

Title:	Document Version:
D6.4 Report of clustering activities and scaling-up M12	1.0

Project Number:	Project Acronym:	Project Title:
H2020-871493	DataPorts	A Data Platform for the Cognitive Ports of the Future

Contractual Delivery Date:	Actual Delivery Date:	Deliverable Type*-Security*:
M12 (December 2020)	M15 (March 2021)	R-PU

*Type: P: Prototype; R: Report; D: Demonstrator; O: Other; ORDP: Open Research Data Pilot; E: Ethics.

**Security Class: PU: Public; PP: Restricted to other programme participants (including the Commission); RE: Restricted to a group defined by the consortium (including the Commission); CO: Confidential, only for members of the consortium (including the Commission).

Responsible:	Organisation:	Contributing WP:
Michael Arbter	FHG	WP6

Authors (organisation):	
Michael Arbter (FHG)	Andreas Metzger (UDE)
Kristina Weimer (FHG)	Daniel Alonso (ITI)
Aljosha Brand (FHG)	Francisco Valverde (ITI)
Fabiana Fournier (IBM)	Santiago Cáceres (ITI)
Christos Gizelis (OTE)	Andreu Belsa (UPV)
Achilleas Marinakis (ICCS)	

Abstract:

The DataPorts platform aims to become the standard data platform for seaports in Europe. A well-defined scaling strategy and close collaboration with strategic initiatives are required to reach this ambitious goal. This document presents the development of the strategic activities and pillars to scale up on European level. Furthermore, the status of the collaboration with the strategic initiatives is presented.

Keywords:

Scaling Strategy, Scaling activities, Roadmap, Strategic Pillar, Advisory Board

Revision History

Revision	Date	Description	Author (Organisation)
V0.1	19.01.2021	First version of the document, create ToC	Michael Arbter (FHG)
V0.2	15.02.2021	Refined and update document/ToC	Michael Arbter (FHG)
V0.3	02.03.2021	First complete version	Michael Arbter (FHG)
V0.4	06.03.2021	First review and update of document	Fabiana Fournier (IBM) Michael Arbter (FHG)
V0.5	11.03.2021	Second review and update of document	Sofia Terzi (CERTH) Michael Arbter (FHG)
V0.6	25.03.2021	Update of the document	Andreas Metzger (UDE)
V1.0	29.03.2021	Final version	Santiago Cáceres (ITI)



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement № 871493.

More information available at <https://DataPorts-project.eu>

Copyright Statement

The work described in this document has been conducted within the DataPorts project. This document reflects only the DataPorts Consortium view and the European Union is not responsible for any use that may be made of the information it contains.

This document and its content are the property of the DataPorts Consortium. All rights relevant to this document are determined by the applicable laws. Access to this document does not grant any right or license on the document or its contents. This document or its contents are not to be used or treated in any manner inconsistent with the rights or interests of the DataPorts Consortium or the Partners detriment and are not to be disclosed externally without prior written consent from the DataPorts Partners.

Each DataPorts Partner may use this document in conformity with the DataPorts Consortium Grant Agreement provisions.

INDEX

1	INTRODUCTION	6
1.1	DATAPOINTS PROJECT OVERVIEW	6
1.2	DELIVERABLE PURPOSE AND SCOPE	6
1.3	DELIVERABLE CONTEXT	7
1.4	DOCUMENT STRUCTURE	7
1.5	DOCUMENT DEPENDENCIES	7
2	CONCEPTUAL FRAMEWORK FOR DATAPORTS SCALE UP	8
2.1	THEORETICAL BACKGROUND	8
2.1.1	SCALING	8
2.1.2	STRATEGY	9
2.1.3	PLATFORM THEORY	9
2.2	MOTIVATION AND FRAMEWORK OVERVIEW	10
2.2.1	BUSINESS DRIVERS	11
2.2.2	INPUT	11
2.2.3	ACTIVITIES	12
2.2.4	DELIVERABLES	12
2.2.5	METHODICAL DRIVERS	12
3	DEVELOPMENT OF POTENTIAL SCALING ACTIVITIES	13
3.1	RELEVANCE DESCRIPTION	13
3.2	SCALING ACTIVITIES	15
4	PILLARS OF THE SCALING STRATEGY	19
4.1	SCALING CRITERIA	19
4.2	EVALUATION	20
4.3	SCALING LOOP	22
4.3.1	SCALING CANVAS	22
4.3.2	SELF-REINFORCING SCALING LOOP	23
4.3.3	SCALING ACTIVITIES IN DETAIL	24
4.4	MAPPING TO DATAPORTS KEY PERFORMANCE INDICATORS	27
5	ROADMAP FOR DATAPORTS SCALING STRATEGY	29
5.1	SCALING APPROACH	29
5.2	DATAPORTS ROADMAP	29
6	CLUSTERING ACTIVITIES	32
6.1	COLLABORATION WITH RELATED BDV PPP ACTIVITIES	32

6.1.1	EUROPEAN DATA PLATFORM WEBINARS (ORGANIZED BY BDVA/BDVE)	33
6.1.2	EUROPEAN BIG DATA VALUE FORUM (EBDVF)	33
6.1.3	EUHUBS4DATA PROJECT MEETING	34
6.1.4	BDV PPP TECHNICAL COMMITTEE #6 (COLLOCATED WITH BDVA ACTIVITY GROUP MEETING #41)	34
6.1.5	BDV PPP TECHNICAL COMMITTEE #7 (COLLOCATED WITH BDVA ACTIVITY GROUP MEETING #43)	34
6.1.6	DATA WEEK 2021	35
6.1.7	BDV PPP BOOK "TECHNOLOGIES AND APPLICATIONS FOR BIG DATA VALUE"	35
6.2	COLLABORATION WITH LINKED ACTIVITIES	35
6.2.1	AMMITEC	36
6.2.2	ASSIST-IoT	36
6.2.3	BOOST 4.0	36
6.2.4	PIXEL	37
6.2.5	PLEDGER	38
6.2.6	PORTFORWARD & SMARTSHIP	38
6.3	INTERACTION WITH ADVISORY BOARD	39
7	CONCLUSION	41
8	REFERENCES AND ACRONYMS	42
8.1	REFERENCES	42
8.2	ACRONYMS	44

LIST OF FIGURES

Figure 1 - Framework for DataPorts scaling strategy	11
Figure 2 - Evaluation of the project results using SWOT analysis	15
Figure 3 - Views on scaling DataPorts.....	16
Figure 4 - Scaling factors of the individual views	19
Figure 5 - Scaling canvas	23
Figure 6 - Scaling loop and scaling activities.....	24
Figure 7 - Theory of the Scaling Approach	29
Figure 8 - Roadmap for the scaling strategy of DataPorts	31

LIST OF TABLES

Table 1 - Relevant input for the scaling strategy of previous working packages	15
Table 2 - Classification of the scaling activities	18
Table 3 - Evaluation of scaling criteria.....	21
Table 4 - Scaling KPIs	28
Table 5 - Elements of the DataPorts scaling strategy.....	31
Table 6 - Collaboration activities with related BDV PPP activities	33
Table 7 - Collaboration activities with linked projects	36
Table 8 - Agenda for the Advisory Board meeting	40
Table 9 - Acronyms	44

1 INTRODUCTION

1.1 DATAPORTS PROJECT OVERVIEW

DataPorts is a project funded by the European Commission as part of the H2020 Big Data Value PPP programme, and coordinated by the ITI - Technological Institute of Informatics. DataPorts rely on the participation of 13 partners from five different nationalities. The project involves the design and implementation of a data platform, its deployment in two relevant European seaports connecting to their existing digital infrastructures and addressing specific local constraints. Furthermore, a global use case involving these two ports and other actors and targeting inter-port objectives, and all the actions to foster the adoption of the platform at European level.

Hundreds of different European seaports collaborate with each other, exchanging different digital data from several data sources. However, to achieve efficient collaboration and benefit from AI-based technology, a new integrating environment is needed. To this end, DataPorts project is designing and implementing an Industrial Data Platform.

The DataPorts Platform aim is to connect to the different digital infrastructures currently existing in digital seaports, enabling the interconnection of a wide variety of systems into a tightly integrated ecosystem. In addition, to set the policies

for a trusted and reliable data sharing and trading based on data owners' rules and offering a clear value proposition. Finally, to leverage on the data collected to provide advanced Data Analytic services based on which the different actors in the port value chain could develop novel AI and cognitive applications.

DataPorts will allow establish a future Data Space unique for all maritime ports of Europe and contribute to the EC global objective of creating a Common European Data Space.

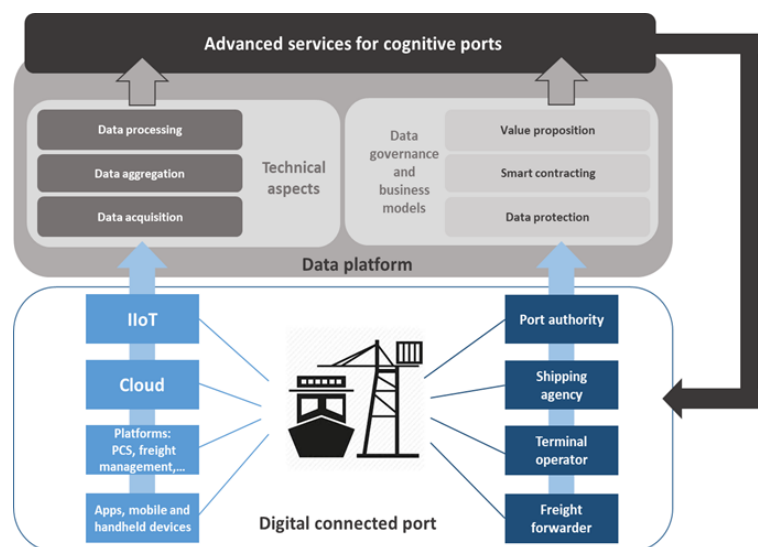
1.2 DELIVERABLE PURPOSE AND SCOPE

Specifically, the DOA states the following regarding this Deliverable:

This report will collect all activities carried out in the scope of T6.3 and T6.4, involving community building, initiatives contacted and engaged and level of adoption of the platform by other actors.

DataPorts main goal is to become the de-facto standard data platform for seaports. For this purpose, several communications and collaboration activities need to be carried out to increase the awareness and the attraction of DataPorts. This approach requires an agile but also clearly defined workflow. Therefore, this document focuses on a strategic and an operative construct to scale up DataPorts on European level. The strategic part describes the scaling direction to increase attraction of DataPorts on European level while the operative part concentrates on the predefined collaboration with linked projects. In contrast to the strategic part, the scope of the operational part is clearly defined. The strategic part covers a consideration area outside these limitations, which are determined by the predefined collaboration with linked projects (see task 6.3).

The purpose of the document is to provide a defined scope for the strategic part and develop a scaling strategy which defines and prioritizes the required activities to enable the adaption of the platform by other



stakeholders. Furthermore, the document describes the status of the collaboration with the linked projects. In several successive steps (see section 2.2), a scaling strategy will be developed and aligned with the activities of the current collaborations. With this scaling plan DataPorts is capable to channel the adaption precisely.

1.3 DELIVERABLE CONTEXT

D6.4 relationship to other documents is as follows:

Primary Preceding documents:

- Description of Action (DOA): Provides the foundation for the actual research and technological content of DataPorts. Importantly, the Description of Action includes a description of the overall project work plan.

Primary Dependant documents:

- None

1.4 DOCUMENT STRUCTURE

This deliverable is broken down into the following sections:

- **Section 2** defines the scope and framework for the development of a scaling strategy.
- **Section 3** indicates several scaling activities which can be carried out for a scale up on European level.
- **Section 4** prioritizes the scaling activities and sets up a self-reinforcing loop to make use of network effects.
- **Section 5** presents a roadmap and the concrete next steps/milestones to implement the scaling strategy.
- **Section 6** describes the collaboration with linked projects.

1.5 DOCUMENT DEPENDENCIES

This document is part of an iteration of a living deliverable for Tasks 6.3 & 6.4. This is the first variant which is going to be delivered in M15. There are two more advanced deliverables planed for M24 and M36.

2 CONCEPTUAL FRAMEWORK FOR DATAPORTS SCALE UP

The conceptual framework indicates the boundaries of the strategy. To guarantee the same understanding across all partners, the theoretical background with the terms scaling, strategy, and platform theory is provided (subchapter 2.1). These are aiming towards a common definition for the term scaling strategy. The second subchapter explains the framework including the drivers, inputs, activities, and deliverables to understand the scope of this deliverable.

2.1 THEORETICAL BACKGROUND

2.1.1 Scaling

The concept of scaling is complex and originates from the noun scale, which has different definitions [1]. In terms of objects or systems, scaling represents a change in size [2]. The ability to change scale is also known as *scalability*. It describes a frequently required property of networks, systems, or processes [3]. In business administration, scalability refers to the ability of a business model to expand through capacity expansion to achieve higher efficiency and profitability. At this point, however, it is important to distinguish scalability from growth. While the term growth is understood to mean a linear relationship between the use of resources and an increase in revenue, the term scalability is used when revenue increases without a significant increase in resources.

If a system or object does not have this characteristic, it cannot cope with an increased level of performance. Often, the additional costs of coping with a given increase in traffic or size are too high. These costs as processing overhead, space, storage, or money, can be quantified. Accordingly, a system or object that does not scale well causes an increase in labour costs or a decrease in the quality of services. It may delay revenue opportunities or deprive users. Ultimately, it must be replaced. Therefore, the long-term success of a system or object that is subject to growing demand depends on its ability to scale.

The scalability of a system or object should consider the following characteristics [3]:

- **Load scalability** is the ability to maintain system behaviour over larger load ranges. The system does not exhibit excessive delays and processes requests expeditiously.
- **Space scalability** is when the system's memory requirements do not increase to an unacceptable level even though the number of supported elements increases.
- **Space-time scalability** describes the maintenance of the system's performance even though the number of objects in the system increases.
- **Structural scalability** characterizes a system whose implementation does not significantly hinder the increase of the number of objects within a self-defined range.

The different types of scalability can have mutual effects on each other and are thus not to be considered completely independent of each other. These types of scaling can also be applied in the context of the DataPorts platform. Therefore, the scaling of the DataPorts platform should exhibit a constant system behaviour (load scalability). Furthermore, the platform's offering should be easily expanded without the platform reaching its technical limits (space scalability). In addition, the platform should maintain its performance despite scaling (space-time scalability). The structural design of the DataPorts platform allows for a simple expansion of the offering (structural scalability). This work, however, is not about the technical scaling of the DataPorts platform. It is about the scaling of the awareness of the DataPorts platform among potential stakeholder and users. For the following work, the scaling of the DataPorts platform is understood as a process of dissemination. DataPorts will be scaled by introducing more users to the platform's features and functionalities and support the platform adoption by other communities.

2.1.2 Strategy

For successfully scaling up a business, the strategic management and the development of a scaling strategy are focal. To this end, a common disambiguation of the term “strategy” and the related processes in strategic management is necessary [4].

At the outset, it can be directly noted that there is neither a uniform definition of the term "strategy" nor a strict specification of what a strategy must contain. Nevertheless, it is common to summarize the basic pillars of a strategy - especially in an economic context. The following key questions describe a framework for long term planning [5]:

- Where are we? → What is the actual state?
- Where do we want to go? → What is the strategic goal?
- How do we get there? → Decision making framework to strategic goal.

The content of a strategy also depends primarily on the application and the corresponding requirements and the corresponding strategic planning approach. Therefore, the goal of this definition is to narrow down a concept of strategy that is appropriate for the task of scaling the DataPorts platform. For the application in DataPorts and the focus on the scaling of DataPorts users, the thematic limitation to the realm of business is appropriate, so called business strategy. In the following, the topics business strategy, strategic management, and marketing strategy are summarized.

Business strategy is a further development of the classic concept of strategy, which had to be adapted due to the lack of planning in real business processes. According to Mintzberg, the focus is on the formation of a decision-making framework for achieving long-term corporate goals. This decision framework is based on the corporate vision, which must be precisely formulated and understood for this purpose [6] [7].

Strategic management is a management function in companies/organizations that deals with the development and implementation of a business strategy for the long-term success of the company. Organizationally, it is usually part of corporate management and has many thematic overlaps with other stakeholders. In addition to the development of a strategy, the central task areas are the alignment of the company with this strategy, especially the company structures and the systems used [8].

The topic of marketing strategy is an important influencing factor for the development of a scaling strategy, as the scaling of the platform is primarily dependent on the acquisition of new customers and partners [7]. Due to its high central role, the marketing strategy is the dominating function strategy (sub-strategy) of the business strategy. The central goals of the marketing strategy are the successful positioning of the company in the market and the development of this market. As with strategic management, various instruments are used for this purpose, the aim of which is the long-term alignment of marketing functions with the corporate vision [9].

2.1.3 Platform Theory

DataPorts is defined as a data platform based on platform economics and accompanying scaling mechanisms. The scaling strategy finally must be aligned to this context. To give a rough overview of what constitutes a platform, and which special aspects are particularly relevant here, there is a theoretical overview of the topic of *platform economy* at this point.

A platform in an economic context (platform economy) describes a (digital) basis for goods exchange of third parties (e.g., producer, consumer, prosumer). In this context, the platform provider acts as an intermediary role that enables the platform participants to exchange services, information, etc. The platform provider's role is to offer one or more service(s). The platform provider does not provide any active services, even though there are often optional service offerings from the providers [10]. Such platforms are used both in the private sector (e.g., Facebook, eBay, Uber, etc.) and in the commercial sector (e.g., Kaggle, etc.).

For the topic of a scaling strategy, there are two characteristics of digital platforms that will be discussed in more detail here because of their relevance. The first is that the topic of scaling is core to the business model of digital platforms. Without physical processes, supply chains and value chains, digital platforms are predestined for rapid scaling, which means that the speed of scaling is primarily based on market demand. By eliminating these physical processes, platforms have a strong scaling advantage over companies with traditional business models [11]. The second relevant property is the network effects, which are highly relevant for digital platforms. Network effects describe the customer benefit as a function of the number of user changes, whereby there are positive and negative effects. From an economic point of view, network effects are a thoroughly complex topic, but at this point a categorization into two types will be sufficient. Direct network effects describe the customer benefit depending on the participants of the network, whereby positive, neutral, or negative effects can occur. An example is a social network (e.g., Facebook), where the attractiveness for potential new customers increases with the number of users. Indirect network effects do not describe the customer benefit but the mutual influence of customer and supplier benefits in a network. These effects are often reciprocal and usually positive. An example is a trading platform (e.g., Amazon), where the attractiveness for retailers increases as the number of customers increases. In turn, the attractiveness for customers increases as the number of retailers increases. By leveraging these network effects, scaling can achieve much higher growth rates than traditional business models [12].

Considering all three terms (scaling, strategy, and platform theory) a common understanding for the term scaling strategy for DataPorts will be defined as follows:

The DataPorts scaling strategy determines where and how DataPorts wants to exponentially increase participation in its business model and data platform to minimize the platform cost and maximize the customer count to become the leading platform in the seaport's ecosystem.

2.2 MOTIVATION AND FRAMEWORK OVERVIEW

The DataPorts platform is characterized by a complex ecosystem with several stakeholders, different organizational maturity levels, and new technologies. The development of the platform faces several challenges to become the de-facto standard platform for seaports. The current scope of DataPorts only targets two seaports which is suitable to demonstrate feasibility, but not sufficient to enable scalability. By attracting more participants, the platform can be adjusted and aligned with the needs and demands. To attract the right participants in the right time, DataPorts needs a clear scaling strategy with a sophisticated scaling approach for the business model. The framework (Figure 1) targets this complexity and describes how the scaling up of DataPorts should be achieved. For that purpose, the framework distinguishes between business drivers and methodical drivers as well as the necessary activities to achieve the deliverables. These elements define the *Why*, *What*, and *How* of the scaling strategy (known as the Golden Circle). The following paragraphs explain the framework in detail:

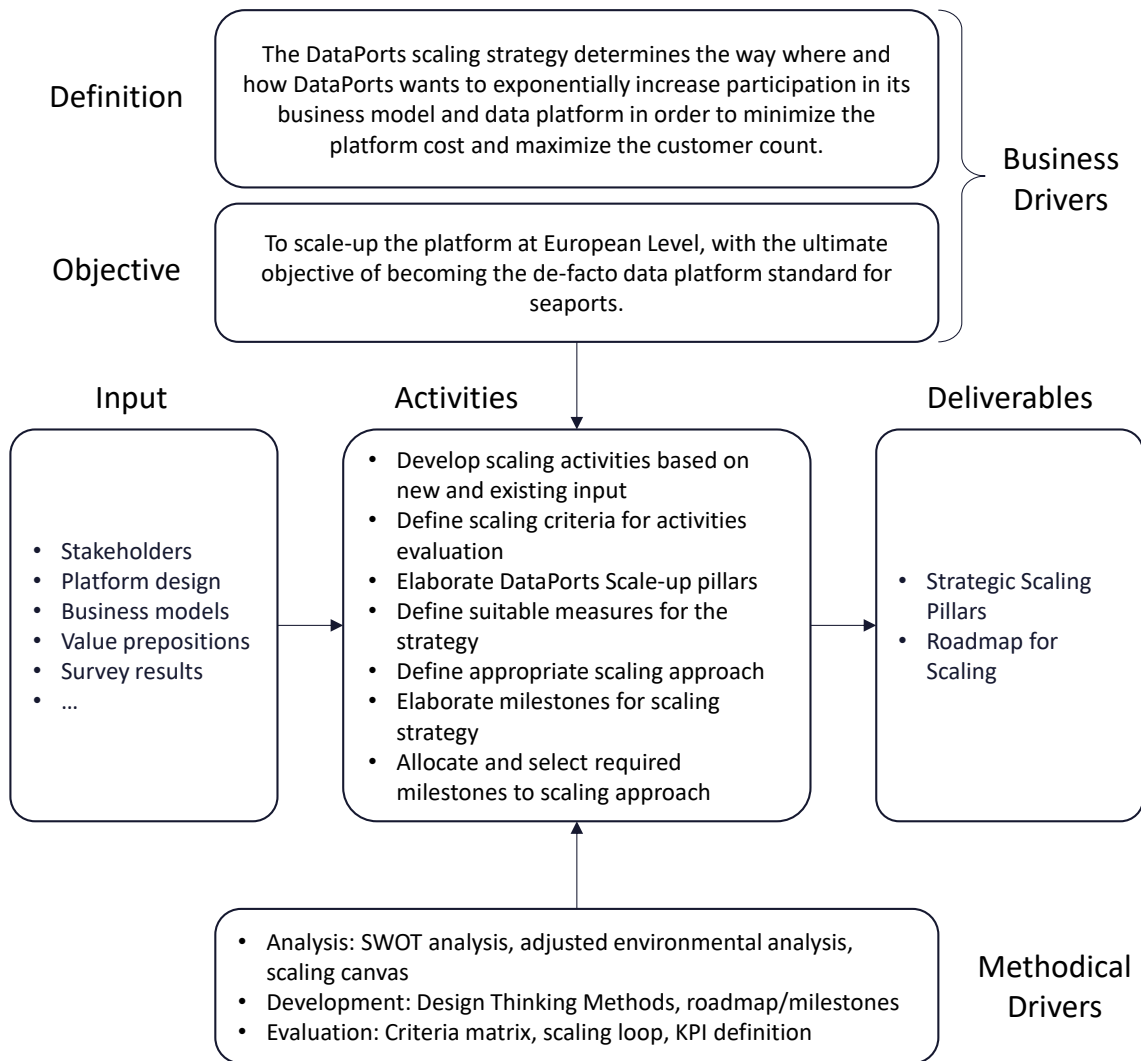


Figure 1 - Framework for DataPorts scaling strategy

2.2.1 Business Drivers

The business drivers explain the *Why* of the scaling strategy. They describe the reasons and objectives for the scaling. The main business driver is the objective of DataPorts which declares to become the de-facto data platform standard for seaports. It shall support the seaports in the digitalization of their value chain by enabling the acceleration of logistics activities and reducing effort in handling the logistic value chain. The platform should interact as intermediary and provide new opportunities for data-driven business models.

2.2.2 Input

The network effect of platforms occurs when the platform receives attention from users on both sides. The scaling activities concern the activities which foster the adaption of the data platform. Nevertheless, for this purpose it is necessary to understand which pillar of the platform could receive sufficient attraction. This allows to enable the potential to scale on European level. The input relies on the current project results (WP2 to WP7): The evaluation will consider the different stakeholders, the platform design, the business models, value propositions, survey results, and many more. The selection of appropriate input will be used for the development of several activities.

2.2.3 Activities

To develop the scaling strategy, several activities need to be fulfilled. The activities are part of the headlines and describe in detail the performed action. The focus of the document is to define a strategy and a roadmap which describe the Why, What, and How for the scale up on European level. The first activities in Section 3 and 4 will be performed to elaborate the strategic pillar for scaling and identify the “What” of the Golden Circle:

- Develop scaling activities based on new and existing input.
- Define scaling criteria for activities evaluation.
- Elaborate DataPorts scale-up pillars.
- Define suitable measures for the strategy.

Further activities focus on the approach how to scale up on European level based on the strategic pillar. The following activities belong to the second part:

- Define appropriate scaling approach.
- Elaborate milestones for scaling strategy.
- Allocate and select required milestones to scaling approach.

For each activity, several methods for strategy development are used.

2.2.4 Deliverables

The strategic development theory distinguishes between the strategic goals, strategic options, business model and roadmap. The strategic goals are already described in the Grant Agreement and the business model development is part of the task T7.2. In conclusion, this document provides the following main deliverables for the scaling strategy:

- Strategic Scaling Pillars: Defines the “What” in the Golden Circle and describe the elements which will be performed for realizing the strategic goals.
- Roadmap for Scaling: Defines the “How” in the Golden Circle and describe the approach which element will be performed in which step with which purpose.

The strategy and the roadmap provide a holistic overview about the required steps to become the de-facto standard platform in the seaport ecosystem.

2.2.5 Methodical Drivers

To support the activities, several methodologies from the strategy theory development are applied. These methodologies are classified in the analysis, development, and evaluation. Following methods were applied:

- Analysis: SWOT analysis, adjusted environmental analysis, and scaling canvas.
- Development: Design Thinking Methods, and roadmap with milestones.
- Evaluation: Criteria matrix, scaling loop, and key performance indicators (KPI) definition.

The definition and the framework provide a short overview of scope for the DataPorts scale-up strategy. The following chapter deals with the development of scaling activities.

3 DEVELOPMENT OF POTENTIAL SCALING ACTIVITIES

The project DataPorts starts with a small scope and an easily understandable amount of use cases for realizing a data platform for seaports. The platform has clear focus based on several pain points of the stakeholders and provides several advantages for the port community. Nevertheless, each product as DataPorts needs an appropriate scaling strategy to enable its full potential for the broader market participants. Initializing a scaling strategy specifies what must be achieved to increase the number of participants on the DataPorts platform. To elaborate the pillars of the strategy several scaling activities are required. This section investigates DataPorts' results and deliverables so far to avoid duplicate work (3.1) and develop scaling activities for the strategy (3.2).

3.1 RELEVANCE DESCRIPTION

In accordance with the results of T7.4 Key Exploitable Results the different results and artefacts will be investigated and evaluated for further consideration. The table does not contain all DataPorts results which have been achieved. It contains the input which has impact on the scaling strategy in form of ideas, boundaries, structure, or organization of the strategy itself. Each listed result provides a short description and assessment about the relevance for the scaling strategy. Deliverable D6.1 "Dissemination and Communication Results" described two main objectives (awareness and appeal) which are used for the relevance assessment of the input. In the DataPorts context *awareness* is defined as activities which increase the visibility of the project, while *appeal* describes the attraction of DataPorts features to other parties. The considered results from the working packages are described in the following table:

ID	WP	Result	Description	Relevance	Input for scaling strategy
1	1.6	Data Management Plan	Description of FAIR (findable, accessible, interoperable, re-usable) data provided by the partners	High	The more data sources are available the more participants are willing to interact with the platform
2	2.1	State of the Art Analysis	Summary of Commercial Products and Technologies, and Related EU Projects	High	Comparability of current projects
3	2.1	Infrastructure Benchmarking	Analysis of current infrastructure and processes and involved technologies	High	Comparability with benchmark
4	2.2	Requirements for DataPorts	Definition functional and non-functional requirements at WP level	High	Properties and functions of DataPorts
5	2.3	Thessaloniki Port Use Case	Introduction of blockchain network regarding Data driven applications and Mobility improvement	High	Visualize the practicability of DataPorts and areas of application

ID	WP	Result	Description	Relevance	Input for scaling strategy
6	2.3	Valencia Port Use Case	Description of use cases for data sharing: on-chain data sharing, off-chain data sharing	High	Visualize the practicability of DataPorts and areas of application
7	4.1	Secure environment specifications	Description of the system security characterisation	Mid	Potentially impact stakeholder's pains positively
8	6.1	External communication strategy	Overview about the different dissemination strategy and channels	Mid	Provide structure, goals and target audiences for dissemination ideas initialized by the scaling strategy
9	6.2	Key Performance Indicators	KPIs presents the status of the potential adaption of DataPorts Platform	High	Influence the objectives and pillars of the scaling strategy
10	6.2	Outreach activities	Identify needs and services of known or unknown (potential) stakeholders	High	Demand could concretize the scaling activities
11	7.1	Service Value Propositions	Development of value proposition to explain the business value of DataPorts	High	Pains and gains present potential benefits for a precise scaling
12	7.1	Smart Port Future Stakeholders	Overview about the potential stakeholders for DataPorts	High	Scaling of DataPorts highly depends on the potential stakeholders
13	7.1	Service Catalog	Categories of provided services for DataPorts	Mid	Service could provide the use cases for participating at the platform
14	7.1	Stakeholders and Benefits	Description of benefits for each stakeholder	High	Could be used for CRM
15	7.1	Data-Driven Roles	Role concept for the platform	High	Increasing stakeholder by changing perspective to data ecosystem roles
16	7.3	TRL Functionality	Each functionality was targeted with a final TRL	Low	TRL might be interesting for future participants
17	7.4	Individual Key Exploitable Results	Analysis and graphical description of KER from each partner	Mid	KER is required for alignment with scaling activities

ID	WP	Result	Description	Relevance	Input for scaling strategy
18	7.4	Market analysis	Describes the ecosystems and the current technology trends within the market	High	Ecosystem and technologies influence the way how to scale the platform
19	7.4	Strategic Definition	Strategic Framework for Exploitation	High	Indicate potential areas for scaling activities

Table 1 - Relevant input for the scaling strategy of previous working packages

The Table shows that the DataPorts project already provided input which can be used to innovate several scaling activities. For the next steps, the information and meta-information of the input will be used to provide key statements for the SWOT analysis. From a strategy development point of view, the key statements are used to build a big picture regards to strengths, weaknesses, opportunities, and threats which influence the business model of the platform. The SWOT analysis is the foundation to derive new insights. The input is analysed, and relevant outcomes are sorted into Figure 2. Not every input from the table is used for developing scaling activities, but they are relevant to other constituents of the strategy (e.g., Key Performance Indicators).

Strengths	Weaknesses
<ul style="list-style-type: none"> Broad service catalog can attract market participants. Stakeholders and their needs are well-known. Benefits of the platform are matching the pains of the port community. Key Performance Indicators define the directions and sub-objectives for the scaling strategy. 	<ul style="list-style-type: none"> No customer engagement so far beyond the included partner. Data sharing complexity still to be validated. Potential customers do not know how to create revenue with
Opportunities	Threats
<ul style="list-style-type: none"> Strategic initiatives could provide a broader awareness to the third parties. High security level of the platform support the participant's' trust level. The growing data management plan enables a growing service catalog on the other side. 	<ul style="list-style-type: none"> Low TRL could influence performance and interest of the platform. The port community is not fully digitalized. Participants are more willing to buy service than sell data. Technologies need to be updated for the platform to attract customers/communities. Data value chain could not be understood by the port community.

Figure 2 - Evaluation of the project results using SWOT analysis

3.2 SCALING ACTIVITIES

Scaling activities are defined as activities which foster the adaption of DataPorts platform by other communities and contribute to the goal to become the de-facto standard platform for seaports in the market. Market scaling can be achieved with an appropriate business model which allows revenue increases without a substantial increase in resources. This perception hides various levers to reach the target. Enabling a

product to scale on European level requires different product perspectives [13]. The most common views are the Business View (BV), Market View (MV), and Organizational View (OV) (Figure 3).

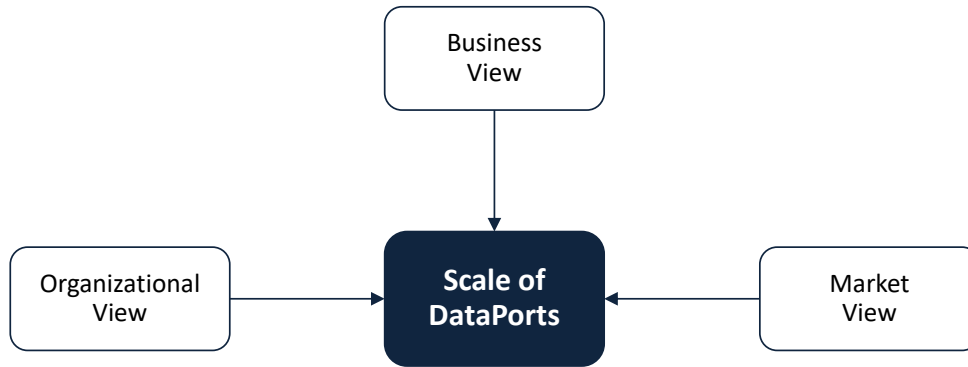


Figure 3 - Views on scaling DataPorts

The Business View describes the implementation of the DataPorts platform business model. This ensures that activities take place to meet the needs of customers. The Market View contains the information to learn to understand, respond to, and react to a customer. The Organizational View considers the capabilities and methods used to structure and manage the DataPorts platform.

The scaling activities were derived and developed on the previous SWOT analysis. The strengths and opportunities are applied to reinforce the positive characteristics for DataPorts, while the weaknesses and threats allow to avoid unnecessary failures and develop activities which support the platform with an appropriate foundation. A scaling activity needs to address at least one view to be considered in the following table to enable the product scale. Each scaling activity is described and allocated to the above-mentioned perspectives.

ID	Scaling Activity	Description	BV	MV	OV
1	Customer Relationship Management	Include DataPorts' consistent focus on its customers and the systematic design of customer acquisitions. The management of customer relationships enables in-depth relationship marketing.	X		X
2	Benefit Catalogue	Describe the value propositions per stakeholder. Customers receive a transparent and in-depth overview of DataPorts offers.	X		
3	Engagement in Strategic Initiatives	Identify and review potential strategic initiatives to satisfy these (e.g., IDSA, alliances of ports, logistics associations).		X	
4	Certification of DataPorts platform	Identify possible certification for the platform to enhance trust level for platform participants (e.g., IDS ready).	X		X
5	DataPorts-Ready Initiative	Provide consulting activities with in-depth analysis and recommendations to support and enable further port communities to participate on the platform (e.g., how to create revenue with DataPorts)	X	X	

ID	Scaling Activity	Description	BV	MV	OV
6	Interaction with Open-Source Community	A loosely organized community of open-source contributors from around the world who have a common interest in the further development of the DataPorts platform. The development effort is shared, and everyone can benefit from the work of others.	X	X	X
7	Community Building for Data Provider	The community should motivate current and future participants to participate on the platform by visualizing revenue potentials. The community address the difficulty that DataPorts participants are more willing to buy services than selling data which is an enabler for the platform.	X	X	
8	Customer Transformation	Support customer in change management of its organization (e.g., visualize transformation of other markets, execution of training courses/webinars for customer)	X	X	
9	Architecture Whitepaper	Publish relevant topics regarding DataPorts in a scientific context. Whitepapers are also a medium for disseminating the features and functions of DataPorts.			X
10	Future Compatibility	Determine technical conditions for current and future enhancements to verify service compatibility of requirements in cooperation with customers.	X	X	
11	Innovation Ecosystem	An Innovation Ecosystem is used for continuous development of the DataPorts platform. With the participation in this ecosystem, it can be ensured that the function and features of DataPorts always correspond to the current state and needs by attracting outside communities to innovate within DataPorts.	X	X	X
12	DataPorts Pricing Models	The prices as well as the pricing models should be appealing to the customers and customer groups. For this reason, an investigation of comparable services and their pricing models is carried out to draw a conclusion about how much a customer would pay for a DataPorts service.	X	X	
13	Portfolio Management	A complete and transparent overview (services and data) is necessary for the acquisition of new customers by addressing the customers' needs and demands.		X	X
14	Customer Self-Assessment	The customer is given the opportunity to assess itself for the suitability of the DataPorts platform via a self-assessment interface. By providing specific questions, a data user receives, for instance, an offer of potential services. The data provider gets the information which data he can sell to which customers.	X		X

ID	Scaling Activity	Description	BV	MV	OV
15	API Management	Provide a comprehensive overview of DataPorts interfaces so that customer can check possible system interoperability.			X
16	Benchmarking	Continuous benchmarking with other platforms to elaborate future scaling opportunities.		X	

Table 2 - Classification of the scaling activities

In total, 16 scaling activities were developed which address multiple views: 11 activities address the Business View, 10 activities the Market View, and 8 activities the Organizational View. The activities with multiple impact on the three views indicate the possible influence range of a scale up. This first assessment allows to separate the activities in internal and external perspectives which can be connected to the previous SWOT analysis. In the next step the suitable activities for DataPorts need to be selected to minimize forthcoming effort and maximize the success.

4 PILLARS OF THE SCALING STRATEGY

In this chapter, the focus relies on the selection of appropriate scaling activities for scaling strategy. The first important step is to describe the foundation of scaling and define the criteria influencing the scale of DataPorts. The second subchapter highlights the evaluation of the scaling activities with the defined criteria. In subchapter 4.3 the mechanics of scaling and their impact on DataPorts are explained. For this purpose, a self-reinforced scaling loop will be developed. In the last subchapter the DataPorts definition of a standard platform will be translated into KPIs and provide an allocation of scaling activities to DataPorts KPIs.

4.1 SCALING CRITERIA

The positive benefits generated by the platform are crucial for the increasing number of users and therefore the scaling of the DataPorts platform. To put it simply, the more users a platform has, the more attractive it becomes for additional users. The competitive capabilities are getting improved through overcoming technical and organizational challenges. In addition, gaining as many users as possible in as short a time as possible increases the prospects of success.

As already indicated in subchapter 3.2, the scaling of a product can be viewed from three different perspectives: Business View, Market View, and Organizational View. Each perspective is influenced by criteria which have an impact on the intensity of the scaling. The more criteria are positively influenced, the more effect has a scaling activity on attractiveness of the platform.

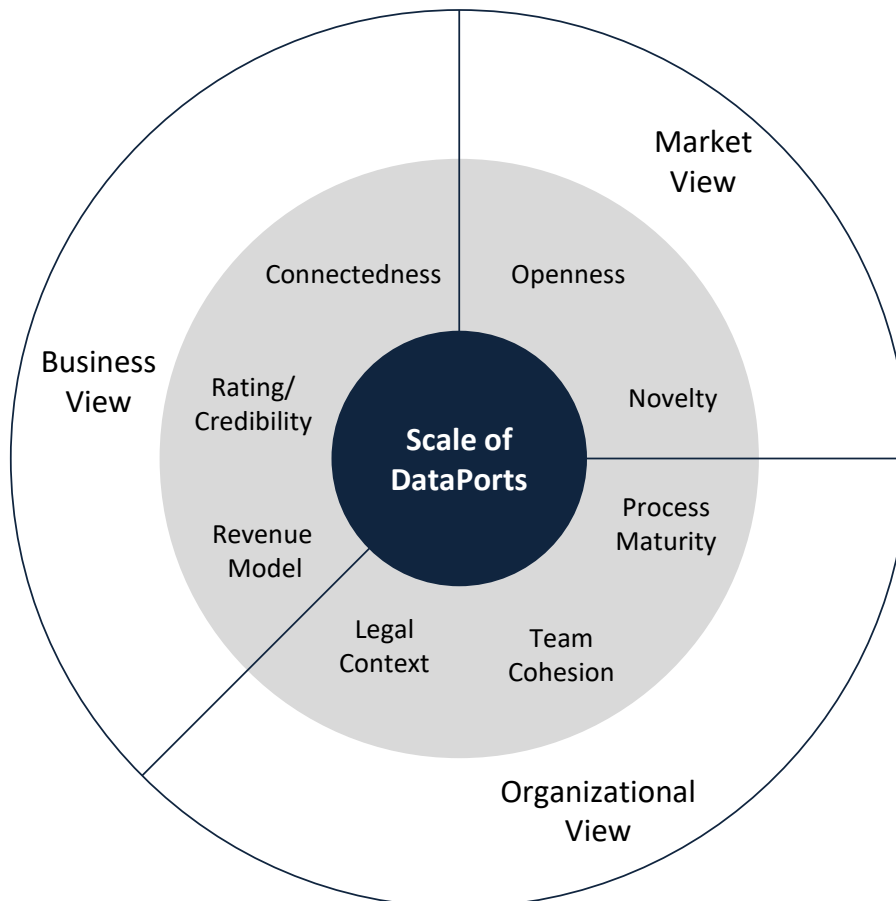


Figure 4 - Scaling factors of the individual views

Accordingly, the Business View deals with the manifestation of the business model. A suitable business model enables the DataPorts platform to position itself against competitors. Based on that, the DataPorts platform

creates a suitable and secure environment for data providers and data users. A scaling effect emerges when the number of platform users increases. This can be achieved if the following Business View criteria for the DataPorts platform are met:

- *Connectedness* is the requirement for a network to guarantee interaction between different stakeholders with different backgrounds. People with the same interests use the same platform. Similarly, the platform can act as a mediator between stakeholders to provide them with services.
- *Rating/Credibility* creates a rating system as a feature to build trust between Data Providers and Data Consumers. This creates the foundation for long-term use of the platform.
- The *Revenue Model* specifies the way in which profit is generated with the DataPorts platform. The usage of DataPorts must be profitable for future potential stakeholders.

To attract new users in the long term, the platform must be made accessible and usable for everyone. Furthermore, the service offering should correspond to the skills and capabilities of the potential users. Therefore, the usage of the platform should also provide a benefit for the users. This results in the following criteria for the Market View:

- The *Openness* property is considered as a key aspect. Appropriate interoperability and correspondence ensure that future stakeholders can use the platform. Fewer barriers result in a global offering.
- *Novelty* describes a means of determining the degree of innovation of the service or offering. In addition, the familiarity of the actors involved with the object is also examined. This criterion helps to decide whether the market is ready for certain services.

The structuring and management of the DataPorts platform is done in the Organizational View. For this purpose, methods for controlling, monitoring, and managing of processes within the DataPorts platform must take place. In this way, barriers or challenges for future users can be detected at an early stage. This scaling effect is conditioned by the following criteria:

- *Process Maturity* determines the mastery degree of processes on the DataPorts platform. It can be used to identify optimization potential and barriers to using the DataPorts platform.
- *Team Cohesion* includes the grade of cooperation between participants of the DataPorts platform (stakeholders, data/service providers, developers, etc.). If there are barriers or potentials for improvement, they can be identified with this criterion.
- A *Legal Context* is used to create a legal framework for all users of the DataPorts platform to develop a safe environment.

4.2 EVALUATION

The definition of the scaling criteria is required to evaluate the attraction of scaling activities. For this purpose, researchers outside from DataPorts were interviewed to conduct an unbiased evaluation of the activities with an impact matrix. Each scaling activity (described in the rows) is assessed with the scaling criteria (described in the columns) on a scale from 0 to 3. An impact factor of 0 does not affect to scaling of DataPorts business model and is indicated with an empty field. An impact factor of 3 strongly influences the scaling of DataPorts business model. The total amount of impact points is sum up in the last column. The average value of all impact matrices is visualized in the following table:

	Connected-ness	Rating / Credibility	Revenue Model	Openness	Novelty	Process Maturity	Team Cohesion	Legal Context	Sum
Customer Relationship Management	2	1	3				1	1	8
Benefit Catalogue		1	2				1		4
Engagement in Strategic Initiatives	2	1		3	1			1	8
Certification of DataPorts platform		3		3		1		1	8
DataPorts-Ready Initiative	2	1	3	2		1	1	1	11
Interaction with Open-Source Community					1				1
Community Building for Data Provider	3	1	1	1	2		2		10
Customer Transformation		1	2			1	1		5
Architecture Whitepaper	1	1		1					3
Future Compatibility	1	1	1	2	2	1			8
Innovation Ecosystem	1	1		1	3		2		8
DataPorts Pricing Models			3			1		1	5
Portfolio Management	1	1	1	1			1		5
Customer Self-Assessment	1	2	2	1		1	1		8
API Management	2	1		2		2			7
Benchmarking			2						2

Table 3 - Evaluation of scaling criteria

Based on the evaluation, eight scaling activities have the most impact on the scaling of the DataPorts business model. The highest ranked scaling activities are the *DataPorts-Ready Initiative* (11 impact points) and the *Community Building for Data Provider* (10 impact points). The last five scaling activities receive 8 impact points. The activities which have less than 8 points will be not considered for further strategy development. Based on the three views of the platform scaling and using the allocation from Section 3.2 the most important views remain the Business View (7), Market View (5), and Organizational View (4). It can be deduced that the scaling of the platform should be mostly answered by the Business View perspective. The Market View complements the Business View by a more external-oriented direction (e.g., *Strategic Initiatives*, *Certification* or *Community Building*). The Organizational View remains together with the Business View and depends on the Business View (e.g., *CRM* or *DataPorts Ready Initiative*). For this purpose, the best-fit scaling combination relies on the Business and Market View. The next chapter describes a scaling loop which explains how both views can reinforce each other.

4.3 SCALING LOOP

The scaling activities have been determined by an impact factor based on the scaling criteria. The evaluation illustrates that the scaling activities have a positive effect on the scaling of the platform. This raises the question in which way the activities influence the market sizing. For this purpose, it is necessary to understand the mechanics of scaling.

4.3.1 Scaling Canvas

A scaling canvas provides an overview about the most important mechanics. The DataPorts scaling activities can be sorted into these categories and establish a deeper understanding of the operating principle of scaling (Figure 5). The scaling canvas considers an inside and outside view. Elements as the *Growth Limiter* and *Core Innovation* describe the foundation of the business models and address the needs allocated to the inside view. *Trends* and *Community Building* have the purpose to anticipate future needs and create knowledge circles around it. These address the outside perspective but influence the inside perspective as well. The *Innovation Distribution to the Customer* is the gate to the *Market Sizing* and *Ecosystem Building*. It is the interface to provide the value of DataPorts to the customer and increase the usage of the platform. The *Market Sizing* and *Ecosystem Building* focus on the expansion of the environment. While *Market Sizing* and *Ecosystem Building* concentrate on the “Who” and “Where”, the *Innovation Distribution* focuses on the “What”. As mentioned above, the canvas was filled up with the scaling activities (prioritized and non-prioritized) and enriched with additional input.

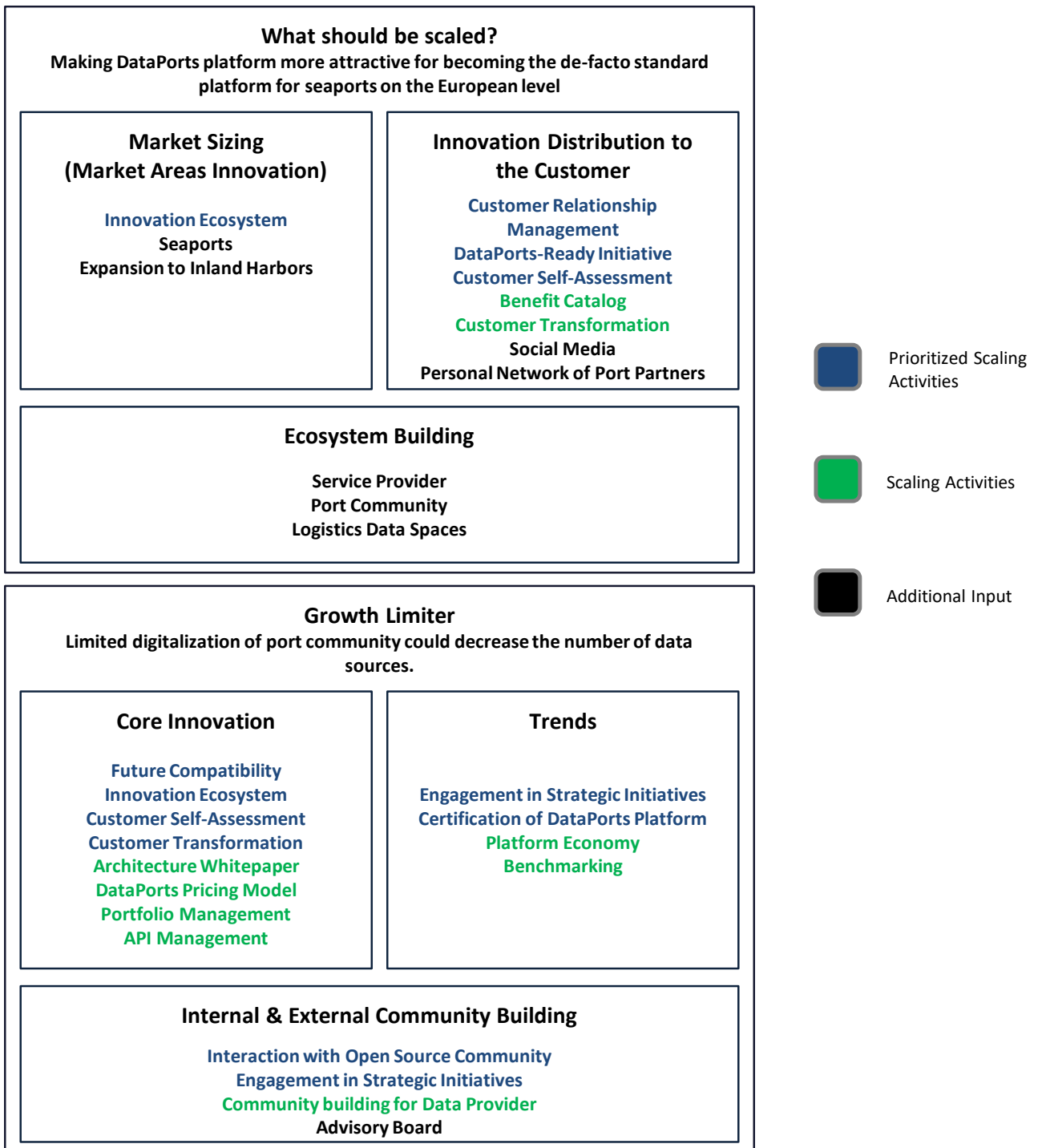


Figure 5 - Scaling canvas

4.3.2 Self-reinforcing scaling loop

The prioritized activities are distributed evenly over the canvas except to the *Market Sizing* and the *Ecosystem Building*. Although the canvas components can be used in a standalone approach, each component has an impact on another component. Like the network effects of platforms, the components can interact as an accelerator and influence each other positively regarding the platform user. This self-reinforcing scaling loop (Figure 6) allows DataPorts to grow and reach the DataPorts goals. In the following, the components *Community*, *Platform Ecosystem* and *Trends & Innovation* in Figure 6 are described.

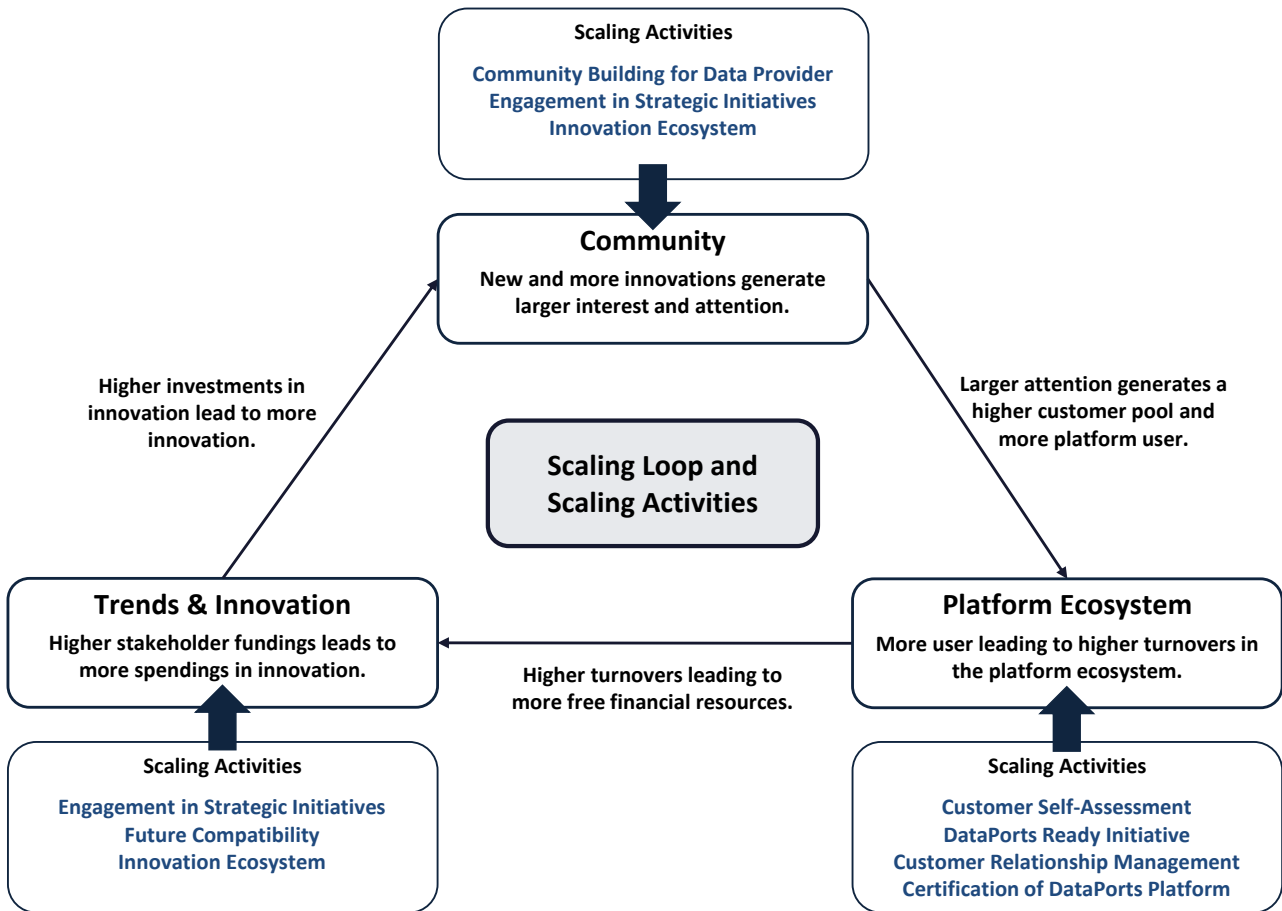


Figure 6 - Scaling loop and scaling activities

Platform Ecosystem

The *Platform Ecosystem* describes all (primarily commercial) stakeholders involved in the platform. It mainly includes DataPorts itself and its data users, data providers, service providers and all other customers and partners who contribute to the platform in any way.

Community

The *Community* includes, among others, the participants of the *Platform Ecosystem*, but also many other interested parties that do not interact with the platform DataPorts or even operate in completely different subject areas. These can be open source communities, strategic initiatives or even groups of interested parties among potential customers. In general, this is a summary of all interested groups around the topic of DataPorts and the associated technologies (hardware and software) from which, among other things, new customers can be acquired.

Trends & Innovations

Trends & Innovations summarizes the innovation capabilities of DataPorts and the *Platform Ecosystem*. It basically maps the development of DataPorts and associated new services and technologies, whether from DataPorts itself or other stakeholders in the ecosystem.

4.3.3 Scaling activities in detail

Through the prioritization of scaling activities in chapter 4.2 and the allocation in the scaling canvas and the scaling loop a much more particular assignment is available. Building up on this, the scaling activities are described more in detail and the leverage in the scaling loop are declared in the following paragraph.

Community Building for Data Provider

Community Building for Data Providers is an important part of building a functioning ecosystem and should enable the alignment of the business model around data sharing. Basically, community building acts as a trust-building measure. Through the exchange between data providers, added values of the platform can be communicated and experiences can be shared, which should increase openness and transparency and thus trust in the platform. This is intended to increase the willingness to share or sell one's own data, which is the cornerstone of the DataPorts business model.

As already described in the scaling loop, this measure is also intended to achieve a self-reinforcing function. On the one hand, the establishment of a larger community strengthens its reach and significance, which in turn, should lead to stronger growth of the community through network effects. In addition, customers can be generated from this community, which has a reinforcing effect on the scaling loop.

Engagement in Strategic Initiatives

Engagement in Strategic Initiatives has been an important part of DataPorts corporate strategy since the project planning phase and will continue to be a central pillar of the scaling strategy. As a research project funded by the European Commission, this engagement is part of DataPorts' tasks anyway, but also actively generates business benefits from its activities.

By engaging in such initiatives, several positive effects can be achieved for DataPorts. On the one hand, a communication channel to the target groups is created. Information about the needs of the customers and the added values of DataPorts can flow in both directions. This exchange and the additional communication with other stakeholders can lead the developments at DataPorts in the right direction and generally stimulate the innovation potential. In addition, by actively engaging in such initiatives, DataPorts target market can be specifically addressed, from which new customers can be acquired. This in turn, addresses the network effects in scaling and boosts the scaling loop, which is another growth-promoting factor.

Customer Self-Assessment

Customer Self-Assessment gives future customers the opportunity to identify potential added value of DataPorts for themselves in advance without much effort and to assess the suitability of their own systems to DataPorts. To achieve this, potential customers will be offered a tool that can be easily processed their information via a questionnaire in an internet browser.

In general, the system conditions of the future customer are to be recorded and compared with the potential interfaces (and interfaces planned for the future). In this way, it should be quickly evaluated whether the use of DataPorts is possible at all, or what barriers would exist in this case. More specifically, the functions as data user and data provider can be analysed. Data users can gain information about possible added values of DataPorts and receive service offers already tailored to their use cases. Data providers can use this to analyse which data they themselves can offer via the platform, which conditions go hand in hand with this, and which added values they can expect here.

As part of the scaling strategy, this is intended to increase the transparency of DataPorts' offering and keep the barriers to entry for potential new customers as low as possible. The simple access and customized presentation of added value should ultimately give an advantage in the acquisition of new customers, which is at the core of the scaling strategy.

DataPorts Ready Initiative

The *DataPorts Ready Initiative* is a consulting offering to support new customers and partners in the efficient adoption of DataPorts. The aim is to make the barriers to entry as low as possible and thus to promote the acquisition of new customers. In addition, targeted support in implementation ensures that DataPorts can be used effectively, and that added value can be achieved for customers in the best possible way. The two central pillars of this offering consist of in-depth analysis activities (e.g., interfaces, processes, etc.) and recommendations for the port community (e.g. webinars, pricing model selection, data source selection).

Another important effect of the *DataPorts Ready Initiative* is that through the effective application of Data Ports and the resulting added value for customers, the platform generally gains in attractiveness and credibility in the entire market. This results in further reinforcing effects in the scaling loop, which contribute to the acquisition of new customers and thus, to the growth of the platform.

Customer Relationship Management (CRM)

A *Customer Relationship Management* includes DataPorts consistent focus on its customers and the systematic design of customer acquisitions. The management of customer relationships enables in-depth relationship marketing with long term customers. Core elements of CRM consist of activities in the areas of marketing, acquisition, and customer retention. The marketing and scaling strategy of the organization is decisive for the orientation of CRM, whereby CRM itself plays a strategic role through its firmly anchored analytical methods and building blocks and the long-term external presentation.

Customer relationship plays a particularly relevant role in DataPorts' scaling strategy. To achieve the strategic goal of a de-facto standard platform, new customers and partners must be acquired in the European market. This core element of scaling is central to the acquisition of new customers and the management of existing customers by increasing trust and knowledge about the platform.

As a central scaling element and the decisive impact on the company's market position, CRM has a self-reinforcing quality. As a result of the network effects at work in scaling, it can be assumed that a stronger market position and the resulting increase in presence will automatically strengthen the effect of CRM and thus make CRM increasingly efficient as its reach increases. In addition, as the number of customers grows, the platform becomes increasingly attractive to customers due to the associated increase in data and opportunities.

Certification of DataPorts Platform

DataPorts Certification is an important measure to ensure customer confidence and acceptance of the platform. The tasks in this area consist of identifying potential certifications and fulfilling the conditions for obtaining them. Such certificates can come, for example, from organizations or strategic initiatives that have a high level of trust among the respective stakeholders due to their establishment and reputation. An example of such a certificate would be the "IDS Ready" [14] certificate, which is issued by the International Data Spaces Association and stands for transparent and trustworthy handling of data.

The aim of certification is to lower the barriers to entry for interested parties by creating trust and transparency and to provide evidence of one's own qualifications. Particularly for the target group of data providers, the intention is to promote the willingness to share one's own data by ensuring that the trustworthy and transparent handling of one's own data is also recognized by third parties. These measures are intended to directly promote the acquisition of new customers in the scaling loop, which leads to a strengthening effect on the loop.

Innovation Ecosystem

Building an *Innovation Ecosystem* is a key task for the successful implementation of DataPorts. The concept of an *Innovation Ecosystem* must be distinguished from that of a *Platform Ecosystem*, even though they overlap considerably. Whereas the *Platform Ecosystem* is defined by the participants of the platform, the *Innovation Ecosystem* refers to the innovation space and thus also to actors not involved in the platform. Ultimately, the *Innovation Ecosystem* encompasses all factors involved in the innovation process, which is why areas such as open-source communities, competitors and strategic initiatives are particularly relevant [15].

By building and participating in a strong *Innovation Ecosystem*, the innovation power of DataPorts shall be increased and the development of DataPorts shall always be aligned with state-of-the-art benchmarks. Through the influence and consideration of other new developments, the compatibility with other systems should also be improved and expanded for the future. All in all, a strong *Innovation Ecosystem* is a basic prerequisite for the innovative strength of DataPorts and thus also for the claim to market leadership, which

in such a dynamic and rapidly developing market is directly related to technology leadership [16].

In the context of the scaling loop, the establishment of such an *Innovation Ecosystem* has a reinforcing effect, as direct effects not only increase innovation, but there are direct connections between the *Innovation Ecosystem*, the community and the *Platform Ecosystem*, which means that they always go hand in hand.

Future Compatibility

Future Compatibility describes technological alignment with future conditions and challenges based on the customer needs. In concrete terms, this means driving forward the definition of interfaces to customer systems and not only reacting to current developments in port management systems, but also taking preventive action to meet them. The same also applies to services, which must be geared not only to the current but also to the future needs of customers. To ensure this far-reaching development, effective innovation management and a strategic focus on development are essential. In addition to market leadership in the European Union, the strategic goal is also to achieve technology leadership.

In the context of the scaling loop, these measures take effect in the development of innovations and the orientation to current trends. Through this crucial position in innovation management, it has a strong effect on the overall innovation power of DataPorts and the associated ecosystem, giving it a central role in the regulation of the scaling loop and enabling it to strongly influence scaling through efficient implementation.

4.4 MAPPING TO DATAPORTS KEY PERFORMANCE INDICATORS

The corporate vision of DataPorts is to become the de-facto standard data platform for seaports. The scaling loop with the prioritized scaling activities addresses this goal and provides input. To achieve this goal, it is mandatory to identify or develop key performance indicators which contribute to the definition of a standard platform. For the formulation of such a strategic goal, criteria are necessary in the first step, according to which the goal can be defined and evaluated in the ongoing process. The development of these strategic target criteria is the focus of this section.

The starting point is to consider how the market position can be assessed and controlled in the process. In accordance with WP6.2 and WP6.3, KPIs appear to be a useful method for this, providing reference values for the scaling criteria based on subjective data. From this follows the core task of this work step to analyse the KPIs created so far and to transfer them to the current problem. At the end of this effort, there will be a much smaller pool of KPIs, some of which have emerged from the previous work packages, but some of which are new or modified KPIs.

When analysing the metrics from WP6.2 and the continued results from WP6.3, it quickly becomes apparent that very specialized metrics tailored to the individual task parts of DataPorts are used. The task of most KPIs from this chapter is thus strongly applied in monitoring the achievement of the goals of the individual work packages. In this chapter, the focus is placed on the general KPIs I.6.1 to I.6.8, which focus on the performance and growth of the DataPorts platform itself. However, these key figures are partly simplified and summarized for the task of measuring and controlling scaling, to generate the broadest possible view of the market situation with very few key figures. In addition, the targets for the individual KPIs are not included, as only possible instruments and not targets for scaling are compiled here. The summary of these KPIs results in KPIs 2.1 to 3.3 for the scaling strategy (Table 4 - Scaling KPIs), which have the measurement of the growth rate as their common focus.

In addition to these prepared key figures, another basic KPI is introduced at this point. The market share (1.1) with revenue as the reference figure is used in addition to the KPIs for measuring growth to assess the market situation of DataPorts [17]. By including this criterion, it should not only be possible to measure the scaling itself, but also the situation in relation to competitors. This should make it possible to measure the strategic objective of market leadership in the EU [18].

ID	Strategic criteria / KPI		Description
Market Share	1.1	Market Share (Revenue)	The (absolute) market share by sales is a KPI for describing the market position of a company / product in relation to the overall market of the sector. The market share here is the ratio of the company's own revenue to total revenue in the field of data platforms for seaports.
	1.2	Annual increase of the Market Share (Revenue)	The annual increase of the market share is a KPI for describing the annual growth of the data platform in relation to the overall market of the sector. The annual increase of the market share is the ratio of the company's revenue to the previous year revenue.
User	2.1	Annual increase in user organizations using the data platform.	The annual increase in users represents as a KPI the new organizations joining each year in absolute numbers without consideration of their size and is thus a measure of the speed of the platform's growth. A deeper distinction between data providers and data users is useful, as it allows conclusions to be drawn about the availability of data.
	2.2	Annual increase of data providers	The annual increase of data providers is a more specialized KPI showing the increase of available data sources, which is essential for the growth of the platform and its ecosystem.
	2.3	Annual increase of data consumer	As a counterpart to 2.2, the increase in data consumers is displayed, which in combination allows the ratio to be calculated. This allows a trend development of the ecosystem to be made measurable.
Revenue	3.1	Annual increase in revenue channeled through the platform	The annual increase in revenue is – like the annual increase in users – a KPI for measuring the speed of the platform's growth. By measuring the increase in sales, financial growth can be represented.
	3.2	Annual increase in ICT sector	Measuring revenue growth in the ICT sector is considered an indicator of the services available and used on the platform and allows conclusions to be drawn about the appetite and acceptance of the platform by external stakeholders.
	3.3	Annual increase in logistics sector	Similar to 3.2, 3.3 serves as an indicator of platform growth and acceptance and usage among external stakeholders, but in the direction of service users. It highlights the same issues as 3.2, but with the customer sector - i.e., logistics operators, especially port operators - as the focus.

Table 4 - Scaling KPIs

5 ROADMAP FOR DATAPORTS SCALING STRATEGY

An important aspect of strategy development is to determine the prioritization and execution dates of the activities. The roadmap visualizes an overview how to achieve the goal to become the de-facto standard platform. The first subchapter describes the different scaling approaches which can be used to enable scaling. The second chapter provides the required information for the roadmap and set the activities stronger into dependencies. The release of the roadmap defines the direction for this task T6.4 until the end of the project.

5.1 SCALING APPROACH

As already mentioned, scalability is understood to be the ability of a system to adapt to growing requirements in terms of performance. The performance of a system can be increased in two different ways [19]: horizontal and vertical scaling (Figure 7).

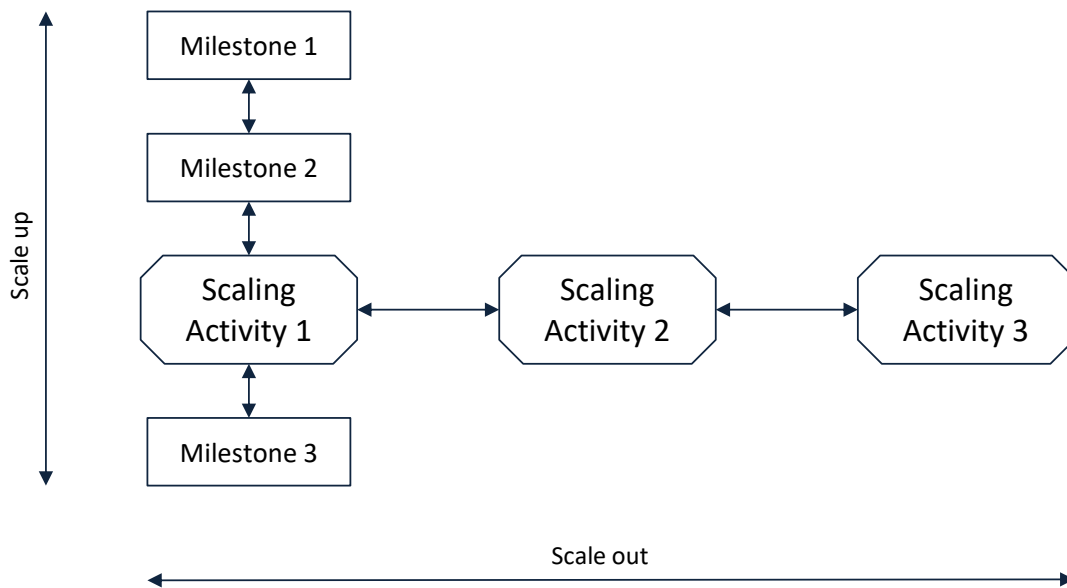


Figure 7 - Theory of the Scaling Approach

On the one hand, the performance increase takes place via horizontal scaling (scale out). In this process, additional instances are added to the system. In the context of the DataPorts platform and the scaling approach, these instances represent the scaling activities described above. It indicates that DataPorts starts with a few numbers of activities to scale small in the beginning. With a higher maturity of the platform, more activities can be executed due to the accessibility of the platform. These extend the offering and usage of the DataPorts platform, thereby increasing the performance of the platform.

Within the individual activities, vertical scaling (scale up) will take place. This means, that the performance increase can be generated by adding resources as well as functions within an activity. These are represented by so-called milestones. In these milestones the tasks of the scaling activities are further specified and applied. The vertical scaling allows to gain deeper insights and ensures that the scaling has sustainable effect on the platform attraction.

The individual scaling activities can influence each other and determine the degree of fulfilment and execution (see 4.3.2)Self-reinforcing scaling loop. For this purpose, the roadmap needs to consider how many activities should start at what time.

5.2 DATAPORTS ROADMAP

The roadmap for the DataPorts scaling strategy consists of three parts: Milestones, prioritization, and start date. The milestones describe the required steps that must be taken for the scaling activity. The amount of

scaling activities required a prioritization, which is mandatory to determine appropriate starting points. In this case, the scale for prioritization is defined from 1 (high) to 4 (low). For each scaling activity, the maximum of three milestones are defined to avoid overload. The derivation of the milestones is aligned with the context of DataPorts and represents logical steps to fulfil the activity and increase awareness and attraction. A scale up is typically represented with step-by-step approaches. In accordance with the vertical and horizontal approach the DataPorts roadmap starts with single activities (horizontal scale up by engaging with possible customers) to realize a small scale and intensify them with other activities (vertical scale up by deepen and expand the relationships).

The first important step is to engage with possible users of the platform, increase awareness of the platform and build up a network. Most of this work will be done in the scaling activities *Engagement in Strategic Initiatives* and *Certification of Data Ports Platform*. Once the first network is established the main focus of the work will be to enlarge the relationships with *Community Building* or appropriate *Customer Relationship Management*. That enables scale up and attraction of potential customers. Once the awareness and attraction are achieved and a circle of customers is emerged, the customer-friendly integration and simple customer classification are key requirements to bind and hold users on the platform. The roadmap is described in Table 5 below.

Scaling Activity	Milestones	Priority	Start
Community Building for Data Provider	<ul style="list-style-type: none"> - Build constitutes (principles, content creation) for community beyond DataPorts - Identify and acquire new members for the DataPorts community - Set up regular meetings for the community 	2	January 2022 March 2022 July 2022
Engagement in Strategic Initiatives	<ul style="list-style-type: none"> - Engage with IDSA and GAIA-X AISBL - Market research for other ports specific initiatives - Choose and interact with initiatives based on market research 	1	April 2021 April 2021 August 2021
Customer Self-Assessment	<ul style="list-style-type: none"> - Derive building blocks (technical, financial, organizational aspects for the customer) - Develop suitable measures to detect customer information - Develop user-friendly interface 	3	April 2022 July 2022 July 2022
DataPorts Ready Initiative	<ul style="list-style-type: none"> - Define value proposition for the initiative - Elaborate technical and business prerequisites for DataPorts participation - DataPorts Integration Webinars 	4	July 2022 August 2022 October 2022
Customer Relationship Management (CRM)	<ul style="list-style-type: none"> - Elaborate CRM concept for DataPorts - Align CRM activities with DataPorts - Select appropriate instruments 	2	February 2022 Mai 2022 Not part of the project

Scaling Activity	Milestones	Priority	Start
Innovation Ecosystem	<ul style="list-style-type: none"> - Establish innovation management - Identify (external) innovation partner and build up innovation network (in accordance with open innovation) - Determine a suitable innovation environment (prerequisites, ideation process, etc.) 	-	Consideration in T7.3
Certification of DataPorts Platform	<ul style="list-style-type: none"> - Market research for trustworthy certifications (standards and regulations) for platforms - Acquire IDS-Ready certificate - Select and acquire suitable certifications for DataPorts 	1	April 2021 April 2021 October 2021
Future Compatibility	<ul style="list-style-type: none"> - Ongoing market research and technology review - Ongoing identification of customer needs through surveys, webinars, etc. - Execution of innovation workshops based on the insights 	-	Consideration in T6.2, T7.3 & T7.4

Table 5 - Elements of the DataPorts scaling strategy

Figure 8 visualizes the roadmap for the scaling strategy for DataPorts. The scaling activities for *Engagement in Strategic Initiatives* and *Certification of DataPorts Platform* will be carried out in 2021 because these activities increase awareness and build a loosely network around DataPorts. These form the basis for the remaining activities in 2022, in which the main activities focus on the enlargement of the community and integration into DataPorts. In this way the activities reinforce each other.

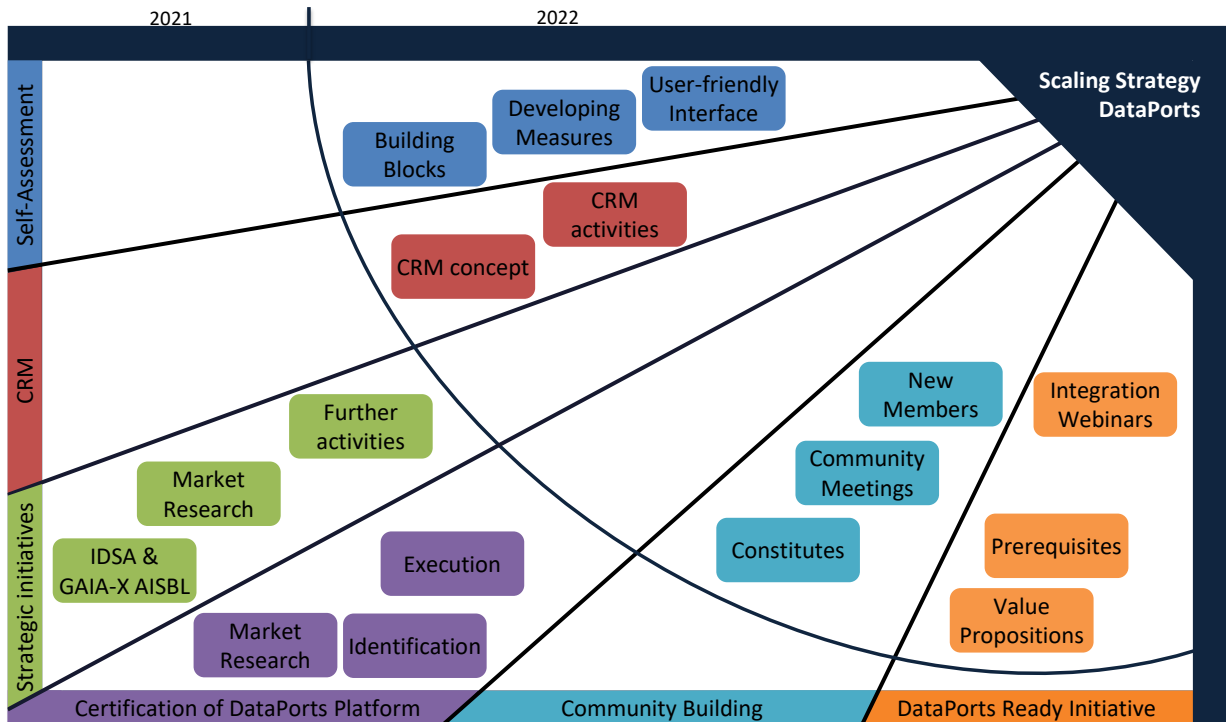


Figure 8 - Roadmap for the scaling strategy of DataPorts

6 CLUSTERING ACTIVITIES

As reported deliverables in D6.1 and D6.2, DataPorts is not working in isolation, but is part of different European innovation ecosystems, where the project will leverage connections to exploit collaborations and build community around data driven innovation, data sharing, data platforms and digitization of maritime ports and logistic value chains.

Facilitated by T6.3, the following three main kinds of activities are carried out, which are elaborated below:

- **Collaboration with related BDV PPP activities:** Collaborations are pursued with related projects and in the scope of relevant activities of the Big Data Value PPP (as reported in detail in Section 6.1).
- **Collaboration with linked activities:** In addition to the linked projects identified during the conception of the DataPorts project, collaborations cover related projects and other related activities from are not covered under the previous bullet.
- **Interaction with Advisory Board:** The DataPorts Advisory Board (AB) is one key instrument to strategically engage with decision makers and the wider stakeholder community.

6.1 COLLABORATION WITH RELATED BDV PPP ACTIVITIES

DataPorts is part of the implementation actions of the Big Data Value PPP, composed of the European Commission (EC) and the Big Data Value Association (BDVA) as public and private counterparts. BDVA is an industry-driven international not-for-profit organisation with over 200 members all over Europe, whose mission of the BDVA is to develop the Innovation Ecosystem that will enable the data and AI-driven digital transformation in Europe delivering maximum economic and societal benefit, and, achieving and sustaining Europe's leadership on Big Data Value creation and Artificial Intelligence (www.bdva.eu).

DataPorts collaborates with other projects included in the portfolio of the PPP (more than 60 projects, see https://www.big-data-value.eu/our_projects/). The collaboration and coordination of all projects is done through three different committees:

- **Technical Committee** includes technical managers.
- **Steering Committee** includes the coordinators of the projects.
- **Communications group**, which includes the leads of dissemination and communication.

DataPorts participates in all those committees, seeking to align strategies in the different fields, and to explore potential collaborations. Below we explicitly report on the activities in relation with the technical committee, as this is where DataPorts contributed with concrete technical presentations.

At the time of reporting, the following concrete activities have been carried out as part of the BDV PPP collaboration:

Activity	Date	Main contact
European Data Platform Webinars (organized by BDVA/BDVe) DataPorts presentation	May 6-7 2020	UDE
European Big Data Value Forum (EBDVF) Sponsors Pitch	3.-5.11.2020	ITI
EUHUBS4DATA Meeting Participation in project meeting	30.09.2020	ITI

Activity	Date	Main contact
BDV PPP Technical Committee #6 (collocated with BDVA Activity Group Meeting #41) Presentation of lessons learnt / project assets	11.12.2020	ITI
BDV PPP Technical Committee #7 (collocated with BDVA Activity Group Meeting #43) Two presentations on data platform components and standards	18-19.03.2021	ITI
Data Week 2021 (co-organized by BDVA) Session proposal	25-27.05.2021	ITI
BDV PPP Book „Technologies and Applications for Big Data Value“ DataPorts full chapter accepted for publication	Q2/2021	UDE

Table 6 - Collaboration activities with related BDV PPP activities

Below we briefly summarize these activities:

6.1.1 European Data Platform Webinars (organized by BDVA/BDe)

To respond to the Covid situation and stimulate interaction and coordination among the BDV projects, TC members and the wider BDV ecosystem, a dedicated series of webinars was organized by the BDe project, the BDVA, and the EC between May 6-7 2020. These online sessions were the first events in a series of events and workshops related to the EU big data platform projects that are funded under the umbrella of the European Big Data Value PPP. The data platform projects develop integrated technical solutions for data collection, sharing, integration, and exploitation. These online sessions had different complementary aims. They served to initiate collaborations among data platform projects and the wider Big Data Value (BDV) ecosystem. In addition, they helped participants learn about key aspects of the new Data Platform projects. Finally, they facilitated identifying important transversal topics of common interest and thus plan potential follow-up online sessions involving further relevant BDV PPP projects and BDVA Task Forces.

The sessions were moderated by Dr. Andreas Metzger from UDE. Each of the online sessions featured interventions from the European Commission, represented by Kimmo Rossi and Malte Beyer-Katzenberger from Unit CNECT.G1 Data Policy and Innovation, which presented the Big Data Value PPP context and indicated the ambitions towards the European Data Spaces as part of the forthcoming framework programme.

The online sessions were grouped into three clusters, related to industrial, personal, and mixed data respectively. Paco Valverde (ITI) as Technical Coordinator of DataPorts, provided a presentation during the industrial data platform session, presenting the ambitions, key platform elements and open challenges of DataPorts. The recordings and slides from the online sessions are available from the BDV PPP website at: <https://www.big-data-value.eu/resources/webinar/>

6.1.2 European Big Data Value Forum (EBDVF)

A sponsored presentation of DataPorts at the Big Data Value Forum 2020 was given which took place from 03/11/202 to 05/11/2020. The session lasted 30 minutes, where a 20 minute presentation was given by Santiago Cáceres (ITI) project coordinator of DataPorts followed by a Questions and Answers session. The

DataPorts slot was attended by around 70 persons online with good feedback received from audience and several questions raised.

Most of the BDV PPP projects were represented at the event but the DataPorts session was specifically dedicated to the project. The overall event was attended on average by 600 participants and especially industry professionals, business developers, researchers, and policymakers coming from over 40 countries.

DataPorts was extensively presented in the session, having details on platform architecture, technical challenges and use case applications. The presentation was recorded and can be found at <https://www.youtube.com/watch?v=ec5X-hTqn8U>

6.1.3 EUHUBS4DATA Project Meeting

The EUHubs4Data is setting up a European federation of Big Data Digital Innovation Hubs (DIHs), with the ambition of becoming a reference instrument for data-driven cross-border experimentation and innovation, and support the growth of European SMEs and start-ups in a global Data Economy. Based on the concept “European catalogue, local offer”, EUHubs4Data will establish a Europe-wide, sustainable ecosystem drawing upon local expertise and achievements of European initiatives and national/regional Big Data DIHs.

During this event, it was presented and highlighted how the DataPorts architecture is aligned with IDSA and our approach for supporting Data Governance. All partners from EUHubs4Data project attended to the meeting, so the audience was around 20 persons.

6.1.4 BDV PPP Technical Committee #6 (collocated with BDVA Activity Group Meeting #41)

This TC meeting was organized jointly with the BDVA Activity Group meeting on December 11 to foster interactions and collaboration among BDVA members and BDVA task forces TF leads. The goals of this meeting included: (1) Learn and discuss about lessons learnt from projects, (2) Be informed about PPP project and BDVA member assets and value propositions towards Horizon Europe (HE), (3) Be informed about past engagements and future opportunities, (4) Facilitate interaction and collaboration among projects and BDVA members. As key outcomes, the project’s value propositions towards future HE engagements were recorded (via Murals) along different topical categories, thereby facilitating the uptake of project outcomes.

DataPorts contributed with a presentation by Paco Valverde (ITI, Technical Coordinator), which covered the DataPorts use cases with ValenciaPort, Thessaloniki Port and the Global use case led by Prodevelop. We also pointed out the key innovations and challenges addressed by the project. Other projects involved in the same session were OpertusMundi, I3-Market and TheFSM.

6.1.5 BDV PPP Technical Committee #7 (collocated with BDVA Activity Group Meeting #43)

As in previous occasions BDVA members and the BDV PPP projects joined forces around common topics of interest. As part of this joint TC and BDVA AG meeting, the focus on the following topics: (1) Data Platforms (linking it to the assets needed to develop the European Data Spaces, considering both sectoral and cross-sectoral assets); (2) Data/AI Governance and Standards (linked to the topic above, but also below); (3) Trustworthiness of Industrial AI (explorative topic with the projects).

DataPorts has contributed with two presentations:

- During the session on “Building blocks and assets to develop Data Spaces”, Paco Valverde from ITI presented a set of building blocks for defining a DataPorts Data Space: Data agents, Semantic Interoperability API, Data Governance with Blockchain and the Auto model prediction engine. The overall idea was to illustrate how to build a cognitive service for port stakeholders.
- During the session on “Data Standards and Data Governance”, Sofia Terzi from CERTH presented the data governance approach of DataPorts involving the Blockchain components of the platform.

6.1.6 Data Week 2021

Data Week 2021 (<https://www.bdva.eu/node/1735>) will be held from 25th to 27th May (online). Data Week 2021 will bring together the European Big Data and Data Driven AI research and innovation communities. Following the Big Data Value Summit's footsteps, Data Week will host exciting workshops and sessions to put the BDVA/DAIRO, Big Data Value PPP projects and the EUHubs4Data community at the centre of the event.

DataPorts is planning to have a workshop (pending of acceptance at the time this report is being delivered), the session will focus on data technologies/applications challenges and solutions in European Ports and Maritime sector in general, apart from DataPorts the workshop will count on representatives coming from SmartShip project (<https://www.smartship2020.eu>), PIXEL project (<https://pixel-ports.eu/>), and the European Technology Platform ALICE (<https://www.etp-logistics.eu/>).

6.1.7 BDV PPP Book "Technologies and Applications for Big Data Value"

The Springer Open Access Book "Technologies and Applications for Big Data Value" (edited by E. Curry, S. Auer, A.J. Berre, A. Metzger, M.S. Perez, and S. Zillner; to be published around Q2/2021) aims to educate the reader on how recent advances in technologies, methods, and processes for big data and data-driven Artificial Intelligence (AI) can deliver value to address problems in real-world applications. The book explores cutting-edge solutions and best practices for big data and data-driven AI and applications for the data-driven economy. It provides the reader with a basis for understanding how technical issues can be overcome to offer real-world solutions to major industrial areas, including health, energy, transport, finance, manufacturing, and public administration. The book's contributions emanate from the Big Data Value Public-Private Partnership and the Big Data Value Association, which have acted as the European data community's nucleus to bring together businesses with leading researchers to harness the value of data to benefit society, business, science, and industry.

The book is of interest to two primary audiences, first, undergraduate, and postgraduate students, and researchers in various fields, including big data, data science, data engineering, and machine learning and AI. The second audience is practitioners and industry experts engaged in data-driven systems, software design and deployment projects who are interested in employing these advanced methods to address real-world problems.

DataPorts contributed with a chapter called "Towards cognitive ports of the future", which features contributions from ITI, UPV, OTE, Traxens, paluno/UDE, NTUA, and UKL. The chapter deals with scalability, interoperability, and standardization features of data platforms from a business point of view in a smart and cognitive port case study. The main goal is to design an innovative industrial data platform aiming to overcome these obstacles and provide an ecosystem where Port authorities, external Data Platforms, transportation, and logistics companies can cooperate and create the basis to offer cognitive services.

6.2 COLLABORATION WITH LINKED ACTIVITIES

Collaborations are pursued carried out jointly with linked activities at the time of reporting are presented below:

Linked project	Main contact
Ammitec (Association): "Association of Maritime Managers in Information Technology and Communications"	OTE
Assist IoT: "Architecture for Scalable, Self-*, human-centric, Intelligent, Secure, and Tactile next generation IoT"	UPV
BOOST4.0: "Big Data Value Spaces for COmpetitiveness of European COnnected Smart Factories 4.0"	IBM

Linked project	Main contact
PIXEL: “Port IoT for Environmental Leverage”	UPV
Pledger: “Performance optimization and edge computing orchestration for enhanced experience and Quality of Service”	Achilleas
PortForward & SmartShip	ITI

Table 7 - Collaboration activities with linked projects

Below we briefly summarize these activities:

6.2.1 Ammitec

Ammitec (<https://www.ammitec.org/>) is a non-profit scientific association, bringing together the ICT Managers of the global shipping companies and everybody else who is involved in maritime IT & Communications. Ammitec, aims to promote the most efficient usage of modern Technology by "Promoting Seaworthy ICT", the relevant best practices in the global maritime sector and the empowerment of the ICT professionals.

OTE an industry partner of DataPorts, together with CERTH, a technology partner, is co-organising a workshop in collaboration with Ammitec. This workshop aspires to be the first step in a series of collaborative actions between DataPorts and Ammitec that will emphasise on the technology transfer in the shipping and maritime ICT community predicting and planning the transformation of seaports.

The workshop is planned to be held in April / May 2021, based on Ammitec members’ availability. During this (~3 hour) online workshop, DataPorts vision towards the seaports transformation will be presented, along with the results of the 1st survey that was conducted in Q4, 2020. Several members of Ammitec have responded in that questionnaire. ICT managers, Data Consumers and Data Providers will be among the workshop participants.

Moreover, in the technical session of the workshop, challenges in maritime and shipping will be addressed, as well as blockchain-based solutions and use cases will be presented. Blockchain is a technology that can be applied in several fields and areas in shipping and maritime. In addition, this workshop will initiate discussions, related to data usage from the DataPorts point of view as is the data governance, sharing and tracking.

6.2.2 ASSIST-IoT

ASSIST-IoT is an EU H2020 ICT-56-2020 funded research project which aims at design, implementation and validation of an open, decentralized reference architecture, associated enablers, services and tools, to assist human-centric applications in multiple verticals. One of the pilots consists of a port automation scenario. The ASSIST-IoT¹ project began at the end of 2020.

At this moment, the collaboration between DataPorts and ASSIST-IoT focused on brief meetings analysing the possible collaborations and synergies between both projects. Some common areas have been located like AI, interoperability, IoT, Distributed Ledger Technology (DLT) or Data Sharing.

6.2.3 BOOST 4.0

Boost 4.0 (<https://boost40.eu/>) was the biggest European initiative in Big Data for Industry 4.0, which ran from 2018 to 2020. With 50 partners from 16 countries and a 20M€ budget and leveraging 100M€ of private

¹ <https://assist-iot.eu/>

investment, Boost 4.0 aimed at creating the European Industrial Data Space to improve the competitiveness of Industry 4.0 and to guide the European manufacturing industry in the introduction of Big Data in the factory, providing the industrial sector with the necessary tools to obtain the maximum benefit of Big Data.

In the scope of the project, IBM has developed a blockchain based solution for textile supply chain. The *sheep to shop track and trace blockchain* application records the transformation of raw materials into fabrics and enables verification of EU Preferential Certification of Origin. Blockchain technology provides trust, transparency, provenance, and real-time information of the assets at each point in the supply chain. Organisations of such a blockchain network include manufacturers, suppliers, retailers, and customs. The backend of the blockchain application (developed on top of Hyperledger Fabric) has been released to open source under the Apache v2 license by IBM and can be found at: <https://gitlab.com/boost4-piacenza/public-artifacts> (e.g., see the video: <https://www.youtube.com/watch?v=jIR1FC5Hqzw>).

The BOOST 4.0 project has ended but the blockchain based solution will be extended in the scope of a spin off project TRICK. The TRICK consortium is composed of 28 partners and is planned to start on May 1st 2021 for a period of 42 months. TRICK will provide a complete, SME affordable and standardised platform to support the adoption of sustainable and circular approaches. End users will cover the whole Textile and Clothes value chain, from raw materials to recycling.

DataPorts is using IDSA as Boost 4.0 for the context broker part, which is optional in the IDS RAM. The data sharing and data governance terms are central in DataPorts project and the blockchain is playing a crucial role in the implementation. Boost 4.0 demonstrated how the blockchain can be used for adding specific information to the IDS Clearing House, but it did not use it to its full potential. DataPorts aims to use the clearing house for adding all the information regarding the dataset's metadata additions, as well as the requests and actual access to the datasets to enable a full history of transactions with a single point of truth. Furthermore, DataPorts will allow fees to be applied to specific datasets and set the IDS clearing house the main point to reference for any disputes. Additionally, Boost 4.0 proposed an architecture for supporting the IDS Broker with HL Fabric, but it didn't go further to add all the metadata information and utilize it as the main point for searching specific datasets. DataPorts, sets the IDS Broker as a main role in datasets metadata exchange and aims to hold not only the data governance rules but also the data sharing rules for the datasets. To this end, DataPorts will also explore the possibility to utilize HL Fabric ACL lists as an identity reliable management system.

6.2.4 PIXEL

PIXEL² (H2020-MG-2017) will enable a two-way collaboration of ports, multimodal transport agents and cities for optimal use of internal and external resources, sustainable economic growth, and environmental impact mitigation, towards the Ports of the Future.

As both projects have several partners in common (like UPV, PRO and THPA), the feedback received from PIXEL Project is constant. The architecture and tools used in PIXEL have been analyzed. As a result, it was decided to use the same FIWARE³ components and Data Models guidelines used in PIXEL to implement the Data Access Layer components. There are some common points in the developments needed to integrate these FIWARE components with the rest of the components of the respective project platforms. Moreover, DataPorts is making use of a framework for data access agent development (pyngsi⁴) provided by Pixel to access the heterogeneous data sources.

² <https://pixel-ports.eu/>

³ <https://www.fiware.org/about-us/>

⁴ <https://pypi.org/project/pyngsi/>

In addition, PIXEL is providing continuous information about target audiences and stakeholders. Finally, a jointly paper⁵ was published with PIXEL Project. It is described in detail in the Scientific Papers section of D6.2.

DataPorts will leverage PIXEL's experiences and lessons learned on how to approach the implementation of ICT technologies in ports in an innovative way to generate real impact in European maritime transportation. Collaboration on technical, communication and dissemination activities will be a commonplace. Finally, in June DataPorts is going to participate in a Pixel Webinar⁶. Specifically, as an external speaker in the session dedicated to "PIXEL architecture modules and platform installation". It will be in a slot dedicated to explaining how the modularity of PIXEL is being leveraged by external EC-funded projects like DataPorts.

6.2.5 PLEDGER

The Pledger project (<http://www.pledger-project.eu/>) aims at delivering a new architectural paradigm and a toolset that will pave the way for next generation edge computing infrastructures, tackling the modern challenges faced today and coupling the benefits of low latencies on the edge, with the robustness and resilience of cloud infrastructures.

It is planned to organize a joint workshop in 2022, meaning during the 3rd year of both projects and based on mature outcomes. The goal of this event would be to give the opportunity to students and developers to create combined applications using components implemented in the context of DataPorts (e.g., Data Abstraction and Virtualization) as well as Pledger (e.g., Edge/Cloud Orchestration tools) and provide feedback on how to improve the components in terms of functionality, usability, performance etc.

6.2.6 PortForward & SmartShip

PortForward proposes a holistic approach that will lead to a smarter, greener, and more sustainable port ecosystem and which will include the following features: The introduction of an Internet of Things (IoT) concept for port assets (infrastructure, vehicles, cargo, people); The socio-economic analysis of the port interface with its surrounding area and the port-city, as well as the rest of the logistics value chain.

SmartShip aims to offer a multi-layer optimization in the fields of fuel consumption, energy efficiency and emissions control management, in full respect to the implementation of the requirements of maritime sector regulations and considering applications of circular economy concepts in the maritime as well. The project will deliver an ICT & IoT-enabled holistic cloud-based maritime performance & monitoring system, for the entire lifecycle of a ship, aimed to optimise energy efficiency, emissions reduction, and fuel consumption, whilst introducing circular economy concepts in the maritime field.

Three representatives of the projects, namely Christian Blobner (Fraunhofer IFF) from PortForward, Eleftheria Marini (ITML) from SmartShip and Santiago Cáceres (ITI) from DataPorts, met virtually on 07/05/2020. General overview of projects objectives, technical developments and milestones were given, followed by open discussions on common topics. Even if projects tackle the maritime and port challenges from different perspectives, there were identified some common issues that would need to be checked in later stages of the projects to see if some collaboration would be possible like e.g., novel smart logistics platforms for decision support systems and environmental monitoring/optimisation, among others.

It was agreed to plan a workshop in a later stage of the projects when more results are available (during 2021). In any case, the SmartShip coordinator, Fotis Oikonomou, is part of DataPorts AB so we may take advantage of it in the future.

⁵ Framework and Methodology for Establishing Port-City Policies Based on Real-Time Composite Indicators and IoT, A Practical Use-Case. URL: <https://www.mdpi.com/1424-8220/20/15/4131>

⁶ https://pixel-ports.eu/?page_id=1692

6.3 INTERACTION WITH ADVISORY BOARD

As reported in D6.1, The DataPorts Advisory Board (AB) will be one key instrument to strategically engage with decision makers and the wider stakeholder community. The AB will foster an active engagement between AB members and key partners of the DataPorts consortium, thereby providing AB members with early insights into project results and findings, whilst providing DataPorts members with external views and recommendations.

In particular, the role of the AB is to engage with DataPorts in the following ways:

- Challenge DataPorts work against new developments and advances in the state-of-the-art.
- Ensure that DataPorts stays in the highest level of scientific and technical quality, thereby ensuring expected impact.
- Provide scientific, technical and domain expertise on DataPorts results and methodology.
- Share common priorities and establish future cooperation opportunities of mutual benefit.

DataPorts members will cover representatives from relevant transport, mobility and logistics actors and initiatives. As opinion-leaders in their respective fields the members of the AB will provide a valuable referral point at critical milestones along the DataPorts project development.

The following individuals constitute the members of the AB:

- Lorenzo Cotino Hueso, Constitutional Law & Political Science Professor, University of Valencia
- Fernando Liesa, Secretary General, ALICE ETP
- Fotis Oikonomou, Senior Researcher, DANAOS Shipping
- Sue Probert, Chair of UN CEFAC
- Till Schlumberger, Strategy Consultant Digital Transformation, HPC Hamburg Port Consulting

AB meetings will be chaired by Andreas Metzger (UDE). Key representatives of DataPorts partners (e.g., members of the general assembly or leaders of key work packages) will join the AB meetings.

The first meeting of the AB will take place on April 22, 2021. The agenda for this first AB meeting is copied below:

Item	Presenter/Moderator
Welcome and Round Table	Andreas Metzger, UDE (AB Chair)
High-level Overview and Achievements (goals, objectives, risks, ...)	Santiago Cáceres, ITI (Project Coordinator)
Technical Overview and Achievements (architecture, use cases, technical components, ...)	Paco Valverde, ITI (Technical Coordinator)
Break	
Impact (outreach, awareness, KPIs, ...)	Christos Gizelis, OTE (Impact Manager)
Dissemination (communication, social media, scientific publications, ...)	Carlos Palau, UPV (Dissemination Manager)
Innovation and Competitiveness (business opportunities, exploitation, ...)	Jan Jürjens, UKL (Innovation Manager)

Item	Presenter/Moderator
Wrap up and final comments	Andreas Metzger, UDE

Table 8 - Agenda for the Advisory Board meeting

7 CONCLUSION

This document represents the deliverable D6.4 of the tasks T6.3 and T6.4. which include the first activities to reach the goal of fostering the adaption of the platform and becoming the de-facto standard platform for seaports. These objectives required two different approaches to reach the ambitious goals. Therefore, the document is separated in two perspectives: the strategic and the operative perspective. The task T6.4 has a strategic focus, while T6.3 represents a close collaboration with several initiatives.

In the chapters 2 to 5 several activities are proposed to be carried out to develop a scaling strategy. For this purpose, strategic development methods were applied to develop scaling activities. A literature review was conducted to define scaling criteria. Several iterations of assessments were carried out to prioritize activities and structured into a self-reinforced scaling loop. The strategic part is finalized with a roadmap which was developed based on the activities.

In the chapter 6 three main activities to exploit collaborations and build community are presented. The collaboration with related BDV PPP activities were increased based on presentation, pitches, project meetings and publications. Further collaboration was enhanced with linked project as Pixel, PortForward or SmartShip. With the organization of the DataPorts Advisory Board meeting an external perspective provides additional recommendations for the development of the DataPorts platform.

Regards to task T6.4 strategies require a yearly revision to control if the executed actions and milestones are still in line with the global strategy, external trends and with the linked projects in T6.3. For this purpose, the scaling strategy will be revised in the upcoming deliverables.

The milestones for the second year (M15-M24) are already defined by the roadmap. The concrete next steps to fulfil the roadmap are defined as follows:

- Contacting responsible IDS stakeholder and provide more information for the IDS use case “DataPorts”
- Exploring possible interfaces with GAIA-X⁷
- Executing first market research iteration for other ports specific initiatives and trustworthy certifications
- Collecting required prerequisites for IDS-Ready certificate

⁷ GAIA-X: European project with the aim to develop common requirements for a European data infrastructure [20]

8 REFERENCES AND ACRONYMS

8.1 REFERENCES

- [1] A. N. Frake and J. P. Messina, "Toward a Common Ontology of Scaling Up in Development," *Sustainability*, vol. 10, no. 835, 2018.
- [2] I. Borg and T. Staufenbiel, *Theorien und Methoden der Skalierung*, Bonn: Hans Huber, 2007.
- [3] A. B. Bondi, "Characteristics of scalability and their impact on performance," *Proceedings of the 2nd international workshop on Software and performance*, pp. 195-203, 2000.
- [4] A. Dixit and B. Nalebuff, *The Art of Strategy*, New York: W. W. Norton & Company, 2008.
- [5] Latham, Ann, "Forbes," *Forbes*, October 2017. [Online]. Available: <https://www.forbes.com/sites/annlatham/2017/10/29/what-the-heck-is-a-strategy-anyway/?sh=117cb40b7ed8>. [Accessed 01 March 2021].
- [6] M. E. Porter, *Competitive Strategy*, New York: Free Press, 1980.
- [7] H. Mintzberg, "Crafting Strategy," *Harvard Business Review*, 1987.
- [8] M. Porter, "What is Strategy?," *Harvard Business Review*, 1996.
- [9] C. Homburg, S. Kuester and H. Krohmer, *Marketing Management: A Contemporary Perspective*, London: Mcgraw-Hill, 2009.
- [10] Federal Ministry for Economic Affairs and Energy, "BMW," [Online]. Available: <https://www.bmwi.de/Redaktion/DE/Artikel/Digitale-Welt/digitale-plattformen.html>. [Accessed 01. March 2021].
- [11] D. Evans and R. Schmalensee, "Matchmakers: The New Economics of Multisided Platforms," *Harvard Business Review*, 2016.
- [12] G. Jones, *The new Palgrave dictionary of economics*, London: Palgrave Macmillan, 2018.
- [13] T. Barton, C. Müller and C. Seel, *Hochschulen in Zeiten der Digitalisierung*, Wiesbaden: Springer, 2019.
- [14] M. Huber, N. Menz and S. Wessel, "InternationalDataSpaces.org," 14 August 2020. [Online]. Available: <https://internationaldataspaces.org/are-you-ids-ready-fraunhofer-fokus-and-aisec-help-companies-get-ready-for-ids-component-certification/>. [Accessed 2021 March 22].
- [15] C. Edquist, *Systems of Innovation: Technologies, Institutions and Organizations*, London: Routledge, 1997.
- [16] O. Granstrand and M. Holgersson, "Innovation ecosystems: A conceptual review and a new definition," *Technovation*, 2020.
- [17] P. Farris, N. Bendle, P. Pfeifer and D. Reibstein, *Marketing Metrics: The Definitive Guide to Measuring Marketing Performance*, Philadelphia: Wharton School Publishing, 2010.
- [18] A. Hayes, "Investopedia," 17 July 2020. [Online]. Available: <https://www.investopedia.com/terms/m/marketshare.asp>. [Accessed 22. February 2021].
- [19] C. A. Ardagna, E. Damiani, F. Frati, D. Rebecani and M. Ughetti, "Scalability Patterns for Platform-as-a-Service," *Proceedings of the 5th International Conference on Cloud Computing*, p. 718–725, 2012.

[20] Federal Ministry for Economic Affairs and Energy, “BMWI,” [Online]. Available: <https://www.bmwi.de/Redaktion/DE/Dossier/gaia-x.html>. [Accessed 22. March 2021].

8.2 ACRONYMS

Acronym List	
AB	Advisory Board
BDVA	Big Data Value Association
BV	Business View
CP	Consortium Plenary
CRM	Customer Relationship Management
DIH	Digital Innovation Hub
DLT	Distributed Ledger Technology
DoA	Description of Action
EBDVF	European Big Data Value Forum
EC	European Commission
EU	European Union
FAIR	Findable, Accessible, Interoperable, and Reusable
HE	Horizon Europe
ICT	Information and Communications Technology
IDSA	International Data Spaces Association
KPI	Key Performance Indicator
MV	Market View
OV	Organizational View
Prio	Priority
ToC	Table of Contents
WP	Working package

Table 9 - Acronyms