the DataVaults consortium has built the business model on the basis of the Lean Canvas, in order to cover the business aspects of a Personal Data Marketplace business. The business model, illustrated in Figure 12 below, will be evaluated and refined during the project and it is expected to change during and after the end of the project to adapt to real conditions and facts.

The DataVaults platform aims to be placed in the market as a data broker service, and does not intend to sell self-produced services to its customers (although this can also happen, it's not the core functionality of the platform), not even selling data on which the platform has ownership rights. From a business point of view, it is a multi-sided platform with the main goal to provide the infrastructure to facilitate transactions between multiple parties, and derives value not in an inherited way but from the stakeholders (platform users) network itself.

This all contributes to making the evaluation process more complex and increased reliance on canvassing the opinions and judgements of the wide range of stakeholders set out in Chapter 6, as well as the wider view from the community of practitioners and sister projects with which WP7 will be in conversation.

In terms of metrics to be adopted, initial suggestions from the DoA include: Established contracts, Volumes of Data Exchanged, the value of this data exchanged as well as basic indicators such as the number of users attracted to the platform.

Specific metrics linked to Third Party use of the platform within individual demonstrations site activity might be envisaged.

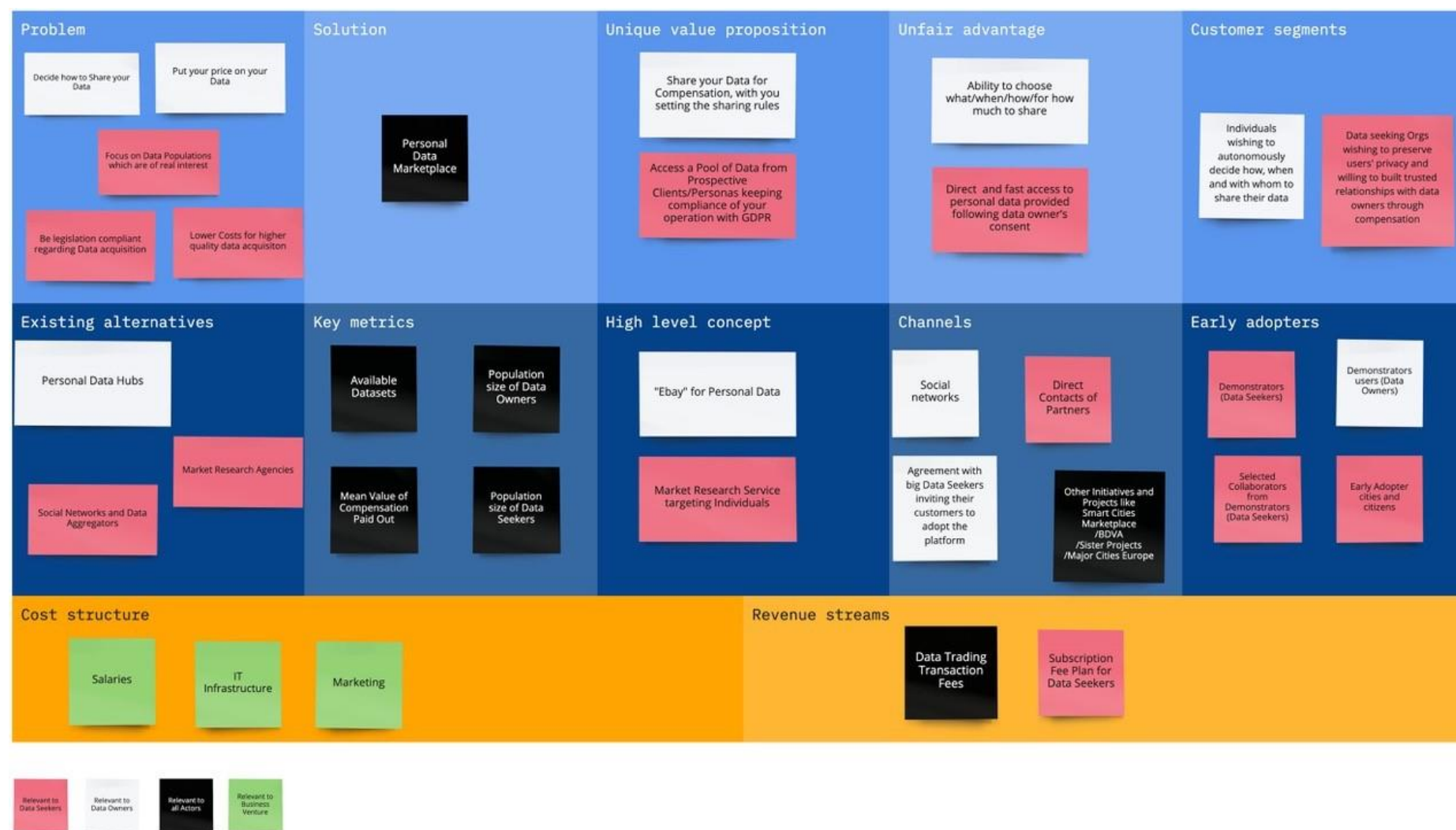


Figure 12 Lean Canvas of DataVaults

7.13 HIGHER LEVEL GOAL METRICS REQUIREMENTS

We have concentrated on achieving the goals prescribed for the demonstrators, but it is necessary to translate the achievement of these goals into success criteria for the project as a whole. We would expect to be able to have answers to the questions in the table below in the final phase of the project, measuring how we have contributed to or have influenced the higher level goals we have identified within the DataVaults Theory of Change.

We will have utilised the Benefit Logic approach to derive questions and similarly to ascertain the most valuable metrics linked to the satisfactory resolution to the questions posed. For example, we will need to provide sets of criteria to establish whether we have succeeded in expanding the personal data lake and whether the targeted eco-systems have grown. Metrics needed to be considered in order to be able to address such questions as those raised in the table below:

Is there any evidence of an Increase in data economy activity?
How has value increased for all in the data chain through:
<ul style="list-style-type: none"> • Technical convergence
<ul style="list-style-type: none"> • Business Innovation
<ul style="list-style-type: none"> • Cross-domain collaboration
Has Increased scale been demonstrated from small existing initiatives?
Do we contribute to and are we aligned with: other projects and regulatory tools?
Has a consortium wide sustainability plan been delivered?
Have we cultivated a trusted sustainable and ever-growing ecosystem, with industry offers expanded by citizen controlled access to more and varied data?
Have we collaborated with other projects and businesses?
Have we propelled the creation of a joint venture of personal data owners and data seeking organisations?
Have we supported the emergence of data markets and the data economy?
Have we successfully linked to and brought in industrial data providers (not necessarily as consortium members) that will populate the platforms?
Have we demonstrated a 20% annual increase in the number of data provider organisations in the personal and industrial data platforms?
Have we demonstrated a 50% annual increase in number of users (data subjects) in the personal data platforms?
Have we demonstrated 20% annual increase in volume of business (turnover) channelled through the platforms?

Have we indicated how we will have contributed to:
<ul style="list-style-type: none"> • Digital Single Market Strategy for Europe?
<ul style="list-style-type: none"> • The public-private partnership "Big Data Value Association"?
<ul style="list-style-type: none"> • Improving innovation capacity?
<ul style="list-style-type: none"> • Financial and Business impact in sectors working on personal data?
<ul style="list-style-type: none"> • To European policies on data protection and security?
<ul style="list-style-type: none"> • To other EU policies/ strategies and to standardisation?
<ul style="list-style-type: none"> • To other socially important impacts?
Have we enabled smaller players to participate in the data economy better?
Have we evidence of growing data eco-systems?
Has there been a contribution to the Basis for Privacy, Ethics and IPR?

Table 12 High level goals requiring metrics

7.14 BENEFITS LOGIC: TRANSLATING RESULTS FROM THE DEMONSTRATORS TO A PROJECT LEVEL.

This section sets out to outline how a preliminary valuation of the benefits of the demonstrator, by analysing the verified benefits for the different actors and stakeholders in the demonstrations, can be used to look ahead to see how these benefits may likely scale-up in the future.

The Demonstrator's Benefits will continue to be considered in depth during all phases of the project, based on the values linked to the success criteria established for the demonstrators and the Benefits Logic method applied to obtain and to consolidate findings in terms of progress and results achieved, which is the basis for assessing the value of the pilot. The Benefits Logic method was introduced as a means of formalising the achievements of the demonstrators. It was oriented towards translating the pilot's objectives to results that can now start to be measured and evaluated.

The benefits logic has been designed to serve the purpose of measuring, through qualitative and quantitative metrics, the results of the pilot. The success of the project, at the end of the piloting phase, will be evaluated through concrete, measurable and objective results. The results having been used to demonstrate that the technical objectives of the demonstrations have been met, will be used to demonstrate that the business objectives and higher level objectives have been met.

Continuing from the process to derive metrics for the demonstration sites, having common criteria, reflected in Figure 11 above, it is possible to use these initial results to address the achievement of the identified higher level goals. One starting technique is to start to structure the results and responses to the evaluation questions into the categories of USE, VALUE and LEARN (see Table 3 above) in order to help make a collective sense of a wide-ranging set of

results, from the evaluation of the common criteria used by the individual demonstration sites. This relationship is depicted in Figure 14 below.

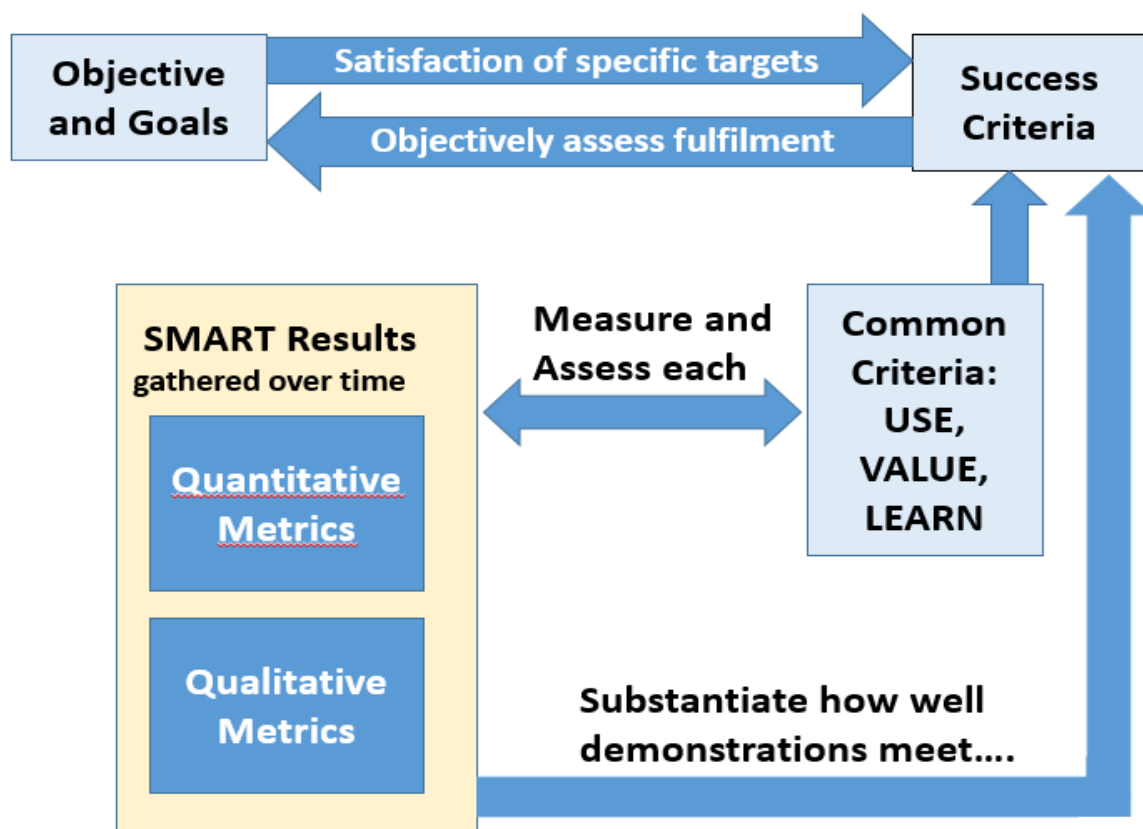


Figure 13 From Objectives and Goals to measuring success

Table 13 below is indicative of the format to be utilised for collating the results from all five of the demonstrators to derive enhanced meaning at the DataVaults project level.

Common Criteria to be measured	Type	MosCoW	Use	Value	Learn	Description of Metric.	Success criteria for Metric	Method to Gather Results for the Metric	Target Group
Functional Suitability Performance efficiency Compatibility Usability / Understandability Reliability/Maturity Security Portability Maintainability Flexibility/Scalability Interoperability Etc.	Quantitative/Qualitative	Must, Should, Could or Would	U	V	L				Stakeholders benefiting

Table 13 Format for collection of results

KEY

U is USE-the measurable results related to the use of the services demonstrated (number of users, uptime of the services etc.)

V is VALUE and is in relation to results linked to the technical or business value added as a consequence of using DataVaults enabled services (service provider estimations, user's satisfaction etc.)

L is LESSONS LEARNED from the technical and business perspective and effect on future policy.

7.15 ADOPTION

Whilst this document has been primarily establishing the evaluation framework for the initial demonstration phase, it will be necessary later in the project, to consider the adoption of metrics related to adoption.

Adoption is the process where an organisation introduces new IT tools to support a (new) way of working. This is not merely focused on whether a service provider was finally able to introduce/integrate with DataVaults but rather on all the possible lessons to be learned from this process. Adoption will be recognisable in the Evaluation reports and feed from the data gathered for the demonstrations. An analysis will be performed and reported in the final deliverable of this work package, following the metrics presented above. This analysis will allow the demonstrators to set the outcomes in a sense of learning perspective, serving as a reference for future adoptions and implementation of DataVaults.

7.16 LESSONS LEARNED

Whilst not conventionally a metric, the “Lessons Learned” from DataVaults will contribute to ascertaining whether various aspects of DataVaults have successfully contributed to the adopted metrics, complementing them. Whilst not directly seeking to evaluate whether we have learned enough lessons, their contributions to achieving other goals will be acknowledged.

We would anticipate being able to create lessons learned in a logical framework that links to the other identified goals and objectives from individual WPs and across the project as a whole. These would include “ease of use”, liability, pricing, service level agreements, support as well as technical and security requirements, legal restraints, liability questions and the security, reliability and robustness of the DataVaults infrastructure, study of barriers encountered etc.

For instance, the contacts with service providers in the demonstrations should benefit WP8 if it comes to packaging DataVaults as a service and engaging with the private sector. In the same way supply and demand in the area of standards, robustness and service levels should iterate between the (end) service providers in the demonstrations and DataVaults platform. Lessons learned will be of value internally as well as to outside stakeholders.

7.17 IN CONCLUSION

The value of the pilot is translated into measurable benefits for each one of the stakeholders involved in it. These stakeholders fall into a variety of categories and the values can be

attributed to the benefits realized in the variety of roles and tasks for which DataVaults is being utilised. The set of metrics has been selected with the purpose of providing a clear and objective view of the demonstrations. Specifically, they are aimed at tracking the usefulness, reliability, usability and security for the end user and for the service owner in the data economy. And they are aimed at providing a view on all the potential benefits in user acceptance, process execution savings and public image derived from utilising the DataVaults platform.

Demonstration partners have decided, taking into account the business perspective and the technical possibilities available, which metrics are most relevant for themselves, whilst ensuring they make a contribution to the common criteria necessary for the overall evaluation of DataVaults.

8 DATA COLLECTION AND ANALYSIS

8.1 INTRODUCTION

Data collection is a systematic process of gathering observations or measurements. While methods and aims may differ between fields, the overall process of data collection remains largely the same. Before we begin to collect data, we already know the purpose of our research, we have established the questions which need answering, and from that and the discussions around metrics, the types of data we will need to collect. Feedback from WP10 will be valuable here to ensure all ethical aspects have been covered.

This leads to determining the methods and procedures we will need to use to collect, store, and process the data. As mentioned above, we will use a mixed method of gathering both quantitative data, as is expressed in numbers and graphs and is analysed through statistical methods and qualitative data, expressed in words and analysed through interpretations and categorisations. Quantitative data collection methods include surveys, tests and assessments. Qualitative data collection methods include interviews, focus groups, observations and review of business artifacts.

The identification of the data to be collected and the methods for its collection is an area which needed to be considered and written in conjunction with the progress in T6.2 of the design of the demonstrations, as the demonstrators will need to know what data they are collecting in their planning process. It is also an area which will evolve as the project matures and as alpha and beta versions become available. The topics under scrutiny will widen, as will the scope of data collection and its subsequent analysis. Critical considerations in data collection include who will collect the data and how to engage populations

Some data will be gathered in a holistic way, covering general perceptions as a citizen, in addition to perceptions as a citizen who is also a traveller, sports enthusiast, culture or energy consumer, tourist, health-watcher etc.

The data will generally not appear as raw data, but after analysis in most cases, in respect to the questions it is being gathered to answer and so analysis will be ongoing at the micro level throughout. Micro question analysis will combine to answer broader questions on a topic, such as perception of security.

In the later stages of the project a more joined-up approach to analysing all these micro-results will bring us to being able to answer the wide ranging questions in regard to whether we have achieved the higher level goals.

Here we are outlining a framework within which the already identified data can be collected and which will be able to embrace new sources of data as the project evolves. A more detailed description of how the data was gathered will be included in subsequent deliverables. This deliverable itself has nothing concrete to report and exists to help direct the demonstration planning and complement D6.2 whilst starting to address the Table of Contents for D6.3 which covers the alpha version evaluation.

8.2 DATA GATHERING TECHNIQUES

Careful consideration was given in regard to what methods were to be used in order to gather data that helps to address the research questions. The Table below points to the most suitable methods for the collection of different types of data. The methods selected will help directly answer the research questions which we set.

Method	Appropriate use	Data Collection Method
Survey	To understand the general characteristics or opinions of a group of people.	Distribution to a sample, a list of questions to be answered online, by phone or face-to-face.
Interview/Focus group	To gain an in-depth understanding of perceptions or opinions on a topic.	Verbally ask participants open-ended questions in individual interviews or focus group discussions.
Observation	To understand something in its natural setting.	Measure or survey a sample without trying to affect them.
Desk research	To understand current conditions or practices.	Access relevant documentation.
Secondary data collection	To analyse data from populations not accessible first-hand.	Find existing datasets that have already been collected, from sources such as government agencies or research organisations.

Table 12 Basic Data Collection Methods

8.3 DATA COLLECTION PLANNING

Having determined the methods we will use- which will require a combination of all possible methods, this had to be incorporated into the DataVaults Evaluation Plan, dovetailing into D6.2, as to how we intended to implement the data gathering process.

8.3.1 Operationalisation

Operationalisation is the turning of the conceptual ideas into measurable observations. The data collection plan within the Evaluation Plan takes into account how the concept of the aspects of DataVaults which we wish to concentrate upon translates into the operational definition of what will be actually measured.

8.3.2 Sampling

A set of sampling plans relating to the various populations of interest were required. The populations were determined by the sets of questions, but with the potential for overlapping

sets of questions and populations to be tackled simultaneously where possible. Other factors to be taken into consideration included:

- recruiting participants.
- obtaining measurements.
- required sample sizes.
- accessibility of the sample.
- timing for the data collection.
- Etc.

8.3.3 Standardisation process

Given that the demonstrations take place in five different locations, a process to enable standardisation of approaches had to be designed, contributing to the “handbook” being delivered as part of Task 6.2.

8.3.4 Data Management Plan

A standard requisite in an evaluation framework is the provision of a data management plan.

In the DataVaults case, we are more concerned with the availability and access to the data which is the life-blood of the project. Whilst the focus is on the acquisition of a citizens personal data, access to the data identified in D6.2 and in Section 2.4 DataSources Available and Needed of D1.4 is crucial and will be monitored regarding succesful aquirement.

8.3.5 Data Collection

The sources of evidence for the set of SMART metrics previously established in section 7.4 for each of the nine criteria that are common to all the demonstration sites in DataVaults included the following:

- Feedback Forms,
- questionnaires, close-ended, open-ended, multiple choice, ranked, etc
- the Logs from Data users etc
- security checklist.
- others

Tools used will be included in the Handbook and questionnaires used etc will be reported in subsequent deliverables, with good practice as set out in a guide much cited by government departments being observed. [14]

8.4 ITERATION AND THE THEORY OF CHANGE

As has been stated throughout this document, the evaluation of DataVaults, just as in the rest of the project is very much an iterative process. This document has set out the Evaluation Framework which will shape the evaluation process in the 18 month demonstration phase. At two distinct stages after the completion of the alpha and beta platform demonstrations, we will have finessed the elements covered in this section and gathered preliminary results.

It is at the next “alpha stage” that we will have concluded our discussions on the questions, metrics, data collection etc. and we will have our first findings to scrutinise and analyse. Regardless of the results, the process will still adapt as the technical developments continue,

but there will be lessons to learn from the first iteration. All these changes and initial evaluation findings will be reported in D6.3 Pilots Evaluation of Alpha Platform Version due at M24. It will provide the documentation of the demonstrators' operation and execution consolidating the available input of Tasks 6.3-6.7. This report will evaluate the alpha version of the platform and set out any changes required, within this evaluation framework, to improve all the processes identified as requiring attention.

The iteration will be repeated with the production of D6.4 Demonstrators' Evaluation of Beta Platform Version at M30. This will continue with amendments and improvements resulting in D6.5 Final Evaluation and Impact Assessment Report at M36. Documentation of the demonstrators' operation and execution as well as the impact assessment consolidating the input of Tasks 6.2-6.7. This report will evaluate the final version of the platform.

Whilst some changes will be linked to operational adaptations, an ongoing process will be undertaken throughout these iterations in terms of looking for reasons to make amendments. The Evaluation Framework has its Theory of Change as a foundation. This was developed at an early stage- that of the Theory of Change at the Design Stage. However, as the project evolves, the function of the Theory of Change will alter and it will become the Theory of Change at Evaluation.

During the main evaluation process the initial Theory of Change at the design stage was discussed with the key actors and stakeholders involved in the implementation of the DataVaults project. Revisions and updates to the Theory of Change are made to reflect any formal documented changes in the project's intended results or intervention logic and to take into account any changes in external context of the intervention that may influence the causal pathways and the changing needs and priorities of stakeholders.

For example, in the course of project implementation, some project outputs or even whole components might have been cancelled or added in order to respond to external changes (or misjudgments at design) regarding, among other things, stakeholder needs and priorities, resource availability, partner capacity and risk factors. The Theory of Change at evaluation should reflect these changes, to the extent that these have been formally captured in project revision documents, revised technical plans, Project Steering Committee minutes etc.

Therefore, the evaluation team will make sure that the Theory of Change at evaluation will cover such potentially changing topics such as:

- Where intermediate results have an effect and require changes to be made where necessary.
- Any new drivers and assumptions are added and their role in the change processes explained.
- Changing Interdependencies between causal pathways are identified and reflected;
- Any new stakeholders involved in the change processes are identified, as well as how they affect or are affected by the changes.

The evaluation team will discuss the revised Theory of Change with main actors involved with the execution and implementation of the project to make sure that they have captured accurately the updated intent of the project and they agree with it. When the Theory of

Change at design has been updated and agreed it becomes the Theory of Change at evaluation.

Any such changes will be reported at the appropriate time.

8.4.1 Evaluation Findings and Interpretation of findings

As stressed above, there will be no findings to report until M22. The final results of the evaluation process will appear in D6.5 Final Evaluation and Impact Assessment Report. But this will be complemented with D6.6 DataVaults Scaleup Roadmap and Key Takeaways, again at M36. This will provide the documentation and lessons learnt from the DataVaults project, and constituting methodological adoption guidelines for the utilisation of the platform. This second report will have a greater emphasis on future implications for the project as a whole rather than whether it successfully carried out what it promised. The evaluation process should enable us to make informed decisions about improvements and next steps/lessons to share at each stage of the project leading to the final results.

9 CONCLUSIONS

This document started from a blank sheet of paper and was completed as a result of scrutinising all the various mechanisms which have been adopted for carrying out an evaluation, as there is no one “right way” and also because evaluation processes need to be adapted to suit the needs of a specific project.

The process led to the establishment of this Evaluation Framework Document as a guidance for how we should tackle the evaluation of DataVaults. The evaluation itself needing to cover micro-aspects of the individual demonstrations, through to the highest level goals set by the project.

The evaluation process is one in which a greater understanding of the project emerges and this is true of this document. That the creation of it left no stone unturned with regard to the detail of the project, with the result being a much greater appreciation of the wide range of benefits which this project will bring and the need to demonstrate and show these sometimes hidden benefits

Scrutiny of all the questions which could be posed regarding the progress of the project and its overall objectives, led to the development of the actual Evaluation Plan itself (Appendix A), which co-exists with the Demonstration Plan from D6.2. This will become a living document and a valuable tool to utilise for the rest of the project.

In conclusion, we now have a range of tools to understand how well the project is doing, at the demonstration and at the project level and the beginnings of a plan to ensure that this actually happens. The plan will have its first trial in D6.3 when it is tested on the evaluation of the alpha version of the platform.

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APPENDIX A: THE DATAVAULTS EVALUATION PLAN

Persistent Personal Data Vaults Empowering a Secure and Privacy
Preserving Data Storage, Analysis, Sharing and Monetisation Platform

D6.1 Appendix A EVALUATION PLAN



DataVaults is a project co-funded by the European Commission under the Horizon 2020 Programme (H2020-ICT-2019-2) under Grant Agreement No. 871755 and is contributing to the BDV-PPP of the European Commission.

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1 INTRODUCTION

The Framework established in D6.1 is the basis for this Evaluation Plan, which **will continuously be updated as the project evolves**.

“An effective evaluation plan is a dynamic tool, or a ‘living document’, that should be updated on an ongoing basis to reflect changes and priorities over time.”¹

D6.1 sets out to describe how we will evaluate both the pilots and the project as a whole. It provides the “Documentation of the evaluation framework and validation methodology, defining the various practices for recording feedback from the demonstration activities and including a set of test-cases to be executed by the demonstrator partners.”

Task 6.1 worked towards providing an inclusive **demonstrators’ evaluation framework**, which is covered in the main body of the deliverable. And as well, a **general guideline document** to be used to **monitor and align the demonstration phases**. It is part of this general guideline document which we are providing here in the form of this **Evaluation Plan**.

The evaluation framework will continue to be studied extensively and should lead to valuable observations and conclusions about the **viability and the sustainability** of the DataVaults platform. This Appendix sets out how we plan to achieve this.

The demonstrations themselves commence at M19 (July 2021). There is an initial evaluation very quickly into the process of rolling out the demonstrations across the five sites at M22. This will be minimal in relation to the final evaluation. But it will:

- 1). Enable us to check assumptions made and
- 2). Enable us to check all the conditions are right to make progress in the coming months.

During the first phases of the project, the needs and requirements of the stakeholders and of the personal data market, were elicited. The product development phase involves a series of steps to develop/extend/customise technologies utilising the agile development philosophy to constantly update the platform, based on feedback received from the actual users. The objective of that phase was to develop a truly innovative product that meets the requirements of the users in a cost-effective and time-efficient manner. Developments were interleaved with releases of mock-ups and MVP prototypes to create a shared understanding on the functionalities of system modules. Evaluation of these early and intermediary stages are followed by the final evaluation which will be all encompassing. Much cannot be evaluated until this stage. The deliverables documenting these evaluations are:

- D6.3 Pilots Evaluation of Alpha Platform Version [M24]
- D6.4 Demonstrators' Evaluation of Beta Platform Version [M30].
- D6.5 Final Evaluation and Impact Assessment Report [M36]

¹ United Nations Environment Agency, “evaluation-criteria-and-ratings,” [Online]. Available: <https://www.unenvironment.org/about-un-environment/evaluation-office/our-evaluation-approach/evaluation-criteria-and-ratings>. [Accessed 21 JAN 2021].

This document sets out the plan through which we will carry out these three phases of the evaluation process. What we will do and how we will do it is already determined by the Evaluation Framework set out in the main body of D6.1. Here we are starting to fill in the detail of what needs to be done, starting with what we need to cover in the first four months of the demonstrators becoming active within the project. The first milestone in this process will be the delivery of the first stage of the evaluation at the end of M22, in the form of the results of the evaluation of the alpha version of the software, which is essentially the documentation of the demonstrators' operation and execution, consolidating the input from each of the demonstrators, reflected in Tasks 6.3-6.7. The plan will be returned to on a periodic basis to update it and to fill in details as the project evolves and the technology and applications under scrutiny start to mature.

The alpha version will be made available in M20. It will include all the "basic" functions, which were specified in M17, following the availability of the mock APIs. So the first iteration will need to evaluate only what we will have available by M20, with the demonstrations kicking off at M19.

The work covered in the first evaluation phase will embrace the creation of connectors and the testing of them. But this does not have a definite deadline, but the intention is to have as much of it as possible carried out before M24 and so the scheduling of the alpha phase evaluation will need to be flexible. We will evaluate and report the testing of the WP5 outputs forming the alpha release in a controlled operation environment, and provide as much useful feedback (and not just debugging etc, but focus on user acceptance, perception of the service, feedback from the demonstrators regarding how DataVaults helps them etc.), whilst identifying any necessary amendments that need to be performed in the scenarios or in the platform etc.

This activity will lead to D6.3 which should report on using the platform and providing preliminary feedback and early metrics of what is covered in the evaluation framework set out in D6.1. Given the short period involved, this is not anticipated to be huge amounts. Essentially, we are at a stage where we are still developing the technology. And so the questions we will need to lead with, will concern whether or not the building blocks and the receptacles and background for the demonstration activity is well prepared.

1.1 EVALUATION PLAN STRUCTURE

Following coverage of the timing of the evaluation process, this document is currently structured to reflect the set of identified questions within the evaluation framework which have been gathered together in the eight categories listed in Appendix B of D6.1.

These categories are:

- In relation to WP2 work and dealing with citizens
- In relation to the Business Model.
- In relation to the creation of the "product"
- In relation to the overall communication with stakeholders
- In relation to the technical trials

- In relation to the demonstration activity
- Those at a higher strategic level
- And finally those linked to the non-functional requirements

2 SCHEDULE

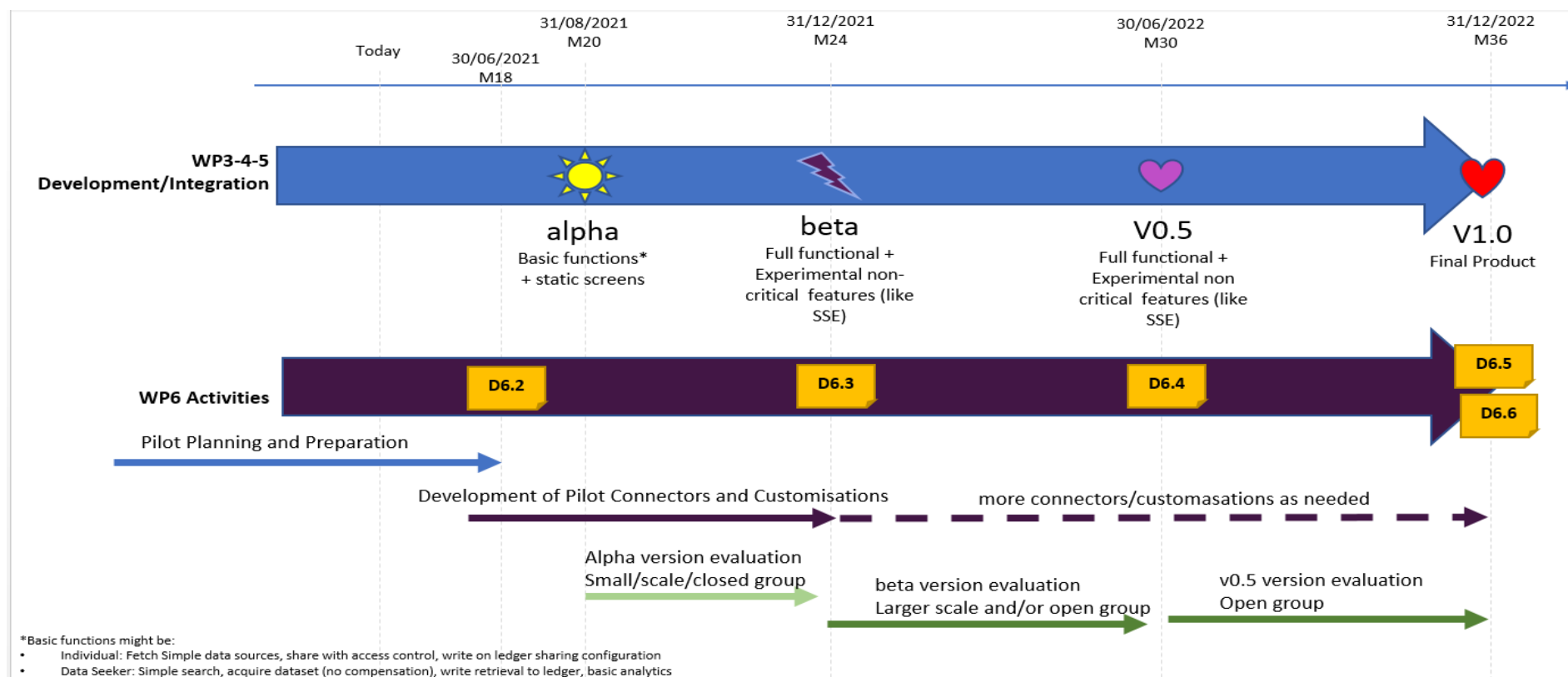


Figure 14 Overall Timing of the DataVaults Project

A regular schedule of meetings will be established and the table below sets out a flexible overview schedule for the whole evaluation process with milestones.

The detailed timetable will evolve as the evaluation process moves forward and will be reviewed regularly, but clearly, it is indicative, as meaningful detail can only be added as the project progresses.

Mth	What	Who
M18	The Alpha version shall offer basic functionalities, for example for the Individual: fetch simple data sources (e.g. structured data from known API), define access control and share personal data under the access control schema, write the Individuals' sharing configuration on the ledger; or for the Data Seeker: simple search on datasets, acquisition of dataset (no compensation), write the Data Seekers retrieval of dataset(s) to the ledger, basic analytics.	The Alpha version shall be evaluated mainly by a small, closed group of users, usually employees of the demonstrator who have also taken part in setting up DataVaults platform at the premises of the demonstrator, i.e. with good knowledge of the goals of the project and both the technical details (e.g. connection of the data sources) and the business details (e.g. the goals that each demonstrator aspires to achieve via the adoption of the DataVaults platform)
	Plan adopted	All partners
	Stakeholder interaction....	All partners
M19	Development of the connectors and necessary customisations at each demonstrator. Integration of the demonstrators' systems with the DataVaults platform, the detailed definition and the acquisition of data from different data sources that need to be provided by the Data Owners, and the gathering of an initial set of individuals which will take up the role of Data Owners to run small-scale validation experiments	All partners
M20	Testing Group established	Prato
	Release of external repository and API	Prato
	Release of API with population registry	Prato
	Every demonstrator is ready to connect to the Alpha version of the DataVaults platform	All partners
	API Test	MiWenergia
	Data verification	MIWenergia
M21	Internal Progress Report and check-list update	All partners

	Stakeholder interaction....	All partners
	Citizen data collected from PieApp	Piraeus
	Connect internal CRM to DataVaults	Olympiacos
	Develop connector	Andaman7
	API adaption	MiWenergia
M22	User group established	Piraeus
	Static isolated data transformed	Olympiacos
	Data availability verification, checking all data required is available. Check-list update.	MIWenergia, All partners
	Develop upload connector	Andaman7
	Test of the certificate flow procedure	Prato
M23	Participant Recruitment	MIWenergia
	Test activity on basic platform functionalities	Prato
M24	D6.3 Pilots Evaluation of Alpha Platform Version milestone	The Beta version shall be evaluated by a larger scale closed group, or a limited open group, depending on the nature of each demonstrator. At this stage, the users should have limited to no knowledge of the technical and business details behind the demonstrator's adoption of the DataVaults platform.
	Piraeus Trade Association initial engagement	Piraeus
	Data collected and analysed	Piraeus
	Develop download connector	Andaman7
	Develop Back-up	Andaman7
	Survey feedback	Prato
	Patient recruitment.	Andaman7
	Develop data integration	Andaman7
	Stakeholder interaction....	All partners
	Fans and members data shared	Olympiacos
	Early adopters data collected	Olympiacos
	Club stakeholders inspect data	Olympiacos
	Data sharing facilities tested	Olympiacos
	Check-list updated for next period	Assentian
	Additional mock-up definition	MIWenergia
	Implementaion virtual wallet	MIWenergia
	Collect feedback	Prato
	Expand piloting group	Prato

M25	Stakeholder interaction....	All partners
M27	Internal Progress Report	
M30	D6.4 Demonstrators' Evaluation of Beta Platform Version <i>milestone</i>	The Beta version shall offer full functionality, with non-critical features (e.g. SSE) being at an early experimental level of maturity.
M33	Internal Progress Report.	
	Consideration of how the evaluation findings will be disseminated and used.	WP8
M34	data analysis	
M36	D6.5 Final Evaluation and Impact Assessment Report <i>milestone</i> D6.6 DataVaults Scale up Roadmap and Key Takeaways <i>milestone</i>	In the final version all major defects identified after the evaluation of Alpha and Beta versions will be fixed and shall offer full functionality plus mature, experimental-to-functional level of non-critical features. Final version shall be evaluated by a fully open group of users, who could range from invitees of the demonstrator to groups of clients of the demonstrator or even the open public.

Table 14 Evaluation Plan Timetable

3 RELATIONSHIP WITH CITIZENS

At the core of DataVaults is the provision of safe, secure, private, fair, legal and ethical mechanisms for handling personal data. Therefore this aspect of the Evaluation Plan is designed to ensure that we conform with everything that has been promised in these respects. Table 2 below sets out how we propose to do this, indicating the metrics, success criteria and data collection process.

Legal, Ethical and Privacy aspects				
Objective	Metrics: Description of indicators towards assessing progress	Measures of change: Success criteria	Data Collection Methods and sources	Frequency of data collection
Citizen experience				
C.1 Improving Privacy Risk Exposure Awareness for Individuals when sharing Personal Data. KPI	currently zero	100% with introduction of new methods. Delivery of the Platform and of the Dashboard.	The privacy risk metrics dashboard will provide this information, as opposed to the current situation where no such data is available.	From date of availability of dashboard, as appropriate
C.2 Improvement of Individuals Knowledge on Personal Data Safeguarding. KPI	Did this facilitate risk situational awareness?	Individuals engaged on the platform will understand better how to share and safeguard their data. Show an increase.	Verified through the AS-IS vs. TO-BE evaluation in the demonstrators through surveys, interviews etc.	Surveys and interviews as appropriate
C.3 To overcome reluctance to personal data sharing services via DataVaults. KPI		Individuals will be educated on how their personal data can be used, while also enjoy remuneration for this, resulting in a trust building. Use of service	Verified through the AS-IS vs. TO-BE evaluation in the demonstrators through surveys, interviews etc.	Surveys and interviews as appropriate
Did these facilitate both privacy and trust preservation and has there been an Improvement in Trust? And TOC1 Have we given improved control and awareness of how a citizen's data is shared and managed?			Observation from C1, C2 and C3.	

C.4 Increase of the value of personal data attributed back to owners KPI Are individuals receiving a fair share of their data value?	currently zero	100% with introduction of new methods. Currently no value is attributed to data owners, and with DataVaults this will change.	Verified through the DataVaults methodology and the AS-IS vs. TO-BE evaluation in the demonstrators through surveys, interviews etc.	Surveys and interviews as appropriate
C.5 To develop privacy metrics that are easy to understand for data subjects	Current situation, beta and final.		Verified through citizen testing and AS-IS vs. TO-BE evaluation in the demonstrators through surveys, interviews etc.	Surveys and interviews as appropriate
C.6 Has the personal app been successfully used by individuals for storing, collecting and sharing data and what was their experience?	N/A		Verified through citizen testing and evaluation in the demonstrators through surveys, interviews etc.	Surveys and interviews as appropriate
C.7 Was the personal app consent mechanism clear and well-received?	N/A		Verified through citizen testing and evaluation in the demonstrators through surveys, interviews etc.	Surveys and interviews as appropriate
Regulatory, Legal and Ethical aspects				
R.1. “Personal data platforms shall ensure respect of prevailing legislation and allow data subjects and data owners to remain in control of their data and its subsequent use.”	Is there compliance with list of regulations identified in WP2? A checklist will be used to ensure that all requirements set out in deliverables were complied with including consent forms and Data Officers work.			Checklist confirmation of full compliance
R.2. “... Conditions of use and practical arrangements of data sharing should be regulated.”	Can just confirm that this was done- with reference			Checklist confirmation of full compliance

R.3. Has there been a contribution to the Basis for Privacy, Ethics and IPR?	This will be part of Lessons Learned.	Confirmation of reporting contribution.
Do we contribute to and are we aligned with:		
R.4. Ethic driven standards	Reference here to where the evidence is reported	YES/NO
R.5. Fundamental Rights and Well-being	Reference here to where the evidence is reported	YES/NO
R.6. Is the personal app compliant with EU regulations and national laws?	Reference here to where the evidence is reported	YES/NO
R.7. Did we provide an Ethics monitoring framework?	D10.2 section 3.1.1 provides a comprehensive ethics risk evaluation table in relation to the pilot's activities.	YES/NO
R.8. Did we successfully link novel trusted and security-by-design data mining, management, analysis and sharing techniques, with legislation- and ethics-driven functions?	Reference here to where the evidence is reported	YES/NO
R.9. Have privacy analytic methods been provided and tested?	Reference here to where the evidence is reported Details on the procedures for data collection, storage, protection, retention, and destruction implemented by the DataVaults tools (app and platform) are provided in the technical deliverables released by the DataVaults consortium in WP2, WP3, WP4 and WP5.	YES/NO

Table 15 Legal, Ethical and Privacy aspects

Checklist of Citizen-facing requirements to be fulfilled.			
Requirement	Alpha	Beta	Final
Purpose limitation and legitimate aim	Only a few of these will be indicated for the alpha version		
Data minimisation			
Data Accuracy			
Integrity and Confidentiality			
Storage Limitation			
Transparency			
Privacy and Data Protection by Design and Privacy by Default			
Avoidance of discrimination (including social sorting) and of harm			
Informed Consent			
Set of requirements referring to the voluntary participation to DataVaults demonstrators			
User Control			
Data subject's rights			
Enforcement			
Fairness by Design			
Effective "sharing the wealth" paradigm			
Privacy Notice			
Data breaches			
Accountability			
Record of processing activities			
Data Protection Impact Assessment			
Application scrutiny to local/national boards if required by national legislation concerned			
International Data Transfer			
Technical and organizational measures			
Use of private environment/cloud as much as possible			
User and data protection friendly User Interface			
Measures in case of profiling			
Appointment of Data Protection Officer			
Assignment of responsibilities			
Ethics Board set-up and involvement			
Checklist for Requirements for Citizen facing security aspects.			
Integrity and Confidentiality			
Authorization and Access Control			
Non-repudiation and Accountability of Actions			
Anonymity			
Conditional Anonymity			
Unlinkability			

Data Privacy			
Forward and Backward Privacy			
Fairness			
Trustworthiness and Operational Correctness			
Cryptography			
Ledger Security			
Physical Security			

Table 16 Checklist for citizen-facing requirements

Other “usability” aspects are covered in Section 9, as non-functional requirements.

4 BUSINESS MODEL

The Evaluation Framework set out how we were to tackle how we have contributed to providing a novel business model and contributions to the data economy. But this again is an aspect of the evaluation plan which cannot be tackled in any detail until the final stages of the project, although any progress made will be reported as it occurs.

What becomes apparent is that several questions are repeated across different categories, serving different purposes when put in different contexts.

The table below "Questions relating to the Business Model and Data Economy", gives an indication of how we will tackle those questions.

However, several of these questions cannot be specifically measured accurately within the project and hence attention will be paid to these aspects in the general impact assessment.

Business Model / Data Economy				
Objective	Targets set	Measures of change: Success criteria	Data Collection Methods and sources	Frequency of data collection
B.1. Lowering effort to handle GDPR issues for SMEs due to the inherited in DataVaults privacy measures.	25%	Reduction of porting data on-site and increased use of the DataVaults platform.	Verified through the delivery of the Platform and AS-IS vs. TO-BE evaluation in the demonstrators.	Surveys at dates to be set
B.2. Reduced investments for personal data handling for enterprises using DataVaults to access and analyse data.	50%	SMEs will invest less in security and privacy infrastructures, relying on DataVaults transformation of data to ensure privacy and security	Verified through the delivery of the Platform and AS-IS vs. TO-BE evaluation in the demonstrators.	Surveys at dates to be set
B.3. Improved access to different personal data categories for economic operators.	500%	Operators will be able to access at least 5 more different personal data categories than they currently do.	Verified through the AS-IS vs. TO-BE evaluation in the demonstrators.	Surveys at dates to be set
B.4. Improved access to personal data from more sectors for economic operators	80%	Datasets of more than 5 different sectors to be exploited.	Verified through the DataVaults Personal Data Model and the data available in the Demonstrators	Surveys at dates to be set
B.5. Increase of revenue for EU data companies, relevant to personal data sharing operations	5%	Increase by 500% in dataset access minus labour costs and processing expenses could attribute to a yearly growth of 5% in revenue.	To be covered within the impact assessment report for the demonstrators.	Surveys at dates to be set

B.6. Enlarge the base of EU data scientists/engineers.	5%	A market increase (in terms of revenue) of 10% contributes to 5% of new job generation.	Verified through the impact assessment report.	Surveys at dates to be set
B.7. Increase of value of reports and services based on personal data.	25%	Incorporation of richer personal dataset or insights to current reports, through the availability of such data.	Verified through the DataVaults Data Model and the AS-IS vs. TO-BE evaluation in the demonstrators.	Surveys at dates to be set
B.8. New services offerings per year created for economic operators.	4	Access to other types of data will allow the generation of new services.	Verified through the AS-IS vs. TO-BE evaluation in the demonstrators	Surveys at dates to be set
B.9. Annual increase in the number of data provider organisations in the personal and industrial data platforms.	20%	Organisations will seek to join DataVaults to get data and offer new features to their existing users.	To be covered within the impact assessment report for the demonstrators and the utilisation of the Open API.	Surveys at dates to be set
B.10. Annual increase in number of users (data subjects) in the personal data platforms.	50%	The virtuous cycle put into motion through trust building and remuneration incentives will result in high user adoption rates.	Verified through the AS-IS vs. TO-BE evaluation in the demonstrators	Surveys at dates to be set
B.11. Annual increase in volume of business (turnover) channelled through the platforms.	10%	New service offerings will allow businesses to grow and enlarge their customer base.	To be covered within the impact assessment report for the demonstrators and exploitation plan of the project/partners.	Surveys at dates to be set
B.12. Service quality and experience improvement through personalisation.	25%	Improved personalisation renovating user experience and satisfaction.	Verified through the AS-IS vs. TO-BE evaluation in the demonstrators	Surveys at dates to be set

Table 17 Questions relating to the Business Model and Data Economy

5 PRODUCT

Once more, this aspect of the evaluation plan will not be finalised until later in the project. Task 5.4-Platform Added Value Services Continuous Integration will form the basis for reporting. This task will also work towards turning the final solution into a market ready product. For this, we need to check that all documentation and training material will be refined and published in an appropriate, user-friendly format with similarly detailed installation and usage instructions.

The integration of the developed software components will formulate the final solution, which in turn can become a market-ready product. For this, all documentation and training material will need to be refined and published in an appropriate, user-friendly format. Installation and usage instructions will be also detailed. The integration plan which will be prepared to guide the integration of the developed backbone infrastructure with the various services and components and this will be reflected in the iterations of the Evaluation Plan.

6 COMMUNICATION WITH STAKEHOLDERS

In addition to having its own KPIs reported in WP8 deliverables, we have shown the importance of having interaction with stakeholders in the Evaluation Framework.

We need to monitor that their involvement meets what is required for a satisfactory evaluation process, with the following questions raised.

Questions raised	Response	Comment
Have we identified the stakeholder's roles in evaluation planning, implementation, interpretation of results and decision-making about the next steps?	YES/NO	See document covering DataVaults "cross-project approach to stakeholders" in WP8 on bscw.fokus site
Has the list of stakeholders been reviewed to ensure all appropriate stakeholders are included?	YES/NO	
Have we created a plan for stakeholder involvement and a communication strategy?	YES/NO	
Have areas been identified for stakeholder input?	YES/NO	
Have stakeholders been brought together as needed?	YES/NO	
Have key stakeholders been targeted for regular participation.	YES/NO	
Have we involved stakeholders in the evaluation process?	YES/NO	

Table 18 Communication with stakeholders

7 TECHNICAL ASPECTS

As part of Task 5.5-Technical Verification and Integration Testing, execution of both automated and manual test will be performed on a regular basis synchronized with release schedules and the progress of this testing procedure will be monitored here. All the software development activities will be followed and a software verification and testing framework will be employed to be used on all outputs. The components of the platform will be covered by functional and integrated tests. To keep the quality of the User Interface component, manual test scenarios will be created based on the input received from the previous WPs and become automated possibly. Execution of both automated and manual tests will be performed on a regular basis synchronized with release schedules. Essentially Task 5.5 will recap all the “Unit tests” of the different components of the DataVaults Platform (Personal & Cloud)and verify if these unit tests are correct.

Here we will adopt a simple reporting process for the timing and the results of the tests.

Technical Modules	Component	Testing results Location	Supporting documentation	Interaction with other components including non-DataVaults components	Progress (Traffic Light system)
DataVaults Personal App				DataVaults Cloud Based Platform	
				All components of the Personal App	
DataFetcher& Transformations	DataVaults Personal App			Personal Asset Store	
Personal Asset Store	DataVaults Personal App			DataFetcher& Transformations	
				Sharing Configurator	
				Edge Analytics Engine	
Edge Analytics Engine	DataVaults Personal App			Personal Asset Store	
Sharing Configurator	DataVaults Personal App			Personal Asset Store	
				Anonymiser	
				Access Policy Editor	
				Data Request Service Resolver	
				Privacy Metrics DashBoard	
Anonymiser	DataVaults Personal App			Sharing Configurator	
Access Policy Editor	DataVaults Personal App			Sharing Configurator	
Data Request Service Resolver	DataVaults Personal App			Sharing Configurator	

Privacy Metrics DashBoard	DataVaults Personal App			Sharing Configurator	
Personal Wallet	DataVaults Personal App			Private DLT	
DataVaults Cloud platform					
Persona Generator	DataVaults Cloud platform			Cloud Platform Data Store	
				Query Builder & Data Explorer	
				Trusted DLT engine	
Cloud Platform Data Store	DataVaults Cloud platform			Persona Generator	
				Query Builder & Data Explorer	
Access Policy Engine	DataVaults Cloud platform			Query Builder & Data Explorer	
				DataVaults Identity Provider	
Query Builder & Data Explorer	DataVaults Cloud platform			Persona Generator	
				Access Policy Engine	
				Secure Analytics Playground	
				DataSeeker Storage Space	
				DataStream & Contract Composer	
				ABE/SSE Engine	
				Public DLT	
				Cloud Platform Data Store	
				Query Builder & Data Explorer	

Secure Analytics Playground	DataVaults Cloud platform				
ABE / SSE Engine	DataVaults Cloud platform			Query Builder & Data Explorer	
				DataSeeker Storage Space	
				DataVaults Identity Provider	
				DataStream & Contract Composer	
				Trusted DLT engine	
				Personal Wallet?	
DataSeeker Storage Space	DataVaults Cloud platform			Query Builder & Data Explorer	
				ABE / SSE Engine	
DataStream & Contract Composer	DataVaults Cloud platform			Query Builder & Data Explorer	
				ABE / SSE Engine	
				Trusted DLT engine	
DataVaults Identity Provider	DataVaults Cloud platform			Access Policy Engine	
				ABE / SSE Engine	
Trusted DLT engine	DataVaults Cloud platform			Persona Generator	
				ABE / SSE Engine	
				DataStream & Contract Composer	
				Platform Wallet	
				Risk Management Monitor	
				Public DLT	
				Private DLT	
Public DLT	DataVaults Cloud platform			Trusted DLT engine	
				Query Builder & Data Explorer	
Private DLT	DataVaults Cloud platform			Trusted DLT engine	

Platform Wallet	DataVaults Cloud platform			Trusted DLT engine	
Risk Management Monitor	DataVaults Cloud platform			Trusted DLT engine	

Table 19 Overview of Technical Verification and Integration Testing

This table will be revised as work progresses on D5.3.

8 DEMONSTRATION ACTIVITY

The Demonstrators contribute to the evaluation process in three distinct ways.

- Primarily they participate in order to showcase the technology and to check it is suitable. Collectively they can contribute to aspects of the project they have in common.
- Secondly, they need to see value in the use of the technology for their own purposes.
- Thirdly. They can add insight and lessons learned to the higher level and strategic goals for the project as a whole.

The Tables in section 8 form the basis for capturing information from the demonstrations.

In addition, questions from previous sections concerning the citizen and concerning the business model etc. will also be embraced at the demonstration level.

Given the inter-locking nature of D6.1 and D6.2 in planning the demonstration and metrics and in evaluation of the achievement of the goals linked to these metrics, the tables below are therefore based upon those also reported in D6.1. sections 3.7- 4.7- 5.7-6.7 and 7.7, as it is valuable to have them within the evolving evaluation plan.

Similarly, these sections for each demonstrator in D6.1 also describes the impact expected for each of the sites: from the perspective of the organisation as a whole, from the perspective of the data owneres and from that of the data seekers and local collaborators.

These identified impacts will allso be referred to in the evaluation process.

8.1 OLYMPIACOS METRICS

Demonstrator 1. Sports and Activity Personal Data. (Olimpiakos)				
Objective	Metrics: Description of indicators towards assessing progress	Measures of change: Success criteria	Data Collection Methods and sources	Frequency of data collection
Increase in Stakeholder Trust	Initial survey showed 65% level in trust. Number of club's stakeholders who are "satisfied" and "very satisfied" with the club's participation in the DataVaults initiative as a percentage of club's stakeholders who completed the satisfaction survey	Targeted to achieve 80% level in trust.	Survey questions responded to by members and fans who participate in DataVaults initiative.	Annual Surveys
More effective management of members and fans data	Current satisfaction level of 50% Number of members & fans who are "satisfied" and "very satisfied" with the club's methods of handling personal data as a percentage of members & fans who completed the satisfaction survey	Targeted to achieve 75% satisfaction level.	In-house mechanisms	As required
More effective management	Current level of effectiveness deemed to be 60% Number of athletes who are "satisfied" and "very satisfied" with the club's methods of	Targeted to achieve 75% level of effectiveness.	In house analytics. Satisfaction surveys completed by athletes who	As required

of sport activity data.	handling personal data as a percentage of athletes who completed the satisfaction survey		participate in DataVaults initiative	
More registered members	Current level of 130,000 registrations Number of members who have renewed their membership with the club for the current season	Targeted to achieve 150,000 registrations.	In house database count.	Annual
More “active members”	Currently 20,000 active members on an annual basis- Number of members who have participated in the club’s advertised activities	Targeted to achieve 22,000 active members.	In house data. In-house analytics (e.g. records of members who took part in the annual general assembly of the club)	Annual
More “active fans”	Currently 60,000 (on an annual basis) Number of fans who have followed the club’s games in more than one sports departments	Targeted to achieve 70,000 “active fans”	In house analytics.	Annual
Increased sponsorship revenue	Currently stands at €800,000 per annum	Targeted to achieve €1,000,000 per annum.	In house data.	Annual Economic Reports

Table 20 Olympiakcs Metrics

8.2 PIRAEUS METRICS

Demonstrator 2. Strengthening Entrepreneurship and Mobility (PIRAEUS)				
Objective	Metrics: Description of indicators towards assessing progress	Measures of change: Success criteria	Data Collection Methods and sources	Frequency of data collection
To increase the number of citizens actively sharing data.	Currently 500 citizens	4,000 citizens	Registered Users	Annual
New municipal services.	N/A	3 new services for the municipality	Information by the Local Authority	Annual
Improved citizen's satisfaction with services.	N/A	60% increase in satisfaction levels.	Surveys	Annual
Touristic activity.	16.000 tourists	27.000 tourists per annum.	Number of visitors reported to the local authority.	Annual
Improved local commercial activity.	€1.200.000 as current	Increasing to €2.000.000	Turnover of local retail as reported to local authority.	Annual
Increase in the number of customers entering the local stores	Increase in the number of customers entering the local stores as percentage	Not available	10% increase	Satisfaction surveys completed by local shop owners

Increase in revenues of the local shops participating in the pilot	Increase in revenues of the local shops participating in the pilot as percentage	Not available	10% increase	Satisfaction surveys completed by local shop owners
Number of entrepreneurs involved	To be extracted from the platform	0	20	Platform statistics
Number of shared datasets	To be extracted from the platform	0	50	Platform statistics
Decrease in time required to reach the sports venue	Decrease in time required to reach the sports venue as percentage	Not available	10% decrease	Satisfaction surveys completed by citizens and Olympiacos members
Decrease in time to park around the sports venue	Decrease in time to park around the sports venue as percentage	Not available	10% decrease	Satisfaction surveys completed by citizens and Olympiacos members

Number of tourists and citizens participating	To be extracted from the platform	0	200	Quarterly
Number of data analysis procedures	Number of data analysis procedures run by the local Destination Management Organization	0	3	Annually
Number of actions taken by the local Destination Management Organization based on Datavaults data	Number of actions taken by the local Destination Management Organization based on DataVaults data	0	5	Annually

Table 21 Piraeus Metrics

8.3 ANDAMAN7 METRICS

Demonstrator 3. Healthcare Data Sharing and Retention (ANDAMAN7)				
Objective	Metrics: Description of indicators towards assessing progress	Measures of change: Success criteria	Data Collection Methods and sources	Frequency of data collection
To increase active users operating Andaman7 <i>Scenarios: a and b</i>	22,000 registered users at M1 2,000 Average monthly users	An increase to 40,000 by M36 An increase of average registrations/day An increase of average active monthly users to 2,800	Andaman will continue to monitor these metrics using its database and Firebase Analytics tool.	Quarterly (Displayed in real time-so any frequency is possible.)
To increase the number of datatypes used by Andaman7 <i>Scenario: b</i>	Current use of 100 data types supported by the app. Implemented data type in A7 app + Analytics (Firebase) on usage of each data	An increase to 120 Usage of these data types	Most will be from calculated data, analytics, charts which can be accessed through the DataVaults platform. Also Implemented data type in A7 app + Analytics (Firebase) on usage of each data	Quarterly
Increase of Volume of data per/ category <i>Scenarios: b</i>	Analytics (Firebase) of volume of data per user for each data category	To be split by categories calculated (in average 326 pieces of data per user for all categories) To show an increase of 15%	An increase should be in the number of data registered in the app thanks to new data sources. Analytics (Firebase) of number of data/user for each data categories	Quarterly

Generation of new services offered through Andaman7 <i>Scenarios: a and b</i>	Currently 2 services	Goal is to have 4 <ol style="list-style-type: none"> 1. Back-up of data 2. Share data to A7 partners* 3. Get data from new sources* 4. Get analytics data from DataVaults *May depend on Andaman7 partners but base can be done if not 100% fulfilled.	Implemented services in A7 app + Analytics (Firebase on usage of service)	Annually
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Table 22 Andaman7 Metrics

8.4 MIWENERGIA METRICS

Demonstrator 4. SmartHome Personal Energy Data (MIWENERGIA)				
Objective	Metrics: Description of indicators towards assessing progress	Measures of change: Success criteria	Data Collection Methods and sources	Frequency of data collection
More effective management of customers.	<p>We consider that the KPI should be based on incremental amounts referred to the incremental expected.</p> <p>Currently at 60%</p>	<p>Increase to 80%</p> <p>We propose and index α_4,</p> $\alpha_4 = \frac{EMC - 60}{20}$ <p>EMC = Effective Management of customers at the time, in %</p> <p>The index 4 makes reference to the number of demonstrators.</p>	Currently from surveys.	Annual at moment.
Increase in revenue through offering personalised services.	Currently none.	<p>0€ to 30,000€</p> <p>We propose and index β_4,</p> $\beta_4 = \frac{RPS}{30000}$ <p>RPS = Revenues through offering personalized services</p>	in € from the economic reporting.	Annual at moment.

Increase in revenue through sales agreements	Currently none.	<p>0 to 20.000€</p> <p>We propose and index π_4,</p> $\pi_4 = \frac{RSA}{20000}$ <p>RSA = Revenues through sales agreements.</p>	in € from the economic reporting.	Annual at moment.
Increase in the number of partners.	20 currently.	<p>Increase to 30.</p> <p>We propose and index δ_4,</p> $\delta_4 = \frac{NOP - 20}{10}$ <p>NOP = Number of partners,</p>	Units from the economic reporting.	Annual at moment.
Increase in client's satisfaction and trust.	Clients satisfaction and trust is currently at 70%	<p>To increase to 90%</p> <p>We propose and index Ω_4,</p> $\Omega_4 = \frac{CST - 70}{20}$	From surveys.	Annual at moment.

		CST= Clients satisfaction and trust, in %.		
Increase in partners' satisfaction and trust	Currently at 80%	<p>To increase to 95%</p> <p>We propose an index $\varphi 4$,</p> $\varphi 4 = \frac{PST - 80}{15}$ <p>PST= Partners satisfaction and trust, in %.</p>	From surveys.	Annual at moment.
<p>NB. If the criteria proposed are set, all the KPI should be evaluated referenced to the unit (1, one). If the KPI is equal to 1, the expected benefits are achieved. If positive under 1, there are improvements, but not as expected. KPI over 1 show a big impact on the benefits, in our case just possible for If KPI is under 0 (hope this case will not happen), there is a reversal in the benefits. The impact is negative, damaging the entity. If percentages are more useful/easy to report, the KPI can be multiplied by 100.</p>				

Table 23 MiWenergia Metrics

8.5 PRATO METRICS

Demonstrator 5. Personal Data for Municipal services and the Tourism industry. (PRATO)				
Objective	Metrics: Description of indicators towards assessing progress	Measures of change: Success criteria	Data Collection Methods and sources	Frequency of data collection
Scenario 1: Access to personal data for the analysis of mobility solutions				
To increase the number of data owners involved	Currently zero data-owners involved	To increase to 100.	Number of registrations on the app/platform Check of registration file	As required
To increase the number of available data sources	Currently zero	5	To be extracted from app functionalities. Check of App APIs	Annually
To increase the number of shared datasets	Currently zero	200	To be extracted from the platform data base	As required
To increase the number of activated smart contract	Currently zero	100	To be extracted from the platform distributed ledger	As required
To increase the number of data analysis procedures	Currently zero	3	To be extracted from the data seeker workflow.	Annually

			Production of data analysis report.	
To increase the number of questionnaires/surveys	Currently zero	2	To be extracted from the data seeker's workflow on the platform- Data seeker's documents.	Annually
To increase the level of Data owners' satisfaction in using the DataVaults tools	N/A	4.5	Survey results (Likert scale 1-5)	Annually
To increase the level of Data seekers' satisfaction in using the DataVaults tools	N/A	4.5	Survey results (Likert scale 1-5)	Annually
Improvement in the planning capabilities as perceived by the Office	Survey (Likert scale 1-5)	N/A	4,5 Survey results	Annually
Savings in the installation of traffic sensors and data acquisition procedures	Specific budget from the Mobility Office's records	10.000 euro	-50% Survey results	Annually

Scenario 2. Access to personal data for the improvement of cultural offer in the city				
To increase the number of data owners involved	Currently zero	50	Number of registrations on the app/platform. Check of registration file.	As required
To increase the number of available data source	Currently zero	5	To be extracted from app functionalities. Check of App APIs	Annually
To increase the number of shared datasets	Currently zero	100	To be extracted from the platform data base	As required
To increase the number of activated smart contract	Currently zero	50	To be extracted from the platform distributed ledger	As required
To increase the number of data analysis procedures	Currently zero	3	To be extracted from the data seeker workflow. Production of data analysis report	Annually
To increase the number of questionnaires/surveys	Currently zero	2	To be extracted from the data seeker's workflow on the platform. Data seeker's documents.	Annually

To increase the level of Data owners' satisfaction in using the DataVaults tools	N/A	4.5	Survey results (Likert scale 1-5)	Annually
To increase the level of Data seekers' satisfaction in using the DataVaults tools	N/A	4.5	Survey results (Likert scale 1-5)	Annually
Improvement in the planning capabilities of the cultural institutions	Survey (Likert scale 1-5)	N/A	4,5	Annually
Savings in data acquisition and analysis procedures	Specific budget figure	5.000 euro	-50%	Annually
Scenario 3. Access to personal data for the delivery of personal certificates				
To increase the number of involved data owners	Currently zero	10	Number of registrations on the app/platform. Check of registration file	As required
To increase the number of shared datasets	Currently zero	10	To be extracted from the platform data base. Check of the data owners' activity	As required

To increase the level of Data owners' satisfaction in using the DataVaults tools	N/A	4.5	Survey results (Likert scale 1-5)	Annually
To increase the level of Data seekers' satisfaction in using the DataVaults tools	N/A	4.5	Survey results (Likert scale 1-5)	Annually
To increase the level of Prato administration's savings of resources in terms of costs and personnel	Cost of one certificate release operation at the counter [15 min personnel cost + paper cost] Current cost €4.10	~ 0	n. data owner x current cost at the counter	Annually

Table 24 Prato Metrics ²

² Changes have been made to the Prato KPIs as a result of amending the scenarios initially offered to suit the project rationale more. Updating of citizen's information has been amended to focus more on the requirements of the Mobility Office as a data seeker. An additional scenario covering "civil certificates" was added.

8.6 COMMON QUESTIONS CONCERNING ALL THE DEMONSTRATORS

Objective	Evidence and Data Collection Methods	Status
Have we included personal datasets of 5 different sites/demonstrators?	Feedback from demonstrators.	YES or NO. List them.
Have we supported 20 types of personal data categories?	Feedback from demonstrators. These could be demographics, social media data, IoT data, smart home data, medical data, nutrition data, fitness data, mobility data, and so on.	YES or NO. List them.
Is there compatibility with at least 20 types of data sources (sensors, IoT, APIs, wearables, records, etc.)?	Feedback from demonstrators. A7 brings sources from individuals (that can be divided in user, doctors), health institutions, laboratories, wearables (Apple health, google fit).	YES or NO. List them.
Are 12 known analytics algorithms supported?	Feedback from demonstrators.	YES or NO. List them.
Have we reused 10 existing vocabulary standards?	Feedback from demonstrators.	YES or NO. List them.
Did the five demonstrators successfully run for the required length of time?		YES or NO.
Did we provide more efficient services?*	Examples from individual demonstrations.	YES or NO. List them.
Did we provide more value-adding services?*	Examples from individual demonstrations.	YES or NO. List them.
Number of second tier operators per demonstration.*	Examples from individual demonstrations.	List them.
Novel services provided.*	Examples from individual demonstrations.	List them.
Have we contributed to the 4 vs of Big Data: Volume, Variety, Veracity and Velocity?*	Feedback from demonstrators.	List them.

Have we provided policy-makers with faster, more effective decision-making procedures based on personal data? **	Feedback from demonstrators.	Describe
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Table 25 Questions common to all demonstrators

8.7 CHECKLIST MONITORING STATE OF READINESS FOR EACH PHASE OF DEMONSTRATION

A checklist will be created to evaluate the state of readiness for each of the demonstrations sites, covering topics such as ethics issues, data availability, recruitment, analytics capacity, in order to report that we are progressing according to the plan and in a timely manner. It will be based on the timetable established within D6.2.

State of Readiness-Alpha Phase	Piraeus	Olimp.	Andam.	MiWen.	Prato
Recruitment- Data Providers					
Recruitment-Data Seekers					
Data Availability					
Analytics capability for knowledge sought					
Etc.					
State of preparation-Beta Phase					

Table 26 State of readiness

9 STRATEGIC AND HIGHER LEVEL GOALS

As established in the Evaluation Framework, we will need to achieve a wide variety of higher level and more strategic goals. This section will be updated as the project evolves.

However, any initial steps taken in this direction will be reported in D6.3

10 MEETING OF THE NON-FUNCTIONAL REQUIREMENTS

Table 11. below, is indicative of the format which can be utilised for collating the non-functional results from all five of the demonstrators to derive enhanced meaning at the DataVaults project level.

Again, this aspect of the evaluation plan will be in focus at a later stage of the project and will be elaborated further and amended where necessary.

Common Criteria to be measured	Type	MosCoW	Use	Value	Learn	Description of Metric.	Success criteria for Metric	Method to Gather Results for the Metric	Target Group
Functional Suitability									
F1 Is DataVaults able to collect data from Individuals in order to gather their data in one place? NFR1	Quantitative	M-Must,	X	X	X				Stakeholder
F2. Does DataVaults allow an Individual to select and manage how his/her data are to be shared to the DataVaults Cloud Platform? NFR2									
F3 Is DataVaults able to share the data collected from Individuals and make them available to Data Seekers following specific data sharing contracts? NFR3									
Security and personal data protection		S-							
S1. Is DataVaults able to handle software errors without affecting the platform overall functionality? NFR24									

S2. Is DataVaults able to securely store uploaded Individuals' data? NFR25									
S3. Is DataVaults able to retain the privacy of Individuals based on the privacy level they have chosen? NFR26									
S4. Does DataVaults take into account privacy and security rules according to national legislation? NFR27									
S5. Does DataVaults ensure different authorisation access to different datasets? NFR28									
S6. Does DataVaults support data seeker's account validation? NFR29									
S7. Is DataVaults able to attest the identity of the user/subject performing any operation? NFR30									
S8. Does DataVaults provide the proper mechanisms for system upgrade/maintenance with minimum downtime? NFR31									
S10. Is DataVaults composed by components that are operating independently? NFR32									

S11. Is DataVaults able to raise alarms about hardware/software failures of the solution? NFR33									
S12. Does DataVaults provide strong transaction validation mechanisms? NFR34									
S13. Does DataVaults keep information about transactions encrypted? NFR35									
S14. Does DataVaults keep history of all important actions (such as transactions)? NFR36									
Performance efficiency		C-Could							
P1. Does DataVaults guarantee the timely and robust collection of data from the side of the Individuals? NFR4									
P2. Is DataVaults able to handle and store datasets from various sources? NFR5									

P3. Does DataVaults guarantee the efficient and effective resource allocation for the sharing and encryption/decryption process execution. NFR6									
P4. Is DataVaults able to perform analytics in a timely and efficient manner? NFR7									
P5. Does DataVaults guarantee the full optimization of the response time to ensure a functional and flexible navigation through the DataVaults solution? NFR8		W-would							
P6. Does DataVaults cater that both the Public and the Private ledgers are able to process transactions fast and within certain time limits? NFR9									
P7. Does DataVaults provide prompt transaction responses from the Brokerage Engines? NFR10									
Reliability/Maturity									

R1. Does DataVaults ensure high availability of the overall system? NFR20									
R2. Is DataVaults able to handle simultaneous requests on a timely and efficient manner? NFR21									
R3. Does DataVaults provide the mechanisms to recover the system state to normal operation after a failure? NFR22									
R4. Does DataVaults keep information about transactions parties private, NFR23									
Portability									
Po1. Is DataVaults able to be deployed in a timely and efficient manner? NFR37									

Po2. Is DataVaults based on easily replaceable independent components interconnected through APIs? NFR38									
Po3. Is DataVaults able to be deployed on various Linux based distributions. NFR39									
Usability									
U1. Does DataVaults feature a user-friendly interface, and be offering a set of user guides? NFR14									
U2. Does DataVaults provide a user interface that supports straightforward task accomplishment? NFR15									
U3. Does DataVaults provide the suitable error protection methods for all input fields? NFR16									

U4. Does DataVaults have a Multi-language user interface? NFR17									
U5. Does DataVaults offer logs about evolution and faults history and periodically send debug reports? NFR18									
U6. Does DataVaults not influence user experience by performing all computational intensive tasks (such as DAA authorisation) in the background? NFR19									
Interoperability/ Compatibility									
I1. Is DataVaults able to interact and exchange information with other systems in a secure way (for example secure REST API)? NFR11									
I2. Does the DataVaults Cloud Platform provide communication capabilities to allow other applications to interact with DataVaults platform? NFR12									

13. Does DataVaults allow the Personal DataVaults App to run on devices that do not support DAA? NFR13									
Other categories, such as Business Value, Flexability, Scalability, Maintainability may be introduced later in the project.									

Table 27 Format for collection of results regarding common criteria

KEY: **QN** –Quantitative **QL**-Qualitative, **M**-Must, **S**-Should, **C**-Could, **W**-Would.

Stakeholders: **C** Citizens, **D**-Data-Seekers, **3** Third Party stakeholders

11 EVALUATION RESULTS

D6.3 will cover preliminary results, which will be further added to in D6.4 which will report upon the demonstrations of the beta version of DataVaults. But it will not be until the end of the project that the main results will be expected and so this aspect of the plan will be deferred until later.

The Evaluation Framework indicates the need for a plan for the communication of results, which will be built into this plan as it evolves. This will all lead to the Final Evaluation Report at M36.

APPENDIX B REPORT FROM ETHICS COMMITTEE.



Persistent Personal Data Vaults Empowering a Secure and Privacy
Preserving Data Storage, Analysis, Sharing and Monetisation Platform

D6.1 Appendix B

Report of the Ethics Board



DataVaults is a project co-funded by the European Commission under the Horizon 2020 Programme (H2020-ICT-2019-2) under Grant Agreement No. 871755 and is contributing to the BDV-PPP of the European Commission.

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1 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report is for the purposes of providing oversight to the European Commission on legal and ethical issues, in order to ensure that the DataVaults project conforms to the applicable national and EU legislation and to the highest H2020 ethical guidelines. The report describes how the Consortium takes into account and addresses the ethical concerns and issues raised by the DataVaults project, as flagged out by the Ethics Summary Report, including the processing of sensitive personal data and user profiling/tracking.

1.2 STRUCTURE OF THE APPENDIX B

This document is structured as follows:

- An **introduction**, which describes the aims of the report and its interrelations with the overall DataVaults project;
- The main **assessment findings**, containing a focus on the status, strategy, mitigating measures and safeguards taken in relation to the main legal and ethical issues raised by DataVaults. This evaluation is twofold, referring, on the one hand, to the project level, with ethics-related findings and remarks on the platform, tools and services under development, and, on the other hand, to the demonstrator level, where such tools and operations are deepened from the legal and ethical viewpoint;
- An **overview of the ethics work** performed by the Consortium, in collaboration with the EB and with the Ethics and Data Protection Officer;
- The **conclusions**.

1.3 ETHICS BOARD'S REPORT CONTEXT

This report is strictly interrelated with most of the work-packages, since the ethical dimension and activities are a transversal topic throughout the DataVaults lifecycle:

- **WP2 “Security Aspects, Privacy Considerations, Value Generation and Commercialisation Outlines in Personal Data Management”**, in particular T2.1 “Personal Data Management and GDPR Challenges” and D2.1 “Security, Privacy and GDPR Compliance for Personal Data Management” and D2.3 “Updated DataVaults Security Methods and Market Design”. In these deliverables, the regulatory and ethical sources relevant to DataVault personal data management and to the demonstrators are identified and analyzed and the related legal and ethical requirements are elicited: the former provides the first

insights, whilst the latter the final release of such regulatory framework and requirements;

- **WP3 "Bundles for Secure Data Sharing and Access, Privacy and Trust Preservation and IPRs Management"** and **WP4 "Multitude Trusted Intelligence Bundles for Personal Data Insights Generation"**, where the legal and ethical requirements are taken into account, following the Fairness & Privacy-by-Design-and-by-Default enriched with the Protection Goals Approach, to design and deploy the bundles and components, in coherence with the overarching DataVaults Ethical Policy;
- **WP5 "DataVaults Platform Continuous Integration"**, since the DataVaults platform architecture and integration has to be inspired by the same approach and requirements;
- **WP6 "Multi-Layer Demonstrators Setup, Operation and Business Value Exploration"**, where the indications and procedures set out by the Ethical Policy and the legal and ethical constraints will be operationalized in order to preserve human well-being and foster human empowerment. The comprehensive Ethics and Data Protection Impact Assessment methodology, as depicted in WP9, will be put in place to operate during the demonstrators' operation and will be used to evaluate their activities under the ground of ethical and legal compliance:
- **WP9 "Project Management and Coordination"**, notably with T9.3 "Ethics Requirements and Project Data Management" and its D9.2 "Ethics and Data Management Plan", where the project's Ethical Policy is outlined, including the description of the Fairness & Privacy-by-Design-and-by-Default enriched with the Protection Goals Approach, of the ethical procedures and oversight roles and of the Ethics and Data Protection Impact Assessment Methodology for the demonstrator cases;
- The other deliverables of **WP10 "Ethics Requirements"**, in particular D10.1 "H-Requirement N. 1", D10.2 "POPD – Requirement N.2" and, above all, D10.3 "GEN – Requirement N. 4". In fact, D10.3 foresees that, due to the severity of the ethics issues raised by the project, the Consortium had to establish an Ethics Board including relevant independent expertise (external to the consortium) to monitor the ethics issues and how they are handled. It also foresees that such Ethics Board has to be consulted at least on the processing of sensitive personal data and user profiling/tracking and has to submit a report before the start of the pilot studies. The present document is prepared to accomplish such requirement

2 ETHICS-RELATED WORK

The Consortium during the first reporting period performed several activities in relation to ethical, legal and societal implications, reaching substantial achievements. In particular:

- in T2.1 “Personal Data Management and GDPR Challenges” the Consortium identified and analysed the **legal and regulatory framework**, including GDPR and national legislation, relevant to the data to be used in the project. This investigation was performed considering the challenges related to personal data management in terms of data collection, data sharing and processing. The Consortium elicited **security, privacy and data protection requirements and specifications** (covering also ethical aspects), including guidelines for application, to be taken into account in the design and deployment of the DataVaults technology;
- in WP3 “Bundles for Secure Data Sharing and Access, Privacy and Trust Preservation and IPRs Management”, WP4 “Multitude Trusted Intelligence Bundles for Personal Data Insights Generation” and WP5 “DataVaults Platform Continuous Integration” the design and development of the tools, services and components, as well as DataVaults platform architecture and integration are driven, besides by the technical and non-technical requirements, also by the legal and ethical requirements and by the **Fairness & Privacy-by-Design-and-by-Default enriched with the Protection Goals Approach**;
- within WP6 “Multi-Layer Demonstrators Setup, Operation and Business Value Exploration” **ethically-driven activities were executed in the demonstration sites**, following the indications set out by the Ethical Policy and the legal and ethical constraints aimed at planning and performing their validation activities under the ground of ethical and legal compliance. For each of the DataVaults Demonstrators, the inclusion-exclusion criteria for volunteers’ identification were defined, the recruitment procedures were established, the project-level models for the consent form and information sheet were customised and the consent procedures were set;
- in the framework of WP9, in particular T9.3 “Ethics Requirements and Project Data Management”, the Ethical Policy was conceived and the building block of the comprehensive Ethics and Data Protection Impact Assessment methodology for the demonstrators operations in WP6 were elaborated. These are functional to approach the data protection and ethical issues in a comprehensive and holistic manner, in line with the Responsible Research Ethics Guidelines.
- in WP10 “Ethics Requirements”, several activities were conducted, results achieved and deliverable elaborated, with the involvement and support of the DataVaults Ethics Board and of the Ethics and Data Protection Officer of the project. This
 - D10.1 “H- Requirement N. 1” on human involvement: each of the demonstrators outlined the procedures and inclusion/exclusion criteria that will be used to identify/recruit research participants in its context, as well as the informed consent procedures that will be implemented for the participation of humans. These procedures and criteria were developed in WP6 in compliance with all EU and national legislation H2020 ethical standards with the aim of prioritizing participants’ well-being and comfort. The document also contains the customized informed consent and information sheets both in English and in national language. They use terms intelligible to the volunteers.

It was also investigated whether an opinion/ approval by ethics committees and/or competent authorities is necessary for conducting the planned research with humans

- D10.2 “POPD – Requirement N. 2”, where the demonstrator reported the findings of the check on the need of a declaration on compliance and/or authorisation under national law for collecting and processing personal data in each of them. The statements from the respective Data Protection Officer were collected and inserted in the deliverable, confirming the compliance of all personal data collection and processing with EU and national legislation. Furthermore, the demonstrators provided detailed information on the respective procedures for data collection, storage, protection, retention, and destruction, as well the ethics risk evaluation related to the data processing activities of the project and the opinion on the need to conduct a data protection impact assessment according to art.35 GDPR. The partners hosting the demonstrators also provided clarifications in relation to the occurrence (or not) of the profiling and related safeguards in place to inform the volunteers and protect their fundamental rights;
- D10.2 “GEN – Requirement N. 4”, which regards the setting up of the DataVaults Ethics Board (EB) and the launch of its operations. This board is functional to build a fruitful and constructive relationship between the research activities and ethics and, for this reason, it has a facilitative role, providing guidance on specific ethical and legal questions, besides the oversight role and its monitoring function;
- Both the DataVaults Ethics Board and the DataVaults Ethics and Data Protection Officer were appointed and involved in the ethics-related activities. EB’s meetings were regularly arranged as virtual meeting, where ethics aspects especially related to demonstrators’ operations and to the ethical oversight were performed. The communication flows was also enriched by email exchange and phone calls.

3 OVERSIGHT FINDINGS

3.1 OVERALL ASSESSMENT

The DataVaults project is directed to rejuvenate the personal data value chain by delivering a framework and a platform having personal data, coming from diverse sources (wearables, web APIs, smart home sensors, personal data records, etc.), in its centre. This platform will be capable of defining and implementing secure, trusted and privacy preserving mechanisms for allowing individuals to take ownership and control of their data and share them at will, through flexible data sharing solutions and fair compensation schemes with other entities (companies, public bodies or other organisations). The use of smart contracts will safeguard personal data ownership, privacy and usage and attribute value to all entities that generate value within this chain and especially data owners.

DataVaults, which is expected to support 20 types of personal data categories and to be compatible with at least 20 types of data sources (sensors, IoT, APIs, wearables, records, etc.), aspires to become one of the flagship personal data platforms in the European landscape, characterized by fully respect of GDPR provision and satisfaction of the privacy and trust consideration of users, with a novel, fair and understandable value compensation mechanism

to data owners. The Platform will be used by any individual for storing, collecting and sharing, after consent, personal data (or derivatives).

Therefore, in validating and using the DataVaults Technology, personal data will be collected and processed, as well as volunteers will be involved in the demonstration activities in all the demonstration cases. The whole Consortium, including the partners hosting the demonstrators, is committed to respect the data subjects' privacy and dignity, prioritizing human well-being and flourishing. The partners are aware of their obligations and responsibilities and demonstrate a good knowledge of the existing applicable regulatory sources, with a special knowledge on key provisions of the data protection law. They have already defined proper mitigating measures and safeguards to avoid ethics risks to materialize and are committed to implement them in their respective demonstrators' operations, paying great attention to tackle the ethics issues raised by the project. Notably:

- The DataVaults Ethical Policy was elaborated at the beginning of the project (closely involving the whole Consortium, including the demonstrators);
- The regulatory review and elicitation of legal and ethical Requirements and related Guidelines and recommendations was performed in T2.1 and its results reflected in D2.1 and D2.3, which also contain privacy, security and trust requirements;
- the partners are employing the Ethics-and-Privacy-by-Design-and-by- Default enriched by the Protection Goal Approach in relation to the design of the overall DataVaults cloud-based platform and its components, as well as the Personal App, following the requirements, as stemming from D2.1. This happened, for instance, in D1.3 "DataVaults MVP and Usage Scenarios", where GDPR, ethical issues, privacy and security issues are specifically deepened for:
 - Each of the scenarios driven by individuals:
 - Scenario 1: "Personal data collection";
 - Scenario 2: "Personal Data Assets Exploration & Analysis";
 - Scenario 3: "Personal Data Assets Sharing Gains and Risk Information";
 - Scenario 4: "Personal Data Assets Sharing Configuration";
 - Scenario 5: "Personal Data Sharing / Cloud Upload";
 - Scenario 6: "Personal Data Assets Sharing Revocation and Deletion"
 - Each of the scenarios driven by the Data Seekers:
 - Scenario 7: "Explore Data Assets";
 - Scenario 8: "Acquire Data Assets from the DataVaults Cloud Platform";
 - Scenario 9: "Acquire Data Assets from a DataVaults Individual User";
 - Scenario 10: "Analyse and Visualise Data"
 - The scenarios driven by DataVaults Data Scientist:
 - Scenario 11: "Ready-Made Analysis by the DataVaults Cloud Platform"

The ongoing development of all the components for both the Personal App and Cloud Platform of DataVaults is taking into due attention the constraints in terms of privacy, trust, ethics and data protection. This applies in particular to the Personal Wallet, the Attribute Based Encryption Engine, the Access Policies Editor, the DataStream and Contract Composer, the Access Policy Engine, the Risk Management Monitor and Dashboard, the Data Anonymizer, as well as the Policy-compliant Blockchain Infrastructure and DLT Engine and the Persona Generator.

Ethical and legal compliance considerations have also been carefully taken into consideration by the demonstrator partners, as confirmed by the attention given to these topics for instance in D6.2, besides in other parts of D6.1.

- The ethics screening requirements were fulfilled: the Consortium accomplished with the post-grant requirements depicted in the Ethics Summary Report and inserted in WP10 as deliverables;
- Oversights, supervision and advice are ensured by the appointment and operation of the DataVaults Ethics and Data Protection Officer and of the DataVaults Ethics Board, which include a member external to the project partners. These roles are committed to guarantee that the projects solutions are compliant with given legal and ethical requirements and to avoid any detrimental impact on society, overseeing that due attention is given to the ethical concerns involved in this research;
- The Consortium is following a citizen-centric paradigm for moving beyond GDPR compliance towards a value-driven, win-win personal data-sharing environment capable of ensuring human protection and flourishing in conjunction with the business considerations and with the public interest. This paradigm is perceived as a prerequisite for DataVaults Technology's acceptance, and future sustainability. Furthermore, the chosen approach is aligned with EU vision as expressed, for instance, in the EU strategy for data and in the Data Governance Act. For this purpose, great efforts were dedicated to gather and analyse the citizens' perspective with the aim of identifying main perceptions, doubts and concerns, and openness to use Datavaults. A dedicated survey was conducted in 5 languages through the ReachOut Survey tool. Key findings were elaborated on features relevant to the future design and deployment of DataVaults Platform and Personal App, which are also useful from the ethical viewpoint. In particular, they refer on:
 - Attitudes towards personal data sharing
 - Data retrieval, storage and deletion
 - Privacy preservation on the shared data
 - CompensationMechanisms
 - Control and Informed Consent

The outcomes of the survey are reported in D1.4.

3.2 DATAVAULTS DEMONSTRATORS' ASSESSMENT

The DataVaults system and its components are going to be validated through the first iteration of the five showcases: the business impact and value of the project's outcomes will be clearly demonstrated through real-life cases, whilst external entities will provide suggestions for improvements and features that will help to maximise the project's impact. Thanks to the demonstrators, the overall DataVaults solution will be populated with data and adequately prepared for a successful market entry. The business and technical validation of this novel product for personal data management, along with value-added services offering multiple benefits to data owners and Data Seekers. will be conducted under realistic conditions.

Following the defined all-inclusive framework, all the relevant service bundles and other outcomes of the project (from their conception to final release), as well as the overall

DataVaults infrastructure, will be experimented in these pilot settings and verified, validated and evaluated via an iterative approach. For this purpose, all prototype and intermediate versions of the platform's Apps, APIS, backbone, services, etc. will be provided to the demonstrators, to allow them to test all the different features and give feedback to the project's developers for updating, parameterising and improving the technology accordingly, maximizing functional completeness, in conjunction with users' satisfaction and experience.

The DataVaults demonstrators are the following:

- Demonstrator #1 – Sports and Activity Personal Data
- Demonstrator #2 – Strengthening Entrepreneurship and Mobility
- Demonstrator #3 – Healthcare Data Retention and Sharing
- Demonstrator #4 – Smart Home Personal Energy Data
- Demonstrator #5 Personal data for municipal services and the tourism industry

Their relevant ethics-related operations and issues have been tackled and deepened since the beginning of the project and the resulting outcomes have been reported in D2.1 and updated in D2.3. Furthermore, key aspects, such as the occurrence of profiling and the ethics procedures (for recruitment and informed consent) to be implemented, have been investigated in D10.1 and D10.2.

This preparatory activity in view of the first cycle of DataVaults piloting activities was characterized by the Consortium's efforts directed to ensure their smooth operation regarding regulatory and ethical compliance in activities involving human participation and personal data gathering and handling. In particular:

- as regards the planning of the demonstrators' operations involving humans, it encompassed: i) the training/awareness raising of the partners' staff in relation to the ethical implications of the scheduled operations, in particular data protection issues, ii) the elaboration and plans for implementation of recruitment and consent procedures for each one of the showcases, following common, project-level models and protocols. Each demonstrator fine-tuned and customized (according to its own environment, features and personal data to be collected/handled), the models prepared by the Ethics and Data Protection Officer and inserted in D9.2. In fact, in order to support the demonstrators in meeting the ethics requirements, the models respectively of the Consent Form and the Information Sheet were previously circulated, proposing to the responsible of each pilot to use and integrate them. This initial set of activities also included reflections on the level, nature and modalities of human involvement in each of the five pilots, in line with the specification of demonstrator scenarios, as summarized in D2.1;
- according to the information provided by the partners hosting the demonstrators to the coordinator and to the Ethics Board and reported in D10.1, adequate informed consent procedures, both for the human participation and for the collection, storage, and protection of personal data, will be followed in the project pilot sites. They are consistent with the general H2020 ethical guidelines and with the project's Ethical Policy, besides being compliant with data protection legislation. In order to make the consent procedures simpler and more understandable by the participants, the

procedures and related forms for human involvement and personal data collection and processing were combined. Only after the provision of information through the information sheet, including on all issues potentially able to influence the willingness to participate, the volunteers will be asked to provide their consent. Particular adaptations/changes could be made considering the online environment in some cases;

- the partners hosting the validations operations confirmed that: i) they will put in place adequate mechanisms, aligned with their daily business practices, to ensure that the personal data collected with the consent for project purposes are not used without permission for another reason without additional permission; ii) the involvement of human beings will be realized on a voluntary basis and that, therefore, each of the volunteers will be duly informed and will sign the consent form. The participants will be recruited on a voluntary basis from the demonstrator organizations, pressure to take part in the testing operations. The recruitment procedures rely on both the DataVaults technological progress and the respective use cases, both for identifying the number of participants expected in each site and/or other relevant parameters of the sample and for the elaboration of the inclusion/exclusion criteria. No vulnerable individuals will be involved and any kind of discrimination and bias will be avoided;
- The partners are also exploring the possibility to organise, in the demonstrators sites, focused brief training sessions for voluntary participants, where opportune.

As regards processing of sensitive personal data and the user profiling/tracking, each of the pilots conducted an ethics risk evaluation related to personal data processing, where both the likelihood and the severity of each risks were addressed:

- **Demonstrator #1 – Sports and Activity Personal Data:** the pilot is intended to be implemented with a large amount of data and it is planned to extract personal preferences or interests from DataVaults platform, using new technologies for connecting the CRM platform with DataVaults platform. In the second scenario athletes' data will be contained, that could be useful for their coaches or training sessions. The partner hosting the pilot is familiar with the kind of processing operations envisaged and some of the collection/processing operations, like those regarding demographic data, are available on its social media platforms. Furthermore, it has already in place technical and organizational measures for risk assessment and risk control in relation to data protection and they will be compliant with GDPR. Considering that the pilot scenarios focus on sports activity, including related personal data, and interests, some profiling of the individuals involved will be conducted with the exclusive purpose of providing personalized information. The informed and specific consent form includes the aforementioned purpose of data collection and the measures that participants might activate to safeguard their privacy rights. Considering the evaluation of ethics risks and in relation to both data type and treatment methodologies, a Data Protection Impact Assessment under Art. 35 GDPR will be conducted when details for the pilot are finalized;
- **Demonstrator #2 – Strengthening Entrepreneurship and Mobility.** The pilot scenarios

focus on entrepreneurship and mobility, as well as tourist and cultural interests. The processing foreseen might involve a large amount of personal data and affect a large number of data subjects, but only in the future: in fact, in the pilot context only a limited amount of data is foreseen. There is a low risk that the processing gives rise to identity theft in the scenario related with certificates. Regarding the tracking and observation of people, offline geolocation will probably be used. Some profiling of the individuals involved will be conducted in the pilot activities with the exclusive purpose of providing personalized information. The informed and specific consent form includes the aforementioned purpose of data collection and the measures that participants might activate to safeguard their privacy rights. The organisation hosting the pilot has already in place technical and organizational measures for risk assessment and risk control in relation to data protection: these mainly consist in the register of treatments and risk assessment procedures when necessary according to the GDPR (art.35), appointment of DPO and definition of appropriate policies for the correct behaviour of employees. According to the evaluation of ethics risks and in relation to both data type and treatment methodologies, a Data Protection Impact Assessment under Art. 35 GDPR will be conducted, if required and under the Municipality of Piraeus DPOs consult, when details for the pilot are finalized.

- **Demonstrator #3 – Healthcare Data Retention and Sharing.** This pilot involves both medical data and non-medical data collection and processing. Only general health data will be processed with the only goal to provide new services or better health to the patient. Only basic aggregations will be done and not on a large scale. The consolidated procedures, the privacy policy and daily practices of Andaman7 will be followed. Andaman7 is a renowned company with consolidated experience in the field of sensitive data handling. A7 has been built following the principles of “security by design and privacy by default”. It will adopt also in the context of the DataVault research adequate technical and organizational measures to ensure that the processing of personal data is always carried out with appropriate safeguards to protect the data against any unauthorized access or unlawful processing and against loss, destruction or accidental damage: A7 has in place and adopt a privacy policy established according to the GDPR with the consultation of an external DPO (a lawyer specialized in privacy); the consent of the user for any sharing is required and the technical and design security of A7 platform and solution allow to minimize risks. The individual participants have a right of access, a right to forget, a right of rectification, a right of limitation of treatment, a right to portability, a right of opposition. These can be exercised in a simple and user-friendly manner. The personal health record can hold identifying information such as national ID, social security ID, ... Those pieces of information shouldn't be disclosed when anonymized or pseudonymized. Those identifiers are generally not used for strong identification or alone. So the likelihood and severity of the risk of identity theft is low. As regards the risk of loss of confidentiality of personal data protected by professional secrecy, the personal health record can hold such data. With security and pseudonymization, likelihood is really

low. But as it discloses private health data, severity can be higher depending on the data. The risk that the foreseen processing might give rise to unauthorised reversal of pseudonymization is low: some data can be really hard to pseudonymize (raw documents like picture or PDF for example, identifiers, ...); most of the time, only some authorized people may have access to it and no harm will be done to the final user; furthermore, process will be achieved on a small partition of data so even if pseudonymization is reversed, not much data will be identified. As regards the amount of data to be collected and processed, connected devices can bring a lot of personal data: only basic aggregation of the same type and transfer of data will be done and it is important to remark that such kinds of health data are less sensitive. Only biometric data entered and explicitly shared by the user will be processed: only transfer and aggregation of such data will be done, to provide new functionalities to the user and they won't be used to identify or track the user in any way. No profiling will be done in this demonstrator: they can collect aggregated data from users that have similarities on some specific medical field (example: suffer from the same chronic disease) but a specific user won't be associated with any profile information and this information will not be stored at any time. Although we are dealing with medical data, any risks concerning this kind of data are reduced as much as possible by providing secure exchange, storage and by limiting the possibility to access the data. Any process of data is basic and done under pseudonymization. Thus the Data protection impact assessment is therefore not mandatory, the demonstrator partner in charge of the operations will conduct a DPIA under Art. 35 GDPR, considering the sensitivity of data used during this demonstration.

- **Demonstrator #4 – Smart Home Personal Energy Data.** The collection and processing of electricity consumption data will consist only of the transfer of data between the data collector and the data owner, in basic aggregations of data of the same type. It will not involve sensitive data such as health or location data. Personal preferences or interests are expected to be extracted from DataVaults platform. The pilot is intended to be implemented on a small scale, but with a large amount of data. Customer profiling is one of the objectives of the use cases: it will be based on tastes and interests for the promotion of additional services, or special offers. In any case, such processing should be subject to suitable safeguards, which should include specific information to the data subject and the right to obtain human intervention, to express his or her point of view, to obtain an explanation of the decision reached after such assessment and to challenge the decision. In order to ensure fair and transparent processing in respect of the data subject, taking into account the specific circumstances and context in which the personal data are processed, appropriate mathematical or statistical procedures are expected to be used for the profiling. Appropriate technical and organizational measures will be implemented as well, in order to ensure, in particular, that factors which result in inaccuracies in personal data are corrected and the risk of errors is minimized, as well as that any potential risks involved for the interests and rights of the data subject and possible discriminatory effects is prevented. Due to the non-

sensitive nature of the electricity consumption data that MIWenergia will collect, process and share, and the research nature of the project, a data protection impact assessment is not considered necessary.

- **Demonstrator #5 Personal data for municipal services and the tourism industry.** In the future (after the project's end), a large amount of personal data might be collected and processed, potentially affecting a large number of data subjects. Nevertheless, in the pilot context only a limited amount of data is foreseen. Likewise, in the future a systematic and extensive evaluation of personal aspects relating to natural persons, based on automated processing, including profiling, might occur, but in the context of the piloting actions such aspects are limited. The Municipality of Prato is already familiar with this kind of personal data processing operations: personal data processing is already used by the administration in different contexts. It has already in place technical and organizational measures for risk assessment and risk control in relation to data protection: register of treatments and risk assessment procedures when necessary, according to the GDPR (art.35), appointment of DPO and definition of appropriate policies for the correct behaviour of employees. Profiling might be carried out to build citizens' samples for surveys on the basis of their cultural interests or mobility preferences. It might be included both in the mobility and cultural scenario to build citizens samples to whom questionnaires or direct requests for data specification might be addressed. Information on such action is included in the consent form, that reports also the measures that participants might activate to safeguard their privacy rights. A Data Protection Impact Assessment has already been carried out under Art. 35 GDPR by the Municipality of Prato, according to its own internal procedures and it will be available on request. There is a low risk of identity theft in relation with certificates.

4 CONCLUSIONS

The DataVaults Consortium is dealing in a meaningful and proper manner with the ethical dimensions of the action and the security, privacy and data protection issues. It elaborated an adequate Ethical Policy and both the Ethics-and-Privacy-by-Design-and-by-Default Approach, defined at the beginning of the project, and the legal and ethical requirement elicited in the context of WP2 (after and in-depth legal review and analysis), are properly considered in the design of the technological solution and in the demonstrator environments. An ethics risk evaluation related to the planned data collection and processing in each of the demonstrators have been performed. Almost all the demonstrators (except for the Demonstrator #4 – Smart Home Personal Energy Data, where only energy consumption data will be handled), will perform a Data Protection Impact Assessment pursuant to Art. 35 GDPR in the next phase of the project. Appropriate measures for complying with regulatory sources and the relevant European ethical principles and values have been adopted and the Ethics Requirements set by the Ethics Screening have been accomplished.

The partners demonstrate a high level of awareness and attention to ethical, privacy, data protection and societal implications. To summarize, the EAB believes that **the activities conducted in DataVaults project for handling legal, ethical and privacy aspects have been performed in an adequate way and high quality achievements have been reached so far.**

APPENDIX C: EXHAUSTIVE LIST OF POTENTIAL QUESTIONS RAISED THROUGH THE LOGIC MODELS, THE DOA AND PROJECT DELIVERABLES.

Questions which can be asked of the DataVaults project to refine for evaluation.	Type/ responsibility
<i>"Personal data platforms shall ensure respect of prevailing legislation and allow data subjects and data owners to remain in control of their data and its subsequent use."</i>	WP2 related issue
<i>"...Develop privacy metrics that are easy to understand for data subjects and contribute to the economic value of data by allowing privacy-preserving integration of independently developed data sources."</i>	WP2
<i>"... Conditions of use and practical arrangements of data sharing should be regulated."</i>	WP2
Did we successfully link novel trusted and security-by-design data mining, management, analysis and sharing techniques, with legislation- and ethics-driven functions?	WP2
Did this facilitate both privacy and trust preservation?	WP2
Did this facilitate risk situational awareness?	WP2
Has there been an Improvement in Trust?	WP2
Have privacy analytic methods been provided and tested?	WP2
Has a mechanism for taking back citizen control been provided and tested?	WP2
Are individuals receiving a fair share of their data value? (<i>How have we determined what is fair?</i>)	WP2
Are individuals receiving a fair share of their data value for second level use? (<i>How have we determined what is fair?</i>)	WP2
Has there been a contribution to the Basis for Privacy, Ethics and IPR?	WP2
Is there compliance with all relevant regulations?	WP2
Do we contribute to and are we aligned with:	
Ethic driven standards	WP2
Projects and regulatory tools	WP2
Fundamental Rights and Well-being	WP2
Is the personal app compliant with EU regulations and national laws?	WP2

Has the personal app been successfully used by individuals for storing, collecting and sharing data and what was their experience?	WP2
Was the personal app consent mechanism clear and well-received?	WP2
Are there fair compensation models for all the actors of the value chain available?	WP2
Did we provide an Ethics monitoring framework?	WP2
TOC1 Have we given improved control and awareness of how a citizen's data is shared and managed?	WP2
TOC2 Have we provided an acceptable "Remuneration Scheme" based on the data produced and shared?	WP2
Improving Privacy Risk Exposure Awareness for Individuals when sharing Personal Data <i>KPI already established</i>	WP2
Improvement of Individuals Knowledge on Personal Data Safeguarding <i>KPI</i>	WP2
Reluctance to personal data sharing services via DataVaults <i>KPI</i>	WP2
Increase of the value of personal data attributed back to owners <i>KPI</i>	WP2
Have we demonstrated that Citizens' trust is improved as privacy-aware transparency and control features are increasingly streamlined across data platforms and Big Data applications?	WP2
Have we demonstrated that we have Improved Privacy Risk Exposure Awareness for Individuals when sharing Personal Data?	WP2
Can we show an Improvement of Individual's Knowledge on Personal Data Safeguarding?	WP2
Have we overcome reluctance to personal data sharing services via DataVaults?	WP2
Has a secure trusted platform been provided and tested?	Business Model related
Is there evidence that GDPR related costs in investment decisions have been reduced for industry?	BusMod
How has value increased for all in the data chain through:	
Technical convergence	BusMod
Business Innovation	BusMod
Cross-domain collaboration	BusMod
Has Increased scale been demonstrated from small existing initiatives?	BusMod

Have entrepreneurs been able to develop their own goals and operations?	BusMod
Which local communities are developing their own goals and operations?	BusMod
Have we created a novel business model for personal data and insights sharing where data is valued based on different modalities and is attributed rightful owners:	BusMod
Has an inclusive analysis regarding DataVaults Trusted Data Management and Sharing Principles been carried out?	BusMod
Has the DataVaults Personal Data Sharing Business Model been developed?	BusMod
Has the DataVaults Value Distribution Method been delivered?	BusMod
Have Smart Contract Patterns and Templates for Stakeholder Collaboration and SLAs been provided?	BusMod
Has a PESTLE analysis of the DataVaults ecosystem been delivered?	BusMod
Has a SWOT analysis of the DataVaults platform been provided?	BusMod
Have 3 different Business Models been templated for personal data value sharing?	BusMod
Has a distributed ledger platform to facilitate transactions, been provided?	BusMod
Has there been a consortium wide exploitation plan delivered?	BusMod
Has an inclusive financial strategy plan with cost breakdowns and future projections been delivered?	BusMod
Has a consortium wide sustainability plan been delivered?	BusMod
Are individual partner's business models and exploitation plans in place?	BusMod
Have we cultivated a trusted sustainable and ever-growing ecosystem, with industry offers expanded by citizen controlled access to more and varied data?	BusMod
Did it propel the creation of a joint venture of personal data owners and data seeking organisations?	BusMod
Did we "link to and bring in industrial data providers, (not necessarily as consortium members), that will populate the platforms."	BusMod
TOC3 Have we provided Data Industries with easier and seamless access to personal data?	BusMod
TOC4 Have we provided acceptably secure and privacy aware guarantees for this access?	BusMod
TOC5 Have we significantly increased opportunities related to integrated data and data integration services' provision?	BusMod

TOC6 Have we provided more evidence-based analytics to support their strategic business and operational decisions?	BusMod
TOC7 Have we provided innovative and more effective products and services?	BusMod
TOC8 Have we significantly reduced time to market for new products and services?	BusMod
TOC9 Have we significantly increased business opportunities related to innovative services' and apps?	BusMod
TOC10 Have we provided easier and seamless access to constantly growing volumes of cross-sectorial multilingual big data?	BusMod
TOC Have we provided new business opportunities related to building on top of existing solutions?	BusMod
TOC11 Have we provided improved and fast access to personal data allowing data scientists to focus on experiments development, rather than investing time on data management and collection issues that need to be tackled due to regulation?	BusMod
TOC12 Have we provided a secure environment for experimentation with sensitive personal data structures?	BusMod
Have we demonstrated that personal data protection is improved, and compliance with the General Data Protection Regulation (and other relevant legislation) is made easier for economic operators, including SMEs?	BusMod
Have we reduced investments for personal data handling for enterprises using DataVaults to access and analyse personal data?	BusMod
Have we demonstrated better value-creation from personal and proprietary/industrial data?	BusMod
Have we demonstrated a 20% annual increase in the number of data provider organisations in the personal and industrial data platforms?	BusMod
Have we demonstrated a 50% annual increase in number of users (data subjects) in the personal data platforms?	BusMod
Have we demonstrated 20% annual increase in volume of business (turnover) channelled through the platforms?	BusMod
Have we shown a lowered effort to handle GDPR issues for SMEs? KPI already established	BusMod
Reduced investments for personal data handling for enterprises using DataVaults to access and analyse personal data KPI	BusMod
Improved access to personal data for economic operators KPI	BusMod
Increase of revenue for EU data companies KPI	BusMod
Enlarge the base of EU data scientists/engineers KPI	BusMod

Improved access to personal data for economic operators KPI	BusMod
Increase of value of reports and services based on personal data KPI	BusMod
New services offerings per year created for economic operators KPI	BusMod
Annual increase in the number of data provider organisations in the personal and industrial data platforms KPI	BusMod
Annual increase in number of users (data subjects) in the personal data platforms KPI	BusMod
Annual.inc in volume of business (turnover) channelled through the platforms KPI	BusMod
Service quality and experience improvement through personalisation KPI	BusMod
Have we made a good product?	
Have the Data Sharing means provided been tested successfully?	Product
Have the Data Analytics been successful?	Product
How well have we combined fragmented and domain specific data?	Product
Have we successfully demonstrated the use of data derived from the wide variety of sources available?	
• Recent innovations in sensors	Product
• activity tracking through wearable devices	Product
• Internet of Things	Product
• Cyber- Physical Systems (CPS) technologies	Product
• wearables	Product
• data APIs	Product
• historical data	Product
• social network data	Product
• activity trackers	Product
• health records	Product
• demographic profiles	Product
• Others used in the demonstrations	Product
Have smart contracts within the data chain been successfully tested?	Product

Has the Cloud-based pan-European Personal Data Platform and infrastructure been tested successfully?	Product
And has the Personal App been tested successfully?	Product
<ul style="list-style-type: none"> Has it High Security and Privacy? 	Product
<ul style="list-style-type: none"> For personal data and derivatives 	Product
Have each of the following components been successfully delivered?	Product
<ul style="list-style-type: none"> 1 cloud-based Data Management and Analytics platform, 	Product
<ul style="list-style-type: none"> 1 Personal Data Management and Analytics App, 	Product
<ul style="list-style-type: none"> 1 Open source library of the Personal Data App components 	Product
<ul style="list-style-type: none"> 1 Business Validation and Impact Assessment Report 	Product
<ul style="list-style-type: none"> Have the Impact Metrics targets been achieved? 	Product
Have we delivered the technical solution comprising of:	
<ul style="list-style-type: none"> Secure and trusted Data Management and Analytics cloud based platform as a Service? 	Product
<ul style="list-style-type: none"> Personal Data Apps, for storing, managing, sharing and monetizing over personal data (derivatives) which can be used by any individual with the aim to capitalise on the real value of his personal data, without dropping control of ownership or losing track of the usage methods, providing also constant awareness of the privacy, security and risks he may be exposed? 	Product
<ul style="list-style-type: none"> Has the DataVaults cloud-based platform been successfully tested? 	Product
<ul style="list-style-type: none"> Has the DataVaults mobile Personal App been tested? 	Product
<ul style="list-style-type: none"> Are the DataVaults Personal App libraries of the standard desired? 	Product
<ul style="list-style-type: none"> Is the Data Model as desired? 	Product
<ul style="list-style-type: none"> Has the DataVaults Open API been tested? 	Product
<ul style="list-style-type: none"> Has the Data brokerage engine with two layers been tested? 	Product
<ul style="list-style-type: none"> Have we produced the Documentation and Usage manuals? 	Product
<ul style="list-style-type: none"> Have we produced an expandable knowledge representation (in the form of a knowledge graph or ontology) for the personal data? 	Product
<ul style="list-style-type: none"> Have we provided and tested a secure cloud-based storage facility? 	Product

• Have we provided and tested a cloud-based data analytics engine?	Product
• Have we provided and tested an access control engine?	Product
• Have we provided and tested a risk management service?	Product
• Have we provided and tested a visualization library?	Product
• Have we provided and tested a personal data catalogue?	Product
• Have we provided and tested a business brokerage engine?	Product
Have we integrated existing approaches, tools, libraries and components that allow: <ul style="list-style-type: none"> • Handling of personal data in the way they should be preserved, accessed, valued, and controllably shared? • Guaranteeing high quality results which can support rapid prototyping, traction generation, fast market entry and sustainability? 	Product
Did we provide?	
• Modularised Services and Tools for data management and sharing as part of the platform,	Product
• a unified data management service to interconnect all other components,	Product
• improvement and integration of technical data infrastructure solutions supporting both secure and trusted data exchange and retention,	Product
• a novel paradigm for the documentation and IPR handling of conducted exchanges	Product
Did we provide the platform architecture?	Product
Did we provide designs of all software bundles?	Product
Did we integrate at least 8 TRL>7 technologies?	Product
Did we offer support for cutting edge technologies for security and trust by design?	Product
Did we offer support for modern analytics algorithms on plain, multiplexed and encrypted data?	Product
Scientific and Innovations Objective I:	
Did we deliver an innovative, secure, privacy preserving, IPR respecting, and fair compensation data exchange methodology?	Product

Did we define the Value Chain of Personal Datasets and Data sources?	Product
Did we provide a semantic representation of Personal Data?	Product
Did we update existing semantic vocabularies and make contributions to LOD?	Product
Did we provide data analysis algorithms?	Product
Did this give easy access to and usage of valuable information?	Product
Did we provide a security and privacy by design Personal Data lifecycle Management framework?	Product
Did we provide an Assets Brokerage methodology?	Product
Did we provide methods to isolate data and make them searchable even when encrypted?	Product
Did we provide methods to share data at different levels and modalities?	Product
Did we provide methods to calculate risk exposure?	Product
Did we provide a Data Access Framework?	Product
Did we provide an Assets Brokerage Engine?	Product
Did we provide a Risk Exposure Dashboard?	Product
Did we provide a Secure Data Management Environment on cloud and on App?	Product
HAVE WE DELIVERED THE FOLLOWING SERVICES?	
Holistic personal data management services, including collection, mining processing, normalization, formatting and availability at individuals' personal devices level as well as on secure data vaults on the cloud	Product
• Smart interlinking of personal data to open, linked as well as proprietary data following Linked Data principles and openly (re-)publishing non-sensitive and business critical information to the LOD community	Product
• Novel data security and cryptography, data anonymisation and privacy preservation, remote attestation and trusted data exchange through the utilisation of TPM technologies between the Personal DataVaults and the DataVaults cloud-based engine	Product
• Privacy risk assessment methods that offer a “situational awareness” picture to individuals with easy to understand privacy metrics, revealing the true risk exposure factor of individuals based on the shared data	Product
• Privacy preserving and data security retention mechanisms, to accommodate the generation of anonymised “digital twins” of individuals, as well as specimen clusters (“persona groups”) powering	Product

group analytics that contain valuable insights without violating privacy principles	
<ul style="list-style-type: none"> • A twin fold data brokerage engine to cater for IPR and data license safeguarding, documenting transactions in a privacy preserving, yet undisputable and unforgeable manner, facilitating compensations schemes with third parties (that support the shift to future monetisation streams) through the instantiation of multi-layer real-time micro-contracts specifically tailored to the needs of data sharing, redistribution and utilisation, constructing a bridge between personal data and industrial data platforms. 	Product
<ul style="list-style-type: none"> • Smart balancing of analytics methods to accommodate Edge Analytics as well as centralised operations depending on the degree of data volume, velocity and variety, always in conjunction with the security and privacy modalities allowed by the individual for each kind of analysis 	Product
<ul style="list-style-type: none"> • Provision of intuitive analytics, reports, smart dashboards and visualizations tailored to the needs of each stakeholder of the domain, including the individual, as well as generic ones for wider use by any interested organisation and by the public 	Product
Are all the required Data sources from WP1 covered?	Product
Do we have more effective services?	Product
Do we have more efficient services?	Product
Do we have more value-adding services?	Product
Numbers of second tier operators per demo?	Product
Novel services?	Product
The 4vs of big data: Volume, Variety, Veracity, Velocity?	Product
Did we deliver:	
DataVaults Public Showcase and Web Presence,	Comms
Marketing Kit,	Comms
Exploitation and Marketing Plan,	Comms
Dissemination and Stakeholders' Engagement Plan,	Comms
Events and Workshops,	Comms
Publications and Press material	Comms
Collaboration with other projects and businesses	Comms
Achieved communication targets	Comms

Did we run 200 questionnaires for needs elicitation and what was the outcome?	Comms
Additionally, WP8 has its own KPIs and targets	Comms
Risk exposure metrics –user needs and evaluation	WP5 technical testing
Searchable data catalogue Test	WP5
Methods of making data available:	WP5
Edge Cloud	WP5
Amount to share	WP5
Encrypted	WP5
Anonymisation	WP5
User interface for distributed ledger contracts engine	WP5
Common denominators/unique data sets covered, identify gaps in demonstrators use of data and of technical outputs being evaluated	WP5
<u>Personal DataVaults modules</u>	
Data Fetcher and Transformation mechanism	WP5
Data Schema Repository	WP5
Secure Storage facility,	WP5
Policy Access Editor,	WP5
Privacy Metrics Dashboard	WP5
Data Anonymiser and Identities Wallet,	WP5
Data Publisher and the TPM DAA module.	WP5
Edge Analytics Engine	WP5
Data Request Service Resolver	WP5
Data Picker	WP5
Personal DataVaults Wallet,	WP5
Private Ledger.	WP5
<u>Cloud based DataVaults platform modules</u>	
Data Fetcher and Transformation	WP5
Data Schema Repository,	WP5

Replicas of the Personal Data Storage	WP5
Encrypted Searchable Data Lake	WP5
Access Policy Engine	WP5
Indexing Service	WP5
Risk Management Monitor,	WP5
Data Policies Enforcement Services	WP5
Anonymizer bundle, which includes the Digital Twin Generator and the Persona Group Generator.	WP5
Scalable Data Analytics Containers	WP5
Secure Analytics Playground	WP5
Visualisation Dashboard	WP5
Data Request Service	WP5
Open API	WP5
Query Builder and Data Explorer	WP5
DataStream and Contract Composer	WP5
Open Ledger	WP5
Private Ledger	WP5
Personal Secure Data Management Functions and Edge Analytics bundle	WP5
Trusted Cloud-based Secure Analytics and Data Retention Services bundle	WP5
Trusted Data Sharing and Contract Negotiation Features Bundle	WP5
Pilot Key Performance Indicators	
DEMONSTRATOR #1 – SPORTS AND ACTIVITY PERSONAL DATA (OLYMPIACOS)	
Stakeholders' Satisfaction and trust KPI	Demos
Effective Management of members' and fans' data KPI	Demos
Effective Management of professional and young athletes' sport activity data KPI	Demos
Increase in the number of registered members KPI	Demos
Increase in the number of active members KPI	Demos
Increase in the number of active fans KPI	Demos
Increase in the sponsorship revenues KPI	Demos

DEMONSTRATOR #2 – STRENGTHENING ENTREPRENEURSHIP AND MOBILITY (PIRAEUS)	
Citizens actively sharing data KPI	Demos
New Municipal Services KPI	Demos
Improved Citizens Satisfaction in Municipal Services KPI	Demos
Touristic activity in Piraeus KPI	Demos
DEMONSTRATOR #3 – HEALTHCARE DATA RETENTION AND SHARING (ANDAMAN7)	
Increase in Active users operating Andaman7. KPI	Demos
Increase in Data Types used by the Andaman7 system. KPI	Demos
Increase in the quantity of Data stored for each Category handled by the system. KPI	Demos
Generation of New Services offered through Andaman7. KPI	Demos
DEMONSTRATOR #4 – SMARTHOME PERSONAL ENERGY DATA (MIWENERGIA)	
Effective Management of customers. KPI	Demos
Increase in the number of revenues through offering personalized services. KPI	Demos
Increase in the revenues through sales agreements. KPI	Demos
Increase of the number of partners. KPI	Demos
Client's satisfaction and trust. KPI	Demos
DEMONSTRATOR #5 – PERSONAL DATA FOR MUNICIPAL SERVICES AND THE TOURISM INDUSTRY (PRATO)	
Improvement of data updating frequencies. KPI	Demos
Increasing the quantity of collected data. KPI	Demos
Number of users involved in the demonstrator. KPI	Demos
Number of new data types used in demonstrator. KPI	Demos
Number of analysis for tourism improvement. KPI	Demos
Number of third parties involved in demonstrator. KPI	Demos
Improved citizen's satisfaction of city's services. KPI	Demos
Satisfaction of third parties using the platform. KPI	Demos
Have we included personal datasets of 5 different sites/demonstrators?	Demos
Have we supported 20 types of personal data categories?	Demos

Is there compatibility with at least 20 types of data sources (sensors, IoT, APIs, wearables, records, etc.)?	Demos
Are 12 known analytics algorithms supported?	Demos
Have we reused 10 existing vocabulary standards?	Demos
Did the five demonstrators successfully run for the required length of time?	Demos
TOC 13 Have we provided Policy Makers with faster and more effective decision-making procedures based on personal data?	Strategy
TOC14 Have we provided a solid reference implementation on which to base future legislation and regulations for personal data?	Strategy
TOC15 Have we made progress in advancing research and applying innovative technologies that utilise the best of breed in personal data management?	Strategy
TOC16 Has there been a positive effect of DataVaults on growing the Data Market?	Strategy
TOC17 Has there been a positive effect of DataVaults on growing the Data Economy?	Strategy
TOC18 Has there been a positive effect of DataVaults on Improving the Data Industry?	Strategy
TOC19 Has there been a positive effect on creating a growing eco-system?	Strategy
TOC20 Have we created a pan-EU platform?	Strategy
TOC21 Have we created a new citizen-centric data chain?	Strategy
TOC22 How have we contributed to EU Policy and Strategy?	Strategy
TOC23 In summary: Have we increased the size of the personal data lake? Has this contributed to the development and growth of an eco-system surrounding it?	Strategy
Strategic Impacts: Have we contributed to the following?	
"Supporting the emergence of data markets and the data economy"	Strategy
"... setting up and operating platforms for secure and controlled sharing of "closed data" (proprietary and/or personal data)"	Strategy
"... address the necessary technical, organisational, legal and commercial aspects of data sharing/brokerage/trading, and build on existing computing platforms ..."	Strategy
"... preserve utility for data analysis and allow for the management of privacy / utility trade-offs, metadata privacy, including query privacy..."	Strategy
Is there any evidence of an Increase in data economy activity?	Strategy
Have we evidence of growing data eco-systems?	Strategy
Can we show Financial & business impact in sectors working on personal data?	Strategy
Have we influenced European policies on data protection and security?	Strategy

Have we influenced other EU policies and strategies?	Strategy
Have we made any contribution to standardisation?	Strategy
Have we had other socially important impacts?	Strategy
Have we enabled smaller players to participate in the data economy better?	Strategy
Non –Functional requirements	
Functional Suitability	
Is DataVaults able to collect data from Individuals in order to gather their data in one place?	NFR1
Does DataVaults allow an Individual to select and manage how his/her data are to be shared to the DataVaults Cloud Platform?	NFR2
Is DataVaults able to share the data collected from Individuals and make them available to Data Seekers following specific data sharing contracts?	NFR3
Performance efficiency.	
Does DataVaults guarantee the timely and robust collection of data from the side of the Individuals?	NFR4
Is DataVaults able to handle and store datasets from various sources?	NFR5
Does DataVaults guarantee the efficient and effective resource allocation for the sharing and encryption/decryption process execution	NFR6
Is DataVaults able to perform analytics in a timely and efficient manner?	NFR7
Does DataVaults guarantee the full optimization of the response time to ensure a functional and flexible navigation through the DataVaults solution?	NFR8
Does DataVaults cater so that both the Public and the Private ledgers are able to process transactions fast and within certain time limits?	NFR9
Does DataVaults provide prompt transaction responses from the Brokerage Engines?	NFR10
Compatibility	
Is DataVaults able to interact and exchange information with other systems in a secure way (for example secure REST API)?	NFR11
Does the DataVaults Cloud Platform provide communication capabilities to allow other applications to interact with DataVaults platform?	NFR12
Does DataVaults allow the Personal DataVaults App to run on devices that do not support DAA?	NFR13
Usability	
Does DataVaults feature a user-friendly interface, and be offering a set of user guides?	NFR14
Does DataVaults provide a user interface that supports straightforward task accomplishment?	NFR15
Does DataVaults provide the suitable error protection methods for all input fields?	NFR16
Does DataVaults have a Multi-language user interface?	NFR17
Does DataVaults offer logs about evolution and faults history and periodically send debug reports?	NFR18

Does DataVaults not influence user experience by performing all computational intensive tasks (such as DAA authorisation) in the background?	NFR19
Reliability	
Does DataVaults ensure high availability of the overall system?	NFR20
Is DataVaults able to handle simultaneous requests on a timely and efficient manner?	NFR21
Does DataVaults provide the mechanisms to recover the system state to normal operation after a failure?	NFR22
Does DataVaults keep information about transactions parties private	NFR23
Security	
Is DataVaults able to handle software errors without affecting the platform overall functionality?	NFR24
Is DataVaults able to securely store uploaded Individuals' data?	NFR25
Is DataVaults able to retain the privacy of Individuals based on the privacy level they have chosen?	NFR26
Does DataVaults take into account privacy and security rules according to national legislation?	NFR27
Does DataVaults ensure different authorisation access to different datasets?	NFR28
Does DataVaults support data seeker's account validation?	NFR29
Is DataVaults able to attest the identity of the user/subject performing any operation?	NFR30
Does DataVaults provide the proper mechanisms for system upgrade/maintenance with minimum downtime?	NFR31
Is DataVaults composed by components that are operating independently?	NFR32
Is DataVaults able to raise alarms about hardware/software failures of the solution?	NFR33
Does DataVaults provide strong transaction validation mechanisms?	NFR34
Does DataVaults keep information about transactions encrypted?	NFR35
Does DataVaults keep history of all important actions (such as transactions)?	NFR36
Portability	
Is DataVaults able to be deployed in a timely and efficient manner?	NFR37
Is DataVaults based on easily replaceable independent components interconnected through APIs?	NFR38
Is DataVaults able to be deployed on various Linux based distributions?	NFR39