

DATA MARKET AUSTRIA

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First Report on Business Model Development

(WP No. 3, Business, Legal and Societal Research Issues,
Task 3.1, Business Model Development and Validation)

Deliverable number	<i>D3.2</i>
Dissemination level	<i>public</i>
Delivery date	<i>27. October 2017</i>
Status	<i>Public – Final Version</i>
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The Data Market Austria Project has received funding from the programme “ICT of the Future” of the Austrian Research Promotion Agency (FFG) and the Austrian Ministry for Transport, Innovation and Technology (Project 855404)



Document Identity

Creation Date:	4.5.2017
Last Update:	10/28/2017

Revision History

Version	Edition	Author(s)	Date
1	1	Compass Georg Hittmair, Marion Weber, Klaus Heidenreich	5/5/2017
Comments:	First Report on Business Model Development		
2	1	TDA Andreas Huber	8/31/2017
Comments:	Supplement DMA Operator Role		
3	1	Compass Georg Hittmair, Klaus Heidenreich	10/27/2017
Comments:	First Version for review DUK & inits – adjustments/operator role nearly completed due to consortium meeting graz		
0	2	Compass Georg Hittmair, Klaus Heidenreich	20.11.2017
Comments:	Finalisation after Review		

Executive Summary

The development of the DMA Business model is a cornerstone for the whole DMA project. Technical solution and processes within the DMA will be based on the findings of this workpackage.

A) Basic prerequisites for the development of the business model

Before designing the model itself, the framework for the DMA had to be defined. Legal and financial constraints lead to requirements regarding the legal personality and the overall structure of the DMA.

Legal person:

The DMA is ment to perform long term permanent business activities that require freedom of action for the management and the limitation of liability for the stakeholders. Therefore the setup of a legal entity for running the DMA is recommended, either a GMBH, a Verein or a Genossenschaft. At any rate the legal person should lead to the above mentioned goals (Liability and freedom of action).

Distinction between broker and operator:

During the discussions at the project meeting in Salzburg the consortium decided to distinguish between the DMA broker and the DMA operator. The operator runs the DMA from a neutral position, while the DMA broker acts as an agent on behalf of his principal, either a provider or a customer. This decision brought enhanced clarity to the role descriptions within the DMA.

Mall concept versus supermarket concept:

The second upfront recommendation concerns the overall structure of the DMA and the DMA operator model. Starting from the two different commercial concepts of a supermarket and a shopping mall, the recommendation goes towards the shopping mall concept. (Which also comes nearer to a traditional market). In this case the mall operator provides the infrastructure and supports the contracting parties, but he is not involved in the basic deals on the market. As this mall-concept is the more scalable model for the DMA, it is the preferable sustainable solution.

Value chain considerations

Traditional value chain concepts describe primary activities in a rather rigid succession. This linear approach differs strongly from the multi role approach that prevails in the Data Market Austria. Many of the processes within the DMA can be connected at pleasure and nearly every participant will take on more than one role. Therefore nearly all the elements offered within the DMA must have a stand-alone capability and standardised interfaces.

B) Elicitation of the user expectations

Beginning February 2017 Compass interviewed the consortium partners to evaluate the basic expectations within the consortium. Additionally some questions concerned the current business models of the consortium partners to understand which way their business works at the moment and what benefits they could gain from the DMA.

Nearly all partners expect additional commercial and non-commercial projects as key outcome from the DMA. The mostly requested key features of the DMA are:

- Open public Marketplace
- Easy to use billing and contracting system
- Proper search and browse mechanisms

C) Business Model Development

As INITS, one of the consortium members is a startup- incubator and –adviser, the process of business model definition and validation follows their system. The canvas business modelling system represents the basis for a series of workshops for the whole consortium taking place in autumn 2017. The first assumptions by the authors are published in chapter 6.4.2 of this paper. These assumptions are questioned and validated by the consortium members till the end of 2017.

D) Elements of the value chain and cost structure

The running costs of the DMA at the beginning of the service will be a crucial success factor for the whole system. Therefore Compass conducted a first survey among the consortium partners to evaluate their expectations regarding the basic services. The first outcomes show, that the resources necessary for maintainance and support of the basic functions will be a major cost factor when running the DMA. It will be one crucial task of a future DMA operator to keep an eye on those expenditures. To further develop the business model and a business plan a much more detailed cost estimation must be prepared by all partners unexceptional. Only then a final position can be provided how the DMA can be run in a sustainable way

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List of Abbreviations

AIT	AIT Austrian Institute of Technology GmbH
BMD	Business Model Development
CAT	Catalysts GmbH
COMP	Compass-Verlag GmbH
DMO	Data Market Austria
DMO	Data Market Operator
DUK	Donauuniversität Krems
EODC	EODC Earth Observation Data Centre for Water Resources Monitoring GmbH
INITS	INITS Universitäres Gründerservice Wien GmbH
JRS	JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH
KNOW	Know-Center GmbH
RSA	Research Studios Austria Forschungsgesellschaft
Siemens	Siemens AG Österreich
SWC	Semantic Web Company GmbH
TDA	TDA Trusted Data Analytics GmbH & Co KG
TMA	T-Mobile Austria GmbH
TSA	T-Systems Austria GmbH
Wikimedia	Wikimedia Austria
ZAMG	Zentralanstalt für Meteorologie und Geodynamik

1 Introduction

The creation of the DMA business model is comparable to the conception of a new business operation held by a large variety of shareholders. In this specific case the shareholders have an overall picture of the necessity to increase the exchange of data between various entities, but the estimations regarding the volume of the market, customers and providers are based on vague predictions.

Therefore we chose a bottom-up approach for the development of the model. In a first step we define requirements from a legal, operative and economic perspective. That gives us a fair overview of the revenues and reimbursement of costs we have to reach for providing a sustainable long-term solution. This groundwork will serve as a decision support for the stakeholders for adjustments to the requirements and for the individual decisions to proceed with the project after finalising the funded period.

Quite similar to funding a new company we intend to solve the following issues step by step:

- The elicitation of requirements regarding the legal form of the commercial entity will be laid down in chapter 2 and followed by the
- definition of the overall processes within the entity from a legal perspective in chapter 3.
- As the internal and external expectations regarding the operational functionality of the DMA were topic of various interviews and external workshops we will give an overview of their outcome in chapters 4 and 5.
- These legal and operational requirements are the cornerstones for a basic concept regarding the internal structure and the DMA operator definition, which will be focused on in chapter 6.
- The economic implications resulting from legal and internal structures are examined in chapter 7, the final part of this document. The outcome of a short survey done in summer 2017 among the service providers gives essential input.

In the final version of this document we have to carve out the costs in greater detail, decide upon possible revenue models and estimate the market volume. The outcome of the DMA pilots as our first use cases will give essential input for this estimation.

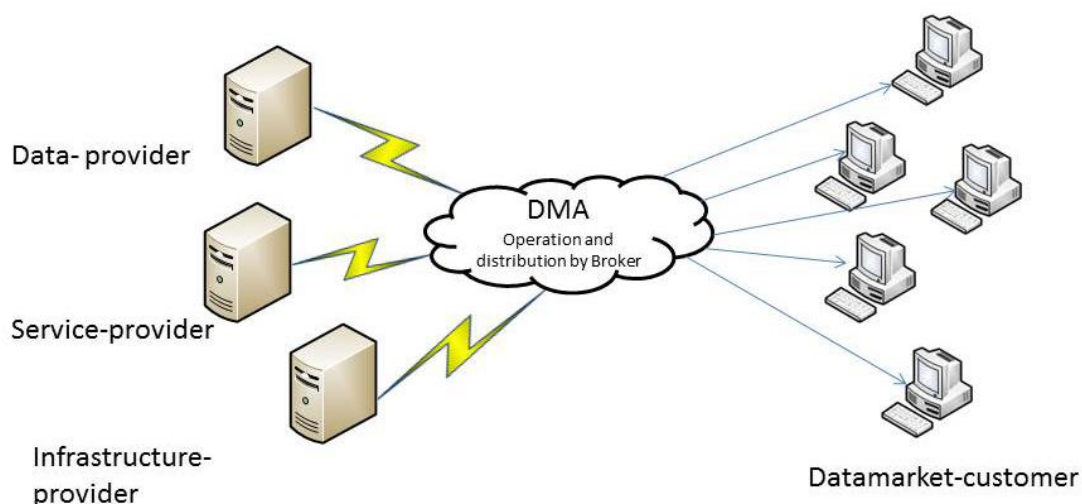
Due to delays in the finalisation of the Pilot-Specific Requirements for the Space Mission Pilot those inputs for the development of the business model will be part of the next version of this document.

As the startup call for participation of startups in the DMA is also postponed, the information packages will also be part of the second version of this document.

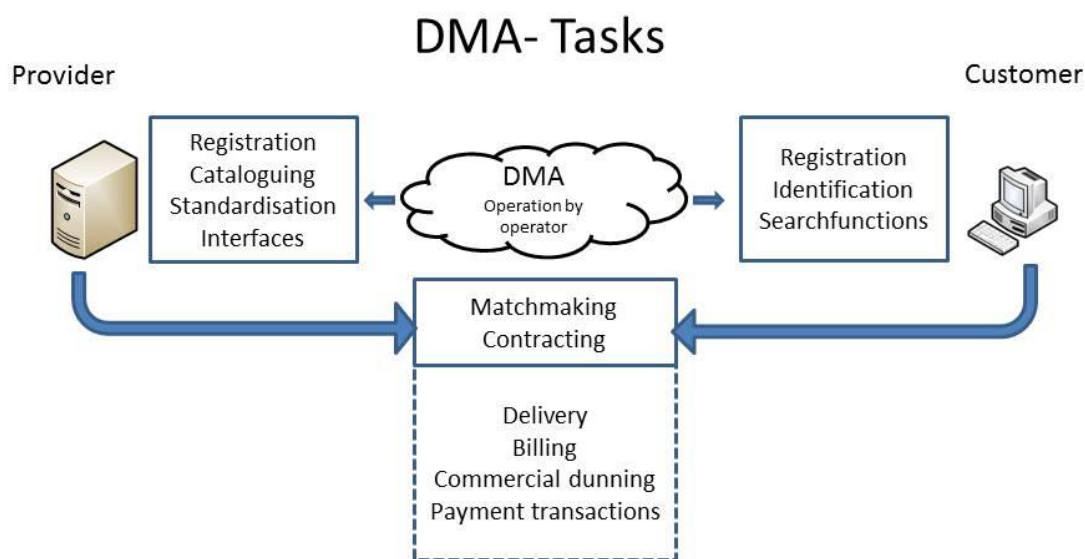
2 Legal form of the commercial entity DMA

2.1 Starting point and requirements

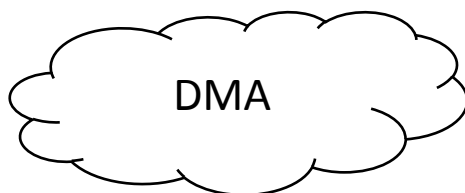
The project proposal contains no statement regarding the legal form of the DMA.



Therefore the tasks the DMA will perform were examined. As it serves as the central hub between the involved partners a lot of different responsibilities were carved out:



To fulfil the above mentioned tasks the DMA has to carry out lots of different activities. Even when those activities are carried out by somebody else in the name of the DMA, the DMA still remains liable.



Activities carried out by the DMA

Permanent running and maintenance of IT systems, including customer support

- Registration/Frequent updating
- Identification/ Frequent updating
- Cataloguing/ Frequent updating
- Search functions
- Matchmaking
- Contracting

Hotline for providers

Contracts with

- Providers/frequently
- Data market Users/very frequently
- Employees
- Suppliers

These activities result in liability issues (warranties, consequential loss responsibility, IP issues, data protection liabilities..)!

The DMA will perform long term permanent business activities that require freedom of action for the management and the limitation of liability for the stakeholders.

2.2 Status Quo

At the moment the DMA must be seen acting as a partnership (Gesellschaft bürgerlichen Rechts nach § 1175 ABGB ff) under Austrian civil law. To avoid uncertainties the most relevant regulations are cited in German:

§ 1175. (1) Schließen sich zwei oder mehrere Personen durch einen Vertrag zusammen, um durch eine bestimmte Tätigkeit einen gemeinsamen Zweck zu verfolgen, so bilden sie eine Gesellschaft. Sofern sie keine andere Gesellschaftsform wählen, bilden sie eine Gesellschaft bürgerlichen Rechts im Sinn dieses Hauptstücks.

(2) Die Gesellschaft bürgerlichen Rechts ist nicht rechtsfähig.

(3) Sie kann jeden erlaubten Zweck verfolgen und jede erlaubte Tätigkeit zum Gegenstand haben.

(4)....

§ 1176. (1) Die Gesellschafter können die Gesellschaft auf ihr Verhältnis untereinander beschränken (Innengesellschaft) oder gemeinschaftlich im Rechtsverkehr auftreten (Außengesellschaft). Ist der Gegenstand der Gesellschaft der Betrieb eines Unternehmens oder führen die Gesellschafter einen gemeinsamen Gesellschaftsnamen (§ 1177), so wird vermutet, dass die Gesellschafter eine Außengesellschaft vereinbaren wollten. (2)....

§ 1189. (1) Zur Führung der Geschäfte der Gesellschaft sind alle Gesellschafter berechtigt und verpflichtet.

(2) Überträgt der Gesellschaftsvertrag die Geschäftsführung einem einzelnen Gesellschafter oder mehreren Gesellschaftern, so sind die übrigen Gesellschafter von der Geschäftsführung ausgeschlossen.

*§ 1192. (1) **Gesellschafterbeschlüsse erfordern die Zustimmung aller zur Mitwirkung bei der Beschlussfassung berufenen Gesellschafter.***

(2) Hat nach dem Gesellschaftsvertrag die Mehrheit der Stimmen zu entscheiden, so bestimmt sie sich nach den abgegebenen gültigen Stimmen. Das Stimmgewicht entspricht den Beteiligungsverhältnissen. Sind nicht alle Gesellschafter am Kapital beteiligt, wird die Mehrheit nach Köpfen berechnet. Arbeitsgesellschafter, denen der Gesellschaftsvertrag einen am Wert ihrer Arbeit orientierten Kapitalanteil zubilligt, gelten als am Kapital beteiligt.

*§ 1199. (1) Für **gesellschaftsbezogene Verbindlichkeiten gegenüber Dritten** haften die **Gesellschafter als Gesamtschuldner**, wenn mit diesen nichts anderes vereinbart ist.*

(2) Aus Rechtsgeschäften, die ein Gesellschafter auf Rechnung der Gesellschaft, aber im eigenen Namen abschließt, wird er allein dem Dritten gegenüber berechtigt und verpflichtet.

2.3 Recommendation

In sum the provisions regarding a Gesellschaft bürgerlichen Rechts according to §§ 1175 ff ABGB do not provide the solution to the requirements defined in chapter 2.1 at all. On the contrary, neither freedom of action for the executive managers nor a reduction of liability is provided through this partnership.

Qualifying the DMA as a Gesellschaft bürgerlichen Rechts leads to every consortium member being liable for the commercial activities of the DMA and even fines. (One recently very often mentioned example are violations of the new General Data Protection Regulation).

Therefore the DMA consortium members should as soon as possible either decide about the found and of a new legal entity to run the DMA or trust an existing legal entity with the tasks of the DMA operator. The process for doing so has to be started on executive level. Of course the legal departments of the various consortium partners will have their own views which kind of legal person would fit on this specific requirements profile, so advantages and disadvantages of the various kinds of legal persons have to be carefully considered.

The selection criteria should include especially the following:

- formation costs
- formation duration
- freedom of action for the management
- decision making within the legal person
- control rights of the shareholders
- limitation of liability for the shareholders
- effort for newcomers to become a shareholder
- Taxation issues
- and many more

The following types of legal persons according to Austrian law should be taken into account :

- Verein
- Aktiengesellschaft
- Gesellschaft mit beschränkter Haftung
- Erwerbs- und Wirtschaftsgenossenschaft

3 Overall structure of the DMA

As the Ecosystem DMA consists of a vast amount of information, data, services (with reference to Deliverable 3.1, Chapter 2, “Gegenstand des DMA”), different activities, basic offers free of charge, commercial offers and contractual relationships in a first step we had to carve out a principal structure of this ecosystem.

This was done by a first report (The DMA business model, Excerpt from “First Report on Business Model Development”), sent to the consortium partners in June 2017. As none of the partners objected to the findings, this document serves as a cornerstone for further development of the DMA business model.

3.1 DMA functional structure

The DMA will consist of a wide variety of datasets, services, infrastructure and functions. For the development of the DMA basic business model this variety of building bricks has to be gathered under one roof while preserving their heterogeneous nature.

The individual elements within the DMA do not form a continuous structure. In fact, the DMA comprises a large number of individual modules originating as well from the consortium partners as from third party external partners.

The following chart shows DMA elements (internal ones as well as external ones) according to the project documents. Completeness is not given and further elements will be added during the lifetime of DMA.

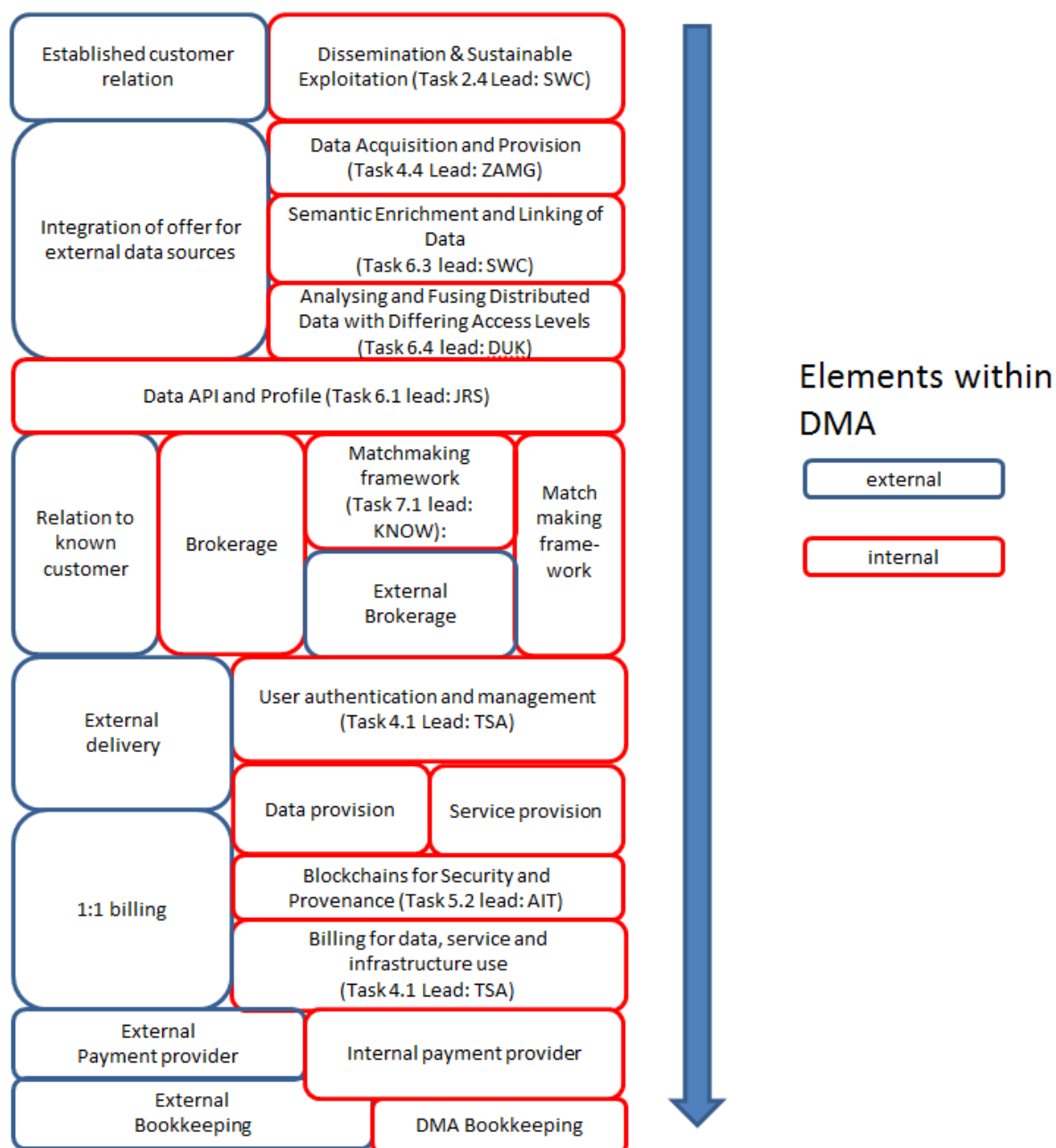


Figure 1: Possible elements of the Data Market Austria

3.2 Roles and functions

To secure flexibility for the respective business needs, the DMA has to operate with variable integrated applications, processes and functions. The main challenge of the whole project will be to maintain coordination and harmonization of these elements without restricting the supply side.

It will be the choice of the DMA customers to decide which elements (data, services, infrastructure) they demand. The various selected elements have to interact with the respective one to follow.

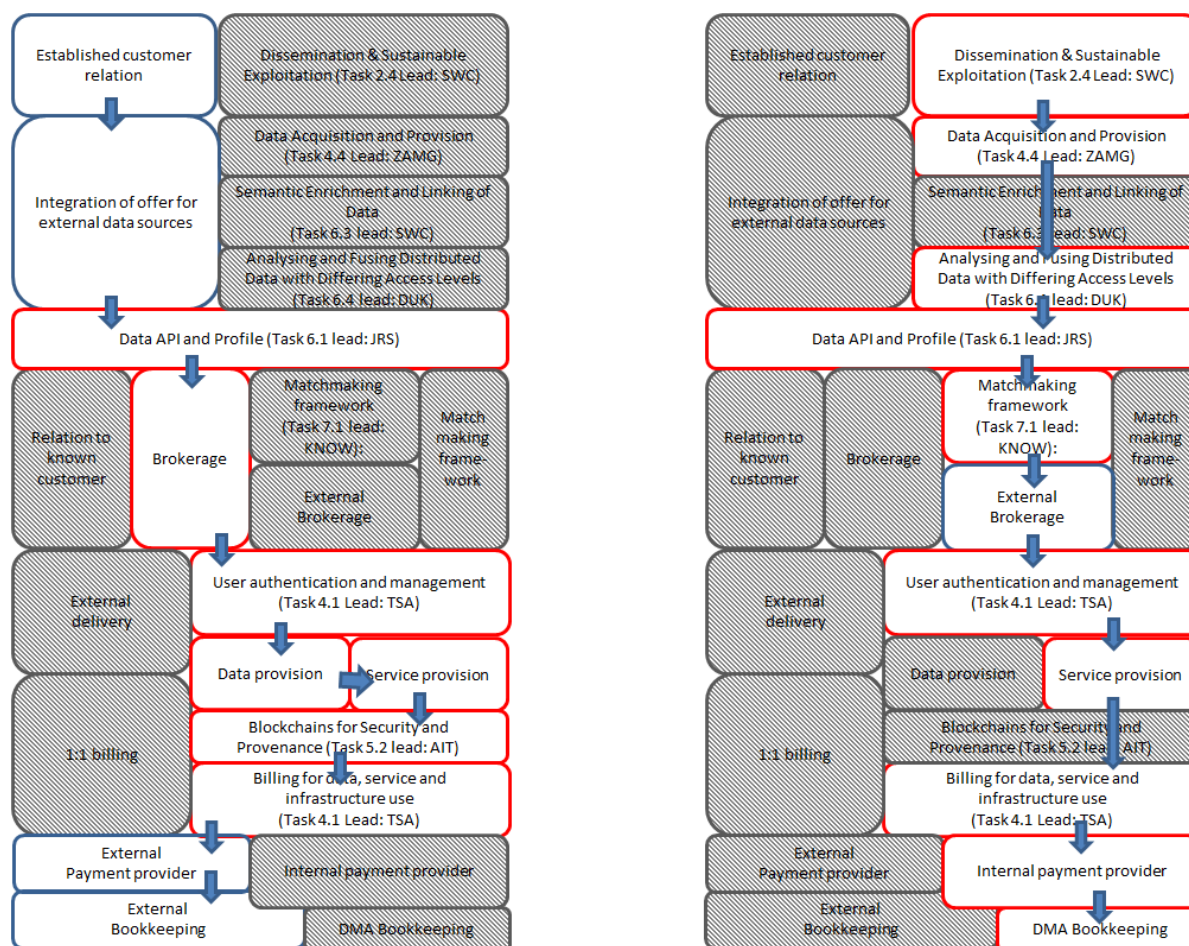


Figure 2: Interaction of a number of variables processes.

Task 3.1: The business model itself will describe processes for order processing, information provision of involved data and service providers in an at least standardised if not automated way, delivery processes dependent on the requested data, bookkeeping and reminder administration, billing processes, payment provider solutions. (FFG Project Description for Proposal, page 42)

3.3 DMA operator model

During the DMA Salzburg meeting the role of the DMA operator was discussed extensively. The consortium partners agreed, that the broker will not act as the operator of the DMA, but a final solution regarding the provision of the resources for an effective running of the whole system was not yet found.

The foundation of a supporting association was discussed, but as the statutes of this association are not drafted yet, it is unclear if and how this association could act as an operator.

3.3.1 Dependencies for business models of project partners

The consortium partners as well as future DMA partners will integrate their offers (Data, services and infrastructure) into the DMA framework. Depending on the overall DMA business model they will do so as sub-suppliers of a DMA business or as autonomous entities.

The business models of the suppliers therefore hinge very much on the contract with the DMA operator. The emerging questions range from

- juridical ones (acting in the name of the DMA or in their own name, who bears liability at what stage, are there common general terms,...),
- calculative questions (fixed costs percentage, scalability, compensation for basic functions,...),
- to marketing and sales (branding, coordinated approach regarding advertising and information or predominant role..).

3.3.2 Shopping Mall versus Supermarket approach

The most obvious comparison between the DMA and a non-digital shop is a big shopping facility with lots of different items to buy. Such centres are organised, in most cases, in two different ways representing two different underlying business models:

- Either the Shopping Mall concept
- Or the Supermarket concept

Both concepts are capable of selling the requested items to the customers (also in the case of the DMA), but they are fundamentally different regarding their legal, financial and organisational structure.

3.3.2.1 Characteristics

The following table shows differences between the two models on an illustrative level - many more exist.

	Shopping Mall	Supermarket
Face to the customer	Individual shops	Overall supermarket owner
Commercial responsibility	Shop by shop	Overall
Contractual system	Lots of individual contracts between shops and customers with a relatively low number of items and billing lines per bill	One contract with the supermarket owner, high number of items and billing lines per bill
Breakthrough rights	On contractual basis	Given
Branding	Individual brands per shop, responsibility for branding is with the shop=brand owners	Brand is mainly the supermarket chain
Support	Individual support per shop	Overall support
Basic services for running the mall	Individual contracts between mall owner and shop owners. Minimum set for maintenance obligatory.	Responsibility alone with Supermarket operator

3.3.2.2 Usual Obligations of mall operators / legal capability

The real-life obligations for mall operators range from the provision of pure infrastructure as for instance

- Electricity, parking, the provision and maintenance of toilets and maintenance common areas

to more customer orientated tasks like

- Overall PR, the implementation of a Guiding system and more detailed Information for potential customers.

Transferred into the DMA environment this points to the need for a portal, user guidance, catalogue systems, standards for entering the stores (standardized interfaces) etc. While many of these elements are depicted in the project description, the question regarding the identity of the future legal person that takes responsibility for running it remains open. As the mall operator has to fulfil obligations, he will have contracts with the shop owners that describe the mutual rights and duties. For developing business models that are based on these contracts it is essential to know

- how the mall operator is organised,

- how he interacts with the shop owners,
- what he provides
- who bears the running costs on what bases

3.3.2.3 Liability issues

As discussed in chapter 2 of this paper, the DMA has to act as an autonomous legal entity due to liability reasons and sufficient freedom of action. Nevertheless, even then responsible managers have to question the legal risks arising from their business model.

To weigh the risks one has to take a scalable model as a starting point. That means the model has to meet the requirements that will hopefully exist in five or ten years time while running a sustainable high volume DMA. Under this assumption the number of data and service providers will be in hundreds and it seems impossible that the DMA operator will know all their services and data in detail. Also the DMA will not want to know the data or store data, because otherwise the DMA will be confronted with data protection risks.

If the DMA sells these data and services in his own name he will be liable in the first place. (That includes legal warranties but also statutory liability for the violation of intellectual property like database rights or fines for violation of privacy provisions). The DMA can of course recourse liability to the providers, but that does not help in case of insolvency of a provider or limited cover pool. It is therefore also a question of limitation of liability if you choose a „supermarket“ or a „shopping mall“ model.

From a long term perspective the „shopping mall“ model seems to be the only scalable and sustainable one, therefore we follow this conjecture.

3.4 Value chain within the DMA

The partners will act in the different roles depending on the individual business opportunities that will be identified. There is the need for a structured and steady interaction between a large number of players in the ecosystem. Due to the specific need of data flow between data providers and data market customers this will require a high complexity of structures, processes, roles and relations between consumers and suppliers of data and services. On the one side there is a highly heterogeneous arena of data providers with different levels of data quality and quantity and on the other side there are data and data service consumers. (FFG Project Description for Proposal, page 28, chapter 1.2.3.2.1)

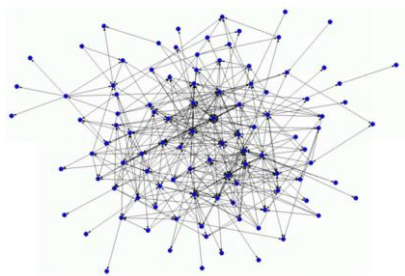
3.4.1 Conventional approach

Traditional value chain concepts describe primary activities in a rather rigid succession. According to these concepts the value creation takes place within a value chain where every chain link is considered to be a beneficiary.



3.4.2 Multi role approach

This linear approach differs strongly from the multi role approach that prevails in the Data Market Austria. A well-developed data market looks more or less like a spider web. Different market players and end users use the data at every stage of development for different purposes and produce different results. Also the market players, who were meant to act at the ends of the chain can act in multiple roles (suppliers, intermediaries, end-users).



According to the project description and the discussions with the consortium partners, this is the way the DMA should work.

3.4.3 Resulting requirements for the individual elements of the value chain

Mostly all data, service, infrastructure elements offered within the DMA value chain will have to have certain characteristics to make the ecosystem work. Among these, the following aspects are of special importance:

- Standalone capability

- Financial sustainability on the long run
- Standardized technical interfaces
- Self-repair capabilities if individual elements disappear

As it will be the mall operators duty to provide a superordinate structure to run the system, he will have to request those characteristics from the providers.

It is within the range of responsibilities of the operator to enforce those requirements in the relationship with the providers of individual elements of the value chain.

3.4.4 Internal structure

The operational entity DMA has to be able to conclude agreements and enter into commitments without asking for reconfirmation by the consortium members every time. Therefore

- Competences,
- co-determination rights,
- Representation rules,
- responsibilities of the supervisory board and
- liabilities

have to be defined and a legal structure according to Austrian law has to be created or an existing legal entity has to take the role of the DMA operator or the basic internal rules of the consortium would have to be adapted.

4 Initial expectations, plans and business models of the consortium partners

Starting February 2017 Compass interviewed the consortium partners to collect their understanding of the DMA. These initial expectations of the partners are an essential building block to develop a business model for the DMA itself.

The main objective was to raise the range of services provided by the consortium partners. In close cooperation with Task 3.3, a rough interview guideline was developed with some questions targeting to gain insights in the view of the consortium with regard to legal requirements (cf. D3.1, chapter 3, Annexes B and C). The interviews personally conducted by compass and were held in german language, recorded, transcribed and finally paraphrased.

Further focus in the DMA partner survey lay on the topic Business Model. The first task was to discover whether the partner is currently already pursuing a business model and monetary profits are targeted as well. There are differing business activity approaches among the various DMA partners. Starting with the questions the answers are based on, the outcome of these interviews with high relevance for the business model development will be summarized in the following.

4.1 Attendees

Partner	Date	Interviewee	Venue
Compass-Verlag GmbH	09.01.2017	Nikolaus Futter	Compass, Vienna
Research Studio Austria	16.01.2017	Allan Hanbury	TU, Vienna
Semantic Web Company GmbH	19.01.2017	Martin Kaltenböck	SWC, Vienna
Joanneum Research	02.02.2017	Harald Mayer, Herwig Zeiner	Joanneum, Graz
Know-Center GmbH	02.02.2017	Robert Ginhör, Heimo Gursch	Know-Center, Graz
Lefkopoulos KG – bouncingbytes	02.02.2017	Philipp Lefkopoulos	bouncingbytes, Graz
INITS	27.02.2017	Peter Tschuchnig	INITS, Vienna
ZAMG	01.03.2017	Günther Tschabuschnig	ZAMG, Vienna
TDA Trusted Data Analytics GmbH & Co KG	28.03.2017	Andreas Huber	Skype
Donau-Universität Krems	28.03.2017	Peter Parycek	DUK, Krems
Siemens AG Österreich	28.03.2017	Deepak Dhungana	Siemens, Vienna
T-Systems Austria GmbH	18.04.2017	Axel Quitt, Alexander Meczes	T-Systems, Vienna
T-Mobile Austria	18.04.2017	Alexander Gänsdorfer	T-Mobile, Vienna
AIT Austrian Institute of Technology GmbH	26.04.2017	Michela Vignoli	Compass, Vienna
Wikimedia Austria	28.04.2017	Clara Landler	Wikimedia, Vienna
EODC Earth Observation Data Centre	17.05.2017	Christian Bries	EODC, Vienna
Catalysts GmbH	11.05.2017	Christian Federspiel	Compass, Vienna

4.2 Business Model - Main Topics

4.2.1 Do you currently pursue a business model, and if so, does this model aim at monetary profits?

4.2.1.1 DMA Partner – non-profit enterprises:

Research Studio Austria (RSA), Austrian Institute of Technology (AIT), Joanneum Research (JR), Know Center (KNOW) and Zentralanstalt für Meteorologie und Geodynamik (ZAMG) work in the field of research & development. They are to be ascribed to the Non-profit sector in its broadest sense. Revenues generated by business projects or together with other research facilities are returned to

further research projects. A large part of the monetary resources is generated by the public sector or through other funding.

Donau Universität Krems (DUK) is a public university focusing on continuing education and research. Wikimedia also is a non-profit organisation whose projects are, to a large extent, financed by funding.

INITS is a university founder's service run by the Vienna Business Agency, University of Vienna and Technical University of Vienna. Despite being a non-profit organisation it, nonetheless, aims to make profit by providing services like renting out office facilities.

4.2.1.2 DMA partners - profit-orientated enterprises

Catalysts (CAT), Bouncing Bytes (BB), Semantic Web Company (SWC), EODC – Earth Observation Data Centre for Water Resources Monitoring, Trusted Data Analytics (TDA) and Compass (COMP) are companies providing services to the market – just as T-Mobile, T-Systems and Siemens that, in addition, have multifarious portfolio at their disposal. All of the enterprises have in common that they are operating with an existing business model – in part, various of models – and that the acquisition of revenue is the business activity's focus of the respective company.

4.2.2 Does your current business model already pursue a certain billing model?

In particular, dealing with the research institutions and non-profit organisations, it was detectable, that the projects are mainly financed by different types of funding. In some cases the realization of profits is carried out by offsets with (external) project partners or clients.

Concerning the profit-orientated companies, there are various billing models depending on the current product or services that are sold to the market. The most frequent denominations were:

- Fees
- Project billing
- Services fees
- Licence fees
- Generalized offset
- Pay per Use
- Completed by a public-private-partnership-model that intends that partners purchase services by realizing an annual subscription

Irrespective of being non-profit or profit-orientated, all the organisations and companies shared the opinion that Data Market Austria is to be seen as a platform to offer, sell or purchase additional products and services from; furthermore, to extend services respectively to acquire existing or new target groups at Data Market Austria.

4.2.3 Do you intend to change or extend your current business model in the course of the DMA project?

The DMA partners operating as research institutions all seek to generate additional research projects through the Data Market Austria.

Likewise, the DMA partners representing profit-orientated companies expect Data Market Austria to be an opportunity to extend and complete existing services.

Several DMA partners – especially those with already established research departments within the company – also see the chance to make progress with in-house research and analysis and, subsequently, to be able to offer services and products with an increasing value to existing and new clients.

In such cases "closed data" is often considered as the product's basis. One example are client-related production data which will not be made public.

A further approach is that one or the other off-the-peg product is easier taken up or sold to those interested via the DMA portal. Frequently, those smaller products would otherwise require a large expense, but generate only little revenue. Therefore, Data Market Austria would be a valuable completion in order to be able to offer data provision as standard products.

Wikimedia would, additionally to its current activity, consider the possibility of functioning as an initial contact for data interested companies. In this field, an expansion of supportive and consulting activities towards Data Market Austria could be realized, for the support of the community is already a key task for the Open Data Portal run by Wikimedia (<https://www.opendataportal.at/kontakt/>).

The bringing together of companies, on the one hand with data experts and software developers on the other is, anyhow, Data Market Austria's primary goal.

Also, small and medium sized enterprises are seen as target groups, as large enterprises normally employ in-house experts or departments dealing with data purchase, use, accumulation and exploitation etc.

DMA partners that, primarily, define start-ups and software developers as a target group, perceive Data Market Austria as a driver causing that these enterprises are supported by Data Market Austria in developing innovative solutions.

An essential point for the development of business models is transparency of costs and, subsequently, prices as no one will base his business model on a construct of unclear pricing/costs. Users have to be able to calculate the costs for data and services up front. A high level of transparency and comprehensibility is a basic requirement.

4.2.4 Do you already have a specific target group (customer base) for your business model?

The DMA partners' customer base is quite diverse reaching from enterprises in several sectors, start-ups, software developers to research institutions and the public sector. An overview is given in the following table:

Partner	Current Business Model	Target Groups	Expected benefit because of DMA
AIT	Non-profit, Projects	Industry: Energy, Mobility Systems, Low-Emission Transport, Health & Bio resources, Digital Safety & Security, Vision, Automation & Control, Technology Experience	More (industrial) projects and clients
Wikimedia	Non-profit, Projects	„Community“, Software Developer, Companies which want to enter the data market	Additional projects, Data Pioneers, first contact person for advisory
Catalysts	Project, Pay per use	Specialised software developer, Mobility, Energy, Space	With DMA more data for international start-ups (f.e. Silicon Valley)
EODC	Public Private Partnership, Partner is owner of data. Services and data for a yearly partner fee	Public and educational entities and research institutions	Additional projects, possibly for new business clients like insurances
T-Mobile	Projects (on base of location based services)	Banking, insurances, Trade, Real Estate, advertising	Development of standardized products. DMA may be interesting as platform for smaller projects
Siemens	Revenue from selling data is not priority (from point of view of research department)	Internal research department of Siemens	Provide analysis, services and data for a closed target group
DUK	Non-profit	Politics & Administration	Research projects for data analysis

Partner	Current Business Model	Target Groups	Expected benefit because of DMA
INiTS	Non-profit	Start-ups	Additional projects for start-ups and for data broker for start-ups needs
bouncingbytes	Software as a service (licence fee)	Mobility, Taxi and transportation companies	Additional projects in transport and logistics
Joanneum Research	Non-profit, projects	Business companies (preferable Steiermark and Kärnten)	Additional and trans-regional research projects
Research Studio Austria	Non-profit, projects	Business	Additional projects and contract research
TDA Center	Non-profit, projects	Industry, Business, Media, i-Health and Life Science	Additional projects and contract research
Semantic Web Company	Projects	Industry, Government	Additional projects and contract research, additional sales channel for existing software products
T-Systems	Various	Different companies and various branches	Infrastructure and Services
Trusted Data Analytics	Service Fees for Data notary services, traders margin in data trading	Tourism, transportation, logistics, mobility, health	Consulting, services and data trading

Partner	Current Business Model	Target Groups	Expected benefit because of DMA
ZAMG	Various	Meteorology, Insurances, other organisations, software developer	Enhanced data for increased target customers, additional sales channels for standardised products
Compass	Data for yearly fee, fair use policy	Finance, tax consultants, tax auditors, consultants, media and business with B2B clients	additional sales channels for selling data

4.2.5 Do you see further chances to increase your target group in the course of the DMA project?

In the first stage the DMA is seen as a (national) domain overarching data market ought to bring together differing communities. By linking up various fields of interests (mobility, energy, health, earth observation, meteorological data etc.), a new ecosystem shall be created which brings up new business models – and attracts new target groups.

New sources of data, the combination and refinement of data and services based thereon will create space for new ideas, products and innovation stimulation both supply and demand.

DMA is seen as a new supply and distribution channel providing easy access to data and services.

The focus shall lie on granting both a transparent supply of data, services and costs and on an easy applicability and usability in general.

Further partnerships and networks that result from the DMA platform will be for the benefit of both the suppliers and all type of users.

The broad spectrum of enterprises belonging to the existing consortium offers an outstanding base to mutually profit from the "data stock exchange" from the beginning on. This attitude is expressed by several mentions by the interviews partners considering themselves not only as data providers, but simultaneously as customers and service providers developing new services out of already offered data.

The communication and broadcasting into the market is a crucial criterion of success for the DMA. The acceptance of this "data stock exchange" depends on that.

Several partners mentioned, that they already informed existing clients about the DMA project and that the clients have shown interest.

4.2.6 Summary of identified chances and risks

4.2.6.1 Chances

- Crosslinking, standardization, support for different communities
- Enrichment for the ecosystem, creation of new business models and projects, strengthened handling and use of data
- Cooperation, combination with further sources of data (refinement), broader user community with differing requests
- Bringing together various data on a single portal
- New product ideas, new data products, better user understanding, domain overarching data market, links between data
- Stimulation of supply and demand, regional data
- Encouragement for innovation, supply channel for untapped data, visualization
- Expanding own services, making profit with generated data, synergies with other companies
- Functioning of a data market in model-like development, generate additional economic use, additional partnerships / connections / networks
- Distribution channel for services
- Expanding open innovation, creating transparent access on data and services, allow intersection of many data sources
- Interest also from the industrial sector, locality – Austria – data confidentiality, platform for the crosslinking of research communities
- Topics like data analysis or data driven business and thinking will, also politically, be made aware
- Competitive advantage for Austria, companies can approach new markets, securing of sites
- Creation of a data market, a "data stock exchange" - less bilateral as now
- Generic, interoperable, transparent

4.2.6.2 Risks

- Not working with but next to the client, keeping the project alive long-term
- DMA is technically ambitious, project might be under-financed, little interest of the community
- No connection of infrastructures
- takeover by big player
- No traffic on the platform
- unknown
- only narrow selection of data (limited variety),
- brokers are not able to bring together interested parties with suppliers
- Low confidence of the stakeholders and customers - no taking part, problems/data (privacy) protection
- Big international competitors
- No space for cross-organisational domain overarching data market – singular specific solutions
- Getting a grip on technical issues, creating legal framework, right time (too early?)
- Confusing and difficult in use, security and data protection, transparency of costs, lack of use
- Complete lack of interest by the market, no economic profit, Austrian market too small
- Different expectations

- Nobody uses portal, portal goes down, intersections are not adequately defined, not as operable as intended, business models do not work – data market dies
- Data insecurity – negative atmosphere, transparent treatment of legal aspects, failing because of too complex technology
- Data will not be sold, DMA business model does not start well, no stakeholders get involved, no users, mini data market
- Little interest by data suppliers, civic development concerning open and free (of costs) data, licensing of data
- Generic, interoperable, transparent – the more interoperable the more complex, the less maintainable

5 External expectations regarding the operational functionality of the DMA

As part of the DMA work package 2 in February and March 2017 various DMA Stakeholder Workshops took place. Beside the facilitators of WP2 always one person of Task 3.2 took part in the Workshops to summarise the expectations of external stakeholders regarding the business model.

5.1 The finding in brief (*excerpt from Deliverable 2.2*)

The Data Market Austria is absolutely necessary and an important activity to foster data management and the data economy in Austria, but we recognised that we have a heterogeneous landscape (and a different speed) in regards to the awareness and the maturity of data management solutions in place in Austria (industry, public administration, academia & research).

This means that some players are already well prepared to offer data related products and services to a Data Market Austria and are very much looking forward to start trading data and providing services as soon as possible (and have already asked for a concrete DMA roadmap to be prepared at launch date) but others (and these are sometimes even big organisations) are only very little aware of the importance to start data related activities but have even no data strategy in place. Such organisations asked for data consulting as part of DMA and support in relation to data literacy and how to create benefit out of existing data in place.

The challenge for DMA will be how to take these different maturity stages in relation to the Austrian data economy into account related to (i) technology provision as well as in (ii) community and communication activities.

Thereby the top requirements for DMA are:

- The provision of a public DMA portal with information about DMA, the data economy and data & services, and the possibility to easily become a part of the marketplace (register & login) including the provision of easy to understand information and guidelines and clear communication of related benefits and added value to use DMA

- DMA should acts as a marketplace for data and data services,
- including easy to use and transparent mechanisms for billing and contracting.
- DMA should act as a single point of access for 'data related demand and supply' and potentially should offer data.
- Comprehensive search and browse mechanisms on data & service is seen as a crucial part for success of DMA
- DMA should foster cross-domain data integration and -applications.
- DMA needs to provide experimentation spaces to foster innovation and (data) exchange in a trusted and secure environment.
- DMA shall publish and promote data stories to support awareness of the importance of data management by providing best practise examples.
- DMA shall take into account Volume, Velocity and Variety needs for efficient data management,
- and DMA shall provide mechanisms for data quality assessment and improvement and take care about interoperability and standards across industries and domains.

Complete DMA requirements as they were collected during requirement elicitation, are much more comprehensive.

This document prepares the foundation for this short-listing & prioritisation as a basis for specification and implementation activities, which is carried out by the team related to technical requirements engineering and development of the architecture of DMA.

6 Running the DMA

On the bases of the above mentioned elicitations and requirements we developed a basic concept on the internal structure and the DMA operator definition. These findings will serve among others as a decision basis for the founding of the legal person DMA.

The legal requirements of the business model DMA represent the framework for the further specification of the roles within. The cornerstones are:

- autonomous legal entity
- acting as platform for contracts between DMA providers and DMA
- providing services to enable this primary task like
 - Registration
 - Identification
 - Catalogue
 - Search functions
 - Contracting
 - Billing
 - Payment services

These requirements have to be aligned to the highest possible degree with the expectations of the internal and external stakeholders and the economic validity of the concept has to be checked.

6.1 Operator Business model and distinction to DMA business model

DMA Management - Operators role & responsibility:

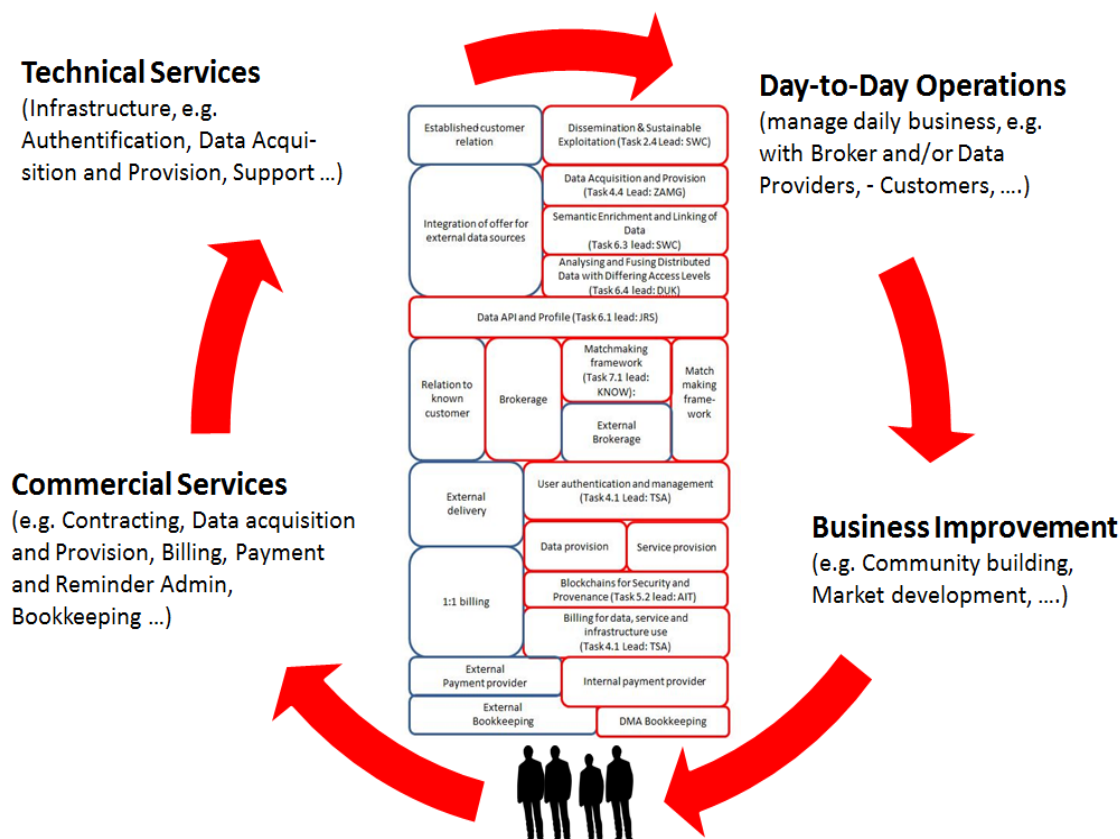


Figure 3: Operators Role

The operator solely operates the trading platform, however, he will not participate as a trader per se. Further he provides infrastructure and base services (as defined in the respective work packages) and supports his business partners (data provider, service provides, R&D, infrastructure providers) with optional services like marketing, sales activities (to nominate brokers and/or act as a sales agent optional) and billing etc.

In contrast to the figuratively mentioned business models “Supermarket” and “Shopping Mall”, the Data Market is in need of supporting the data trading by establishing direct contact between data provider and data seeker.

As an intermediate the Data Market could be a kind of ‘clearing house’ carrying out transactions of purchase and license agreements on behalf of the data owners. Within the supermarket the operator would rather act and sale on his own behalf. Whereas, executing a shopping mall principle, the Data Market Operator would not even act externally. The DMA – Data Market Austria – should be a combination of both. The Data Market Operator has to have a hybrid structure to be able to fulfil these requirements: Neither can he operate completely as in a supermarket, nor completely as in a shopping mall. The Data Market Operator needs to be the operator of the data market and enables data shops and data traders to use the facilities, but needs to stay out of the commercial

responsibility for the sold product. A shopping mall is not responsible for the goods which are sold in the different shops. So should the operator also not be legally responsible for the data sold in the data shops. The sole responsibility should be at the data sellers side. He is responsible for the quality, the accuracy, trustworthiness and reliability of the data.

	Shopping Mall	Data Market Operator (DMO)	Supermarket
Face to the customer	Individual shops	Data Market as a recognisable brand as gate to the customer	Overall supermarket owner
Commercial responsibility	Shop by shop	Shop-by-shop	Overall
Contractual system	Lots of individual contracts between shops and customers with a relatively low number of items and billing lines per bill	One contract between Customer and data provider about the access to DMA (listing as provider or seller). The DMO functions as enabler and Clearing House (and many contracts between DMO and data provider).	One contract with the supermarket owner, high number of items and billing lines per bill
Breakthrough rights	On contractual basis	Data provider is responsible for data quality and data rights. No rights are transferred to DMO.	Given
Branding	Individual brands per shop, responsibility for branding is with the shop=brand owners	Overall marketing as Data Market Austria with individual data shops.	Brand is mainly the supermarket chain
Support	Individual support per shop	Technical support by DMO Data content support by data provider	Overall support

Basic services for running the mall	Individual contracts between mall owner and shop owners. Minimum set for maintenance obligatory.	Like shopping mall	Responsibility alone with Supermarket operator
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6.2 Mission Statement DMO

Based on the aspects previously drawn up, a suggestion for a mission statement of the DMO is made as follows:

“DMO – Data Market Operator is the technical and commercial operator of the DMA Data Market Austria platform. Hereby, the DMO creates – comparable to an operator of a stock exchange – the conditions that enable the market participants to supply, exchange and invoice the data and data services. Hence, essentially the DMO supports transactions of data, but is not a data dealer. In fact, he solely enables the trade in data. The market participants can – comparable to a shopping mall -, in turn, either rent, develop and design a salesroom or hire such a salesroom already completely arranged (Ready-to-use). Running the platform the DMO performs the role of a shopping mall operator enabling the dealers to supply their goods in the shopping centre.

6.3 Structure and Workflow of the DMO

6.3.1 Legal form and representation rules

DMO should be established as an legal entity. Members can be all natural and legal persons. A membership does not provide for trade opportunities or trade advantages. The association / cooperative is represented by a board of directors to the outside.

Liability of the Data Market Operator (DMO): the DMO is represented by a supervisory board. According to legislation the board members are only reliable for major and personal wrongdoing but not for regular work of DMO. Therefore, the DMO is only held liable for the operation of the data trading platform itself and all mechanisms of establishing trustworthiness and data integrity from the side of the infrastructure provider. That means DMO provides technology to prevent intrusion and data theft. But DMO as operator for the DMA is not liable for the supplied data and data services itself. For these, solely the respective data provider or data service provider is held liable. Thus, the DMO is held responsible only for operating the data trading platform and its services – such as billings -, however, not for provided contents.

6.3.2 STRUCTURE

- **Liability:** The association / cooperative may only incur liability within the scope of its assigned tasks (e.g.: rent, personnel costs und further expenses necessary for operating).

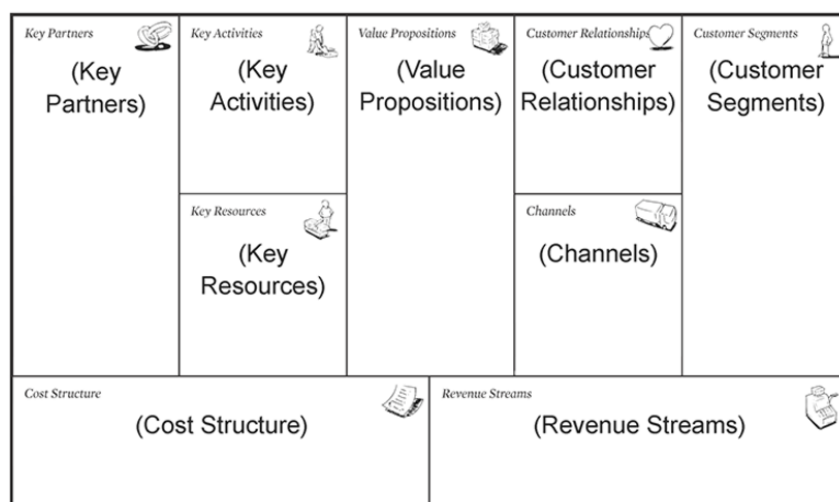
- **Co-determination rights:** The members of the association / cooperative have voting rights at the general assembly, but no operative rights within operational processes regarding the data trading platform. The appointed board solely is responsible for operating.
- **WORKFLOW:** The General Assembly is usually held annually or for important reasons. The meeting elects the executive Board. The executive management board shall appoint a Managing Director of the Organization. Liability issues shall be governed by Austrian law depending on the chosen company structure.
- The operational entity DMA has to be able to conclude agreements and enter into commitments without asking for reconfirmation by the consortium members every time. Thereby, it is capable of acting faster and more direct. Although a decision based on consensus of the association's / cooperative's members increases the legitimacy of the respective decision, a well-functioning data market needs – considering the velocity and amount of transactions on a flourishing data trading platform – a deciding entity that is flexible and competent. The accountability of the board and the managing director to the sponsoring members of the association / cooperative, provides the latter with adequate and sufficient leverage to introduce their interests in operative issues.

6.4 Data Market Operator in brief

6.4.1 The Method 'Business Canvas' as approach for developing the DMA Business Model

The term 'Business Model Canvas' describes a template used by strategic management entities and lean start-ups. Originating from the respective template formulated, new business models may be derived and developed or existing ones may be documented. The visual chart provides describing information about a project's infrastructure, customers, finances or product's values proposition. Entities using the canvasses are being helped in adjusting their activities by illustrating possible trade-offs.

(Further Links: (https://en.wikipedia.org/wiki/Business_Model_Canvas and <https://strategyzer.com/canvas/business-model-canvas>)



Additional to these 9 aspects we added three more aspects for more information:

- Mission statement: what is the core of the business model of the operator of the Data Market Austria? What is its mission and how does it provide services?
- Structure: What would be a suitable structure of the initiative? How could the challenges be addressed?
- Workflow: How could a workflow look like for these target structures? What are the advantages of the model and what are legal necessities and outcome?

6.4.2 The DMO Business Model Canvas in brief

Name of Category	Short explanation
MISSION STATEMENT	DMO as platform's technical operator: Creates environment and conditions under which participants supply, exchange and invoice data and data services; DMO not as a participant himself, but mall organiser
CUSTOMER SEGMENTS	Customers may only be segmented by their respective activities on the platform as they origin from a broad range of business fields; possible segments: suppliers, demanders, service providers
VALUE PROPOSITION	Operating a platform, creating environment in which a flow of data transaction and data service transactions can develop; enable data trading and data service trading
CHANNELS	Mainly online trading; exchange via data media also possible
CUSTOMER RELATIONSHIP	Organisation of regional events with physical presence; Operator's attendance at open-data-conferences; no strong reliance on digital initiations of client relationships
REVENUE STREAMS	Provisioning of access to platform; listing of data; data ads; billing; data management services; data consulting; public funding
KEY RESOURCES	DMA platform; instruments for data quality; data availability; accreditation; trustworthiness
KEY ACTIVITIES	Development of DMA infrastructures; development of data shop prototype; Monitoring of data trades; marketing; Roll-out data service; operation and billing of services
KEY PARTNERS	Members of DMA consortium; BMVIT; further governmental institutions
COST STRUCTURE	Office rent, communication, staff; application developers and further technical requirements; accounting, tax; sales
STRUCTURE	Legal form as association or cooperative; possible members both natural and legal; represented by board of directors; member's co-determination rights solely at general assemblies
WORKFLOW	Annual general assembly; appointed board members and managing director; board and director accountable

<p>MISSION STATEMENT: The DMO creates a comparable platform operator for the DMA Data Market Australia platform. Hereby, the DMO creates a comparable platform operator for the stock exchange-like conditions that enable the market participants to supply, exchange and invoice their data and data services. Hence, essentially the DMO supports transaction side data, i.e., it acts as a data dealer. In fact, the sole aim is to make it possible to trade data in the market. The market participants can compare their goods to other suppliers' goods completely arranged (Ready-to-use). The DMO performs all the roles of a shopping mall.</p>	<table border="1"> <thead> <tr> <th>KEY PARTNERS: The DMAs consortium, The MVITA and other governmental institutions, As well as the most important data market customers and data providers</th><th>KEY ACTIVITIES: Development of technical concepts for the DMA infrastructure; Development of the trading engine / Data shop; (for targeted output) Data providers who want to rent a shop; To let operation and monitoring of data trading platform customer; Development of the concept for going-to-market and roll-out marketing; Roll-out of data services; Operation and billing of services; Further development of services and further service incubation</th><th>VALUE PROPOSITION: The DMO offers a transparent and secure data trading platform which data may be sold and traded legally and trustfully, supporting analysis, monitoring and linking tools are being offered.</th><th>CUSTOMER RELATIONSHIP: In a shopping mall, each shop operator has his own level of interest regarding the technical availability of both the shopping mall and the offered goods. According to the intended business model of the DMO, there will be several concepts for operating shops. Some data providers will sell technology for transferring data or billing of traded data. They may only acknowledge the DMO's contact platform between data provider and data seeker (DMA as platform stabiliser) in contact between provider and provider only. In the third scenario, data provider may acknowledge the DMO's offer for transferring and billing of traded data. In fact, data provider wants to use these additional Data Market features like needs for pay for the services. Hence, the DMO intends to ensure that data which can be retrieved via DMA (data seeker's contact platform) is transferred unaltered, secured and billed. Both the trustworthy data trading and the reliability and reliability of the data infrastructure are the most important aspects hereby. The building of trustful relationships and ensuring the trustworthiness trading environments, therefore, is an important part of the DMO's services. It proceeds digitally. Nevertheless, the personal contact with customers is important. Therefore, the DMO organises regional events with the physical presence of the participants under direct interaction with clients. This is also similar to events for mass e.g. open-data conferences where the DMO may be present to meet existing and possible future customers</th><th>CUSTOMER SEGMENTS: The DMO only supplies business customers (B2B). The DMO's customers originate from different professional suppliers and demanders of data and data services. The customers are, therefore, segmented as follows: (A) Data suppliers with proper sales infrastructure (only needed technically for the trading platform); (B) Data suppliers intending to rent the sales infrastructure (modularly selectable billing, data quality management, advertising (and further), etc.); (C) Brokers either completing individual requests by brokering data services (modularly selectable)</th></tr> </thead></table> <table border="1"> <thead> <tr> <th>KEY RESOURCES: The DMA platform; The data trading platform and running data quality; The offered data according to customer needs; Data availability; There are enough interesting assets available; Accreditation; The data market participants are trustworthy and identifiable (accreditation for trustworthy and reliable producers and data users); Trustworthiness; The offered data is trustworthy, consistent and unchanged</th><th>CHANNELS: The data trading predominantly proceeds online. 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Participants have to make necessary that interfaces decentralised organisation must be realized, the order must be set securely and standardized transfer of data.	<p>COST STRUCTURE: Office rent, communication costs, staff; Technical application developer; (technical operation and further development of the DMA); "Sales" DMA to market; Accounting; Tax</p> <p>REVENUE STREAMS: Depending on the service package and service depth client requests, the DMO will provide different services. Each service has its pricing model behind. The DMO has the following potential income sources: 1) Connection fee DMA: Provisioning of access to the trading platform; 2) Listing fee data and DMA: Provisioning of data to be sold on the platform and maintenance of the listing; 3) Ads for data advertisement: supplied data multi-channel approach; 4) Billing: Billing of transactions (payer-user subscription models); 5) Data management services: Offering support data suppliers (data registration and preparation for sale for quality management services; Ensuring and assessing update intervals); 6) Data consulting: Accompanying customers with conception and establishment of new services; 7) Funding: Revenue by public funding</p>
KEY PARTNERS: The DMAs consortium, The MVITA and other governmental institutions, As well as the most important data market customers and data providers	KEY ACTIVITIES: Development of technical concepts for the DMA infrastructure; Development of the trading engine / Data shop; (for targeted output) Data providers who want to rent a shop; To let operation and monitoring of data trading platform customer; Development of the concept for going-to-market and roll-out marketing; Roll-out of data services; Operation and billing of services; Further development of services and further service incubation	VALUE PROPOSITION: The DMO offers a transparent and secure data trading platform which data may be sold and traded legally and trustfully, supporting analysis, monitoring and linking tools are being offered.	CUSTOMER RELATIONSHIP: In a shopping mall, each shop operator has his own level of interest regarding the technical availability of both the shopping mall and the offered goods. According to the intended business model of the DMO, there will be several concepts for operating shops. Some data providers will sell technology for transferring data or billing of traded data. They may only acknowledge the DMO's contact platform between data provider and data seeker (DMA as platform stabiliser) in contact between provider and provider only. In the third scenario, data provider may acknowledge the DMO's offer for transferring and billing of traded data. In fact, data provider wants to use these additional Data Market features like needs for pay for the services. Hence, the DMO intends to ensure that data which can be retrieved via DMA (data seeker's contact platform) is transferred unaltered, secured and billed. Both the trustworthy data trading and the reliability and reliability of the data infrastructure are the most important aspects hereby. The building of trustful relationships and ensuring the trustworthiness trading environments, therefore, is an important part of the DMO's services. It proceeds digitally. Nevertheless, the personal contact with customers is important. Therefore, the DMO organises regional events with the physical presence of the participants under direct interaction with clients. This is also similar to events for mass e.g. open-data conferences where the DMO may be present to meet existing and possible future customers	CUSTOMER SEGMENTS: The DMO only supplies business customers (B2B). The DMO's customers originate from different professional suppliers and demanders of data and data services. The customers are, therefore, segmented as follows: (A) Data suppliers with proper sales infrastructure (only needed technically for the trading platform); (B) Data suppliers intending to rent the sales infrastructure (modularly selectable billing, data quality management, advertising (and further), etc.); (C) Brokers either completing individual requests by brokering data services (modularly selectable)					
KEY RESOURCES: The DMA platform; The data trading platform and running data quality; The offered data according to customer needs; Data availability; There are enough interesting assets available; Accreditation; The data market participants are trustworthy and identifiable (accreditation for trustworthy and reliable producers and data users); Trustworthiness; The offered data is trustworthy, consistent and unchanged	CHANNELS: The data trading predominantly proceeds online. However, exchangeable data is possible for the participant wish. Participants have to make necessary that interfaces decentralised organisation must be realized, the order must be set securely and standardized transfer of data.								

6.4.2.1 CUSTOMER SEGMENTS

The DMO only applies to business customers (B2B). The DMO customers origin from all fields of professional suppliers and demanders of data and data services. The customers are, therefore, segmented as follows:

A) Data suppliers with proper sales infrastructure (only need technical access to the trading platform),

B) Data suppliers intending to rent a sales infrastructure (modularly selectable: billing, data quality management, advertising or further),

C) Brokers, acting on behalf of their principals and brokering data and/or services (modularly selectable)

6.4.2.2 VALUE PROPOSITION

The DMO offers an open and secure data trading platform on which data may be billed and traded legally and trustfully. Supportingly, analysis, monitoring and linking tools are being offered.

CHANNELS: The data trading is predominantly proceeded online. However, exchange via data media is possible – just as the participant wishes. Parts of the services might make it necessary, that interfaces in decentralized organisations must be realized, in order to be able to transfer the data in a secure and standardized way.

6.4.2.3 CUSTOMER RELATIONSHIP

In a shopping mall, each shop operator is in the need of a certain level of security regarding the technical availability of both - the shopping mall and the offered goods. According to the intended business model of the DMO there will be several concepts of operating a shop.

Some of the data providers will use his own technology for transferring and / or billing of traded data. They may only make use of the DMO as contact platform between data provider and data seeker – like Data Market Customers and/or Service Providers (DMA as platform to establish contact between seeker and provider only).

In other scenarios data providers may make use of the DMO also for transferring and billing the traded data. If a data provider wants to use these additional Data Market features it needs to pay for that services.

Hence, the DMO then has to ensure that data which can be retrieved via DMA is transferred unaltered, secure and billed. Both the trustworthy data trading and the credibility and reliability of the data infrastructure are the most important aspects thereby (see Blockchain concepts).

The building of trustful client relationships and ensuring of a trustworthy trading environment is, therefore, an important part of the DMO business activity. Client relationships are mainly initiated digitally as services are proceeded digitally. Nevertheless, for the reason of trust and business development the personal contact with customers is important. Therefore, the DMO shall organise regional events with the physical presence of the participants in order to get directly in contact with

clients. Also at similar event formats - e.g. open-data-conferences - the DMO may be present to meet existing and possible future customers.

6.4.2.4 REVENUE STREAMS

Depending on the service package and service depth a client requests, the DMO will provide different services. Each service has a pricing model behind. The DMO has the following potential sources of income:

- 1) Connection to DMA: Provisioning of access to the data trading platform
- 2) Listing of data at DMA: Provisioning of data to be sold on the platform and maintenance of the listing
- 3) Ads for data: Advertising of supplied data (multi-channel approach)
- 4) Billing: Billing of transactions (pay-per-use or subscription models)
- 5) Data management services: Offerings for consulting data suppliers (data aggregation and preparation before sale) or quality management services (Ensuring and measuring the data update intervals)
- 6) Data consulting: Accompanying customers with conception and establishment of new offers and services
- 7) Funding: revenue by public funding

6.4.2.5 KEY RESOURCES

- 1) DMA platform: The data trading platform is up and running
- 2) Instruments for data quality: the offered data is according to customers' needs
- 3) Data availability: there are enough interesting datasets available
- 4) Accreditation: the data market participants are trustworthy and identifiable (accreditation of trustworthy and reliable data producers and data users).
- 5) Trustworthiness: the offered data is trustworthy, consistent and unchanged (contracts with reliable partners).

6.4.2.6 KEY ACTIVITIES

- 1) Development of the technical concept for the DMA infrastructures
- 2) Development of the prototype of a data trading engine / data shop (for target group B: data providers who want to rent a shop)
- 3) Pilot operation and monitoring of data trading pilot customers
- 4) Development of a concept for going-to-market and roll-out (marketing)
- 5) Roll-out of data service
- 6) Operation and billing of services
- 7) Further development of services and further service incubation

6.4.2.7 KEY PARTNERS

The members of the DMA consortium, BMVIT and other governmental institutions. Also, the most important data market customers and data providers.

6.4.2.8 COST STRUCTURE

- 1) Office (rent, communication costs, staff)
- 2) Technician / application developer (technical operation and further development of the DMA)
- 3) Sales (DMA to market)
- 4) Accounting / Tax

7 Individual elements of the DMA value chain and their effect on the cost structure

In July and August Compass conducted a survey among the consortium partners about their services and functions which will be implemented in the DMA (based on chapter 2.2) including questions about current service activities and costs for daily operations. The outcome of this survey should help to determine the running costs of the DMA to get a clearer picture of the cost structure.

7.1 Modules and partners

Module	Partner	Type	Additional costs by partner (beside daily DMA operation costs):
T 4.1 / User authentication and management	TSA	Basic function	Maintenance (efforts TBD)
T 4.1 / Billing for data, service and infrastructure	TSA	Basic function	Application scenario and vendor unclear: „billing as a service“ or „billing within service“?
T 4.1 / Virtual machine administration	TSA	Basic function	Maintenance (efforts TBD)
T 4.1 / Basic infrastructure services (DMA portal and functions)	TSA	Basic function	Maintenance (efforts TBD)
T 4.2 / Developer assistance for distributed clouds	CAT	Basic function	Maintenance (efforts TBD)
T 4.1 / Service Provision	TSA	Basic function	Maintenance (efforts TBD)
T 4.4 / Data Aquisition and provision	ZAMG	Data-/Service provider, segmented: APIs for metrological data usage.	Maintenance & Updates (efforts TBD), SLAs optional, Helpline Support and particular free offers (except. earthquake waves and satellite data)
T 4.3 / Data API and Profile Creation	RSA	Basic function	Maintenance (efforts TBD)

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Framework			
T 5.2 / Blockchain for Security and Provenance	AIT	Basic function	Maintenance, high efforts –approx. 40 men days per year.
T 5.3 / Long Term Preservation of Data and Data Citation	AIT	Basic function	No.
T 5.4 / Improving data Quality	DUK	Basic function	Actually unclear – missing empirical values.
T 6.1 / Service API and Profile Creation Framework	JRS	Basic function	Maintenance (efforts TBD)
T 6.2 / Novel Approaches to Large Scale Data Analysis	JRS	Basic function	Maintenance, on-demand specific (efforts TBD)
T 6.3 / Semantic Enrichment and Linking of Data	SWC	Optional solution	Maintenance, Hotline-Support (efforts TBD)
T 6.4 / Analysing and Fusing Distributed Data with Differing Access Levels	DUK	Basic function	Maintenance (efforts TBD)
T 7.1 / Matchmaking framework	KNOW	Basic function	Maintenance (efforts TBD)
T 7.2 / User and corporate profiles and brokerage	KNOW	Basic function	Maintenance: 1 person days / month Regular Updates: 4 person days / month
T 7.3 / Tools for service assessment	RSA	Basic function	Consulting and certification services (efforts TBD)

7.2 Modules in detail

7.2.1 User authentication and management (TSA, Task 4.1)

7.2.1.1 Value proposition

Basic module for user management.

7.2.1.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives? Or according to the respective requirements in each case optional?

It is indispensable for Service booking.

7.2.1.3 Cost-free basic Service?

Is the DMA element part of Cost free offer to DMA users?

Yes. But used resources need to be paid via lump sums.

7.2.1.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** Yes
- **Maintenance:** Yes
- **Regular Updates:** Yes

7.2.1.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

This is a subject that has to be worked out. In any case there must be a business model that can finance that infrastructure – preferred paying customers.

7.2.1.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

Does the provider implement standardised interfaces to those adjoining DMA elements or others? Who does, who bears the costs?

Catalysts will implement a standard framework, costs will be funded within the DMA project.

7.2.2 Billing for data, service and infrastructure use (TSA, Task 4.1)

7.2.2.1 Value proposition

Not clear. TSA plans two various options for billing:

- Billing as a Service: in this option a billing provider (e.g. TMA or TSA or 3rd party) will provide centralized billing services.
- Billing within Service: every provider of either data, services or infrastructure bills his own offerings.

7.2.2.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Reference to chapter 5.2.1

7.2.2.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

No, Billing needs to be seen as a specific service. If a provider decides to define his billing within service as cost free, then it is left up to him.

7.2.2.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** yes
- **Maintenance:** yes
- **Regular Updates:** yes

7.2.2.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

Financed by the Data Market Customer.

7.2.2.6 Position within the DMA value chain

As all DMA elements are part of a value chain which ones are the most likely chain links (other elements) adjoining the DMA element?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

Reference to chapter 5.2.1

7.2.3 Virtual machine administration (TSA, Task 4.1)

7.2.3.1 Value proposition

DMA architecture is based on a defined open source infrastructure stack, inter alia OpenShift and Kubernetes (Red Hat OpenShift is a container application platform that brings Docker and Kubernetes to the cloud, Kubernetes automates container operations). Within this stack provisioning and management of dockerized environments will be standardized. We expect that future infrastructure providers will adhere to this architecture. T-Systems OTC (Open Telekom Cloud will provide exactly services within this stack.

Further details: www.open-telekom-cloud.com, www.openshift.com (information about Docker and Kubernetes provided also).

7.2.3.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Basic module for operating the DMA, indispensable.

7.2.3.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

No.

7.2.3.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** yes
- **Maintenance:** yes
- **Regular Updates:** yes

7.2.3.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

Any implementation and operational costs before a DMA participant is provisioned is own investment.

How does the provider think the DMA element can be financed after 2019:

By the DMA participant (the service consumer also might be a DMA internal consumer, e.g. Data Service Provider (e.g. EODC) uses infrastructure from an infrastructure provider.

7.2.3.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

TBD, not clear at the moment.

7.2.4 Integration (TSA, Task 4.5)

7.2.4.1 Value proposition

Basic modules for operating DMA platform.

7.2.4.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Indispensable, basic functions.

7.2.4.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

No.

7.2.4.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** yes
- **Maintenance:** yes
- **Regular Updates:** yes

7.2.4.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

Any implementation and operational costs before a DMA participant is provisioned is own investment.

How does the provider think the DMA element can be financed after 2019:

By the DMA participant.

7.2.4.6 Position within the DMA value chain

As all DMA elements are part of a value chain which ones are the most likely chain links (other elements) adjoining the DMA element?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

TBD, not clear at the moment.

7.2.5 Developer Assistance for distributed clouds (CAT, Task 4.2)

7.2.5.1 Value proposition

- **Scope of functions**

Developer assistance will be done on multiple levels. On the one hand standard processes on how to develop services within DMA will be defined. On the other hand a set of tools will be provided to the developer.

These tools will range from public default images (Docker) to an online development environment (IDE) for rapid prototyping of services. The IDE will be based upon the python technology stack. It will allow for the instantaneous access of subscribed data products and services within the DMA.

- **Business processes**

The developer assistance will mainly support the service prototyping phase.

- **Interfaces to other applications**

Developer tools will need to run in a sandbox environment with restricted access rights as well as restricted computing resources. They will, therefore, heavily rely on DMA base services to enforce these constraints.

The provided tool-set will allow for “online” code execution. This inherently requires interfaces to the DMA services and data products.

- **Open Source and/or Standard Software**

The developer assistance will be based upon Open Source software. However, these tools will be enriched with DMA specific utilities and helper functions.

7.2.5.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

The provided developer assistance is a convenience feature of DMA to lower the entrance barrier and to attract more developers. It will be possible to develop data products and services without the use of these tools.

7.2.5.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

The developer tools will be free of charge for every developer. Code libraries with DMA specific utilities are likely to be published under an Open Source license. The same applies to basic Docker images defining a standard environment for DMA services.

7.2.5.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** It is not planned to setup end-user support for this specific element, such as hotlines. Support (e.g. via a ticketing system) might become a premium feature later on.
- **Maintenance:** Maintenance efforts will be required to keep the developer tools up to date with new technologies as well as new versions of supported libraries within the python stack.
- **Regular Updates:** At the current state, no regular updates are planned after the first release of the developer assistance tool-set.
- **Computing resources:** Since developer tools will allow for online code execution, computing resources / infrastructure need to be considered. The pricing model for these resources is not defined yet.

7.2.5.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
Developer assistance is a convenience feature to attract more developers (customers) by lowering the entrance barrier. Therefore, the initial development of such tools can be considered marketing expenses. As such financing would be done by the DMA operator organization.
Alternatively, a software developing partner can donor some of his existing tools to the DMA. This, again, can be considered a marketing expense to increase visibility amongst (potential) service providers.
(Developer assistance can also be seen as a product itself. However, a large range of developer tools is available free of charge. Providing a tool-set with a USP is so outstanding that it will be able to amortize its development costs – given the relatively small number of DMA developers, compared to the overall software developer community – is out of the scope of the DMA.)
- **Running costs**
Running costs, especially computing resources, will have to be paid per usage. The developer sandbox can be a special instance one can rent from the infrastructure providers. This fee will then need to not only include the infrastructure costs themselves but also a small premium that has to cover software maintenance costs.

How does the provider think the DMA element can be financed after 2019:

Variable running costs (infrastructure) will need to be covered by introducing a pay per use model as described above.

General maintenance tasks will need to be coordinated by the DMA operator organization. These fixed costs will need to be financed by charging the DMA users a premium.

7.2.5.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element? Does the provider implement standardised interfaces to those adjoining DMA elements or others? Who does, who bears the costs?

The most important link to another element in the DMA value chain is the one towards service publication. After a successful prototyping phase, a developed service will need to be migrated to a production environment and published with the DMA platform (metadata, SLAs, etc.).

Other related links can be search (search for suitable data products and services to integrate), recommendation (recommend additional products based upon source code analysis), as well as all base services (monitoring, billing, sandbox environment, etc.).

7.2.6 Service Provision (TSA, Task 4.3)

7.2.6.1 Value proposition

Functional container management, basic functionality for operating DMA. Content/service within containers are under the responsibility of the data and/or service provider.

7.2.6.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

No, indispensable.

7.2.6.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

No.

7.2.6.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** maybe/optional
- **Maintenance:** yes
- **Regular Updates:** yes

7.2.6.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**

- **Running costs**

Any implementation and operational costs before a DMA participant is provisioned is own investment.

How does the provider think the DMA element can be financed after 2019:

By DMA customer/service consumer.

7.2.6.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element? Does the provider implement standardised interfaces to those adjoining DMA elements or others? Who does, who bears the costs?

TBD, not clear at the moment.

7.2.7 Data Acquisition and Provision (ZAMG, Task 4.4)

7.2.7.1 Value proposition

7.2.7.1.1 Earthquake waves

- **Scope of functions:** Seismic movements in Austria, digital recorded by ZAMG.
- **Interfaces to other applications**
http://www.fdsn.org/media/_s/publications/SEEDManual_V2.4.pdf
- **Open Source and/or Standard Software**
Computer- and operating system-independent software in FORTRAN for reading SEED data is available. So are VMS (Digital Equipment Corporation) and UNIX (Bell Laboratories) versions of the reading program, in FORTRAN 77 and C, respectively; and VMS software in C for writing data into the SEED format. The Albuquerque Seismological Laboratory of the USGS can provide the VMS specific C language writing programs. The National Earthquake Information Center of the USGS will provide the portable and VMS specific FORTRAN reading programs. IRIS supports and distributes a C language reading program, RDSEED that can convert SEED formatted data into a format suitable for analysis and display. IRIS also supports and distributes SEED writing software called POD, Program to Output Data.

7.2.7.1.2 Nowcasting

- **Scope of functions :** INCA generates, evaluates and processes meteorological data for weather analysis and forecasting. With a high specificity spatial resolution of 1 km and a lateral resolution up to 15 minutes forecasting information for the next 6 hours, INCA is calculated currently.
- **Interfaces to other applications**
Available

- **Open Source and/or Standard Software**

No

7.2.7.1.3 Actual meteorological measurements

- **Scope of functions:** Actual measured data collected from overall weather stations in Austria capital cities and summit stations, data is summarized hourly. Containing:
 - Number, name and sea level of weather station
 - Data and time of measurement
 - Metrological data: temperature and dew point, velocity and direction of wind, wind peaks and average, level of humidity, precipitation of rainfall of last hour, atmospheric pressure based on sea level and stations level height, sunshine duration of last hours.
- **Interfaces to other applications**
Available
- **Open Source and/or Standard Software**
No.

7.2.7.1.4 Satellite data

- **Scope of functions:** Earth Observation Data provided by satellites from the ESA Copernicus-Program, based on radar satellites (UAVs) Sentinel-1 and optical satellites Sentinel 2.
- **Interfaces to other applications**
<http://viq4sen.zamg.ac.at/>
<https://www.sentinel.zamg.ac.at/user-guide/open-data-protocol-odata>
- **Open Source and/or Standard Software**
No.

7.2.7.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

chapter 7.2.7.1.1. – Earthquake waves: no alternatives

chapter 7.2.7.1.2. - Nowcasting: no alternatives

chapter 7.2.7.1.3. – Actual Meteorological Measurements: no alternatives

chapter 7.2.7.1.4. – Satellite Data: <https://scihub.copernicus.eu/>

7.2.7.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

chapter 7.2.7.1.1. – Earthquake waves: yes

chapter 7.2.7.1.2. - Nowcasting: no

chapter 7.2.7.1.3. – Actual Meteorological Measurements: no

chapter 7.2.7.1.4. – Satellite Data: yes

7.2.7.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

Chapter 7.2.7.1.1. – Earthquake Waves:

- Running human support (Hotline etc): No or with SLA
- Maintenance: regularly
- Regular Updates: available

Chapter 7.2.7.1.2. - Nowcasting:

- Running human support (Hotline etc): yes
- Maintenance: yes
- Regular Updates: yes

Chapter 7.2.7.1.3. – Actual Meteorological Measurements

- Running human support (Hotline etc): yes
- Maintenance: yes
- Regular Updates: yes

Chapter 7.2.7.1.4. – Satellite Data:

- Running human support (Hotline etc): no
- Maintenance: yes
- Regular Updates: n/a

7.2.7.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation: pay per view or pay per API usage**
- **Running costs: pay per view or pay per API usage**

How does the provider think the DMA element can be financed after 2019:

Pay per view or pay per API usage.

7.2.7.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element (please use functional chart)?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

All APIs provided by ZAMG are designed to integrate into variable business processes and value chains based on standard interfaces.

7.2.8 DMA Portal (TSA, Task 4.5)

7.2.8.1 Value proposition

The portal is the centre for all service provisioning. Nevertheless it is designed in a lean architecture to enable fast service linking and is fundamental operating the portal.

7.2.8.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Basic function. Indispensable, no alternatives.

7.2.8.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

The usage of the portal itself is cost free. The costs of the portal as a service need to be distributed – best via lump sum.

7.2.8.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** yes
- **Maintenance:** yes
- **Regular Updates:** yes

7.2.8.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

Any implementation and operational costs before a DMA participant is provisioned is own investment.

How does the provider think the DMA element can be financed after 2019:

By DMA customer/Service DMA participant via lump sum.

7.2.8.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

Basic function.

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

TBD, not clear at the moment.

7.2.9 Data API and Profile Creation Framework RSA (Task 5.1)

7.2.9.1 Value proposition

Description of the application including

- **Scope of functions**

The data API and profile creation framework defines functions to ingest, validate, and enrich data into the Data Market Austria. This implies both a front-end GUI (as part of the DMA Portal) and a back-end (also exposed as API).

- **Business processes (where appropriate)**

Business processes, to the extent envisaged at this point in time, are described in Deliverable 2.2, Annex User Stories, under User stories US3 (Dataset management) and US4 (Dataservices Management).

- **Interfaces to other applications**

For the front-end, the ingestion, validation, and enrichment functions are embedded into the Portal developed in WP4.

A strong link is also with WP7, matchmaking, which uses the metadata collected or produced during the ingestion process in order to provide DMA customers with recommendations on which datasets are available for which services.

- **Open Source and/or Standard Software**

The current development focuses on the Data ingest pipeline framework which is used to perform a sequence of tasks needed for data ingest. This framework is a backend for asynchronous task execution to perform data validation, transformation, quality enhancement and semantic enrichment operations.

7.2.9.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Indispensable.

7.2.9.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

Cost free.

7.2.9.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** not foreseen
- **Maintenance:** as part of regular updates
- **Regular Updates:** not foreseen, but potentially useful

7.2.9.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

As a consulting service, perhaps also as a certification service.

7.2.9.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?

Basic data services (e.g. ranking, classification, clustering) can all be evaluated against existing test collections. The provider will implement and document APIs such that owners of any of these services may use them to assess the effectiveness of their services, for themselves, and as proofs for others.

7.2.10Blockchain for Security and Provenance (AIT, Task 5.2)

7.2.10.1 Value proposition

Related to Blockchain technologies, the primary goal of the DMA project is to investigate the application of Blockchain technologies to the questions of *decentralized curation*, *preservation*, *provenance* and *security* of Data Assets.

The main question is how the Blockchain technology can contribute to the *veracity*, *integrity*, and *sustainability* of the DMA data and service ecosystem.

- **Business processes**

Based on the ethereum¹ framework and using smart contracts a set of business functions will be developed:

¹ <https://www.ethereum.org/>

- Membership management: The Blockchain technology will be used to regulate the participation in the Blockchain Network.
- Data provenance: The provenance of ingested data sets will be tracked using the Blockchain database, i.e. every change to a dataset is recorded in a tamper-proof manner.
- License/contract execution: Prototype implementation for a dataset/service access negotiation implemented in form of smart contracts.

- **Interfaces to other applications**

The Blockchain technology is going to be integrated into the open source data management application Conduit¹. Furthermore, it is integrated with the user/identity management in DMA.

- **Open Source and/or Standard Software**

Conduit integrates the functionality which is published as open source under the GNU3 license, and the *ethereum* framework which provides the required core functionality is published under the GPLv3 license.

Additional Note (on request by Compass): A private Blockchain will be used for internal clearing processes without any reference to real currency.

7.2.10.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

The implementation of Blockchain technology in DMA is regarded as a research task. It is a technology that has a great potential to improve transparency of transactions and operations around the dataset in the DMA, thereby increasing trust, and it can increase the efficiency of transactions required for dataset sharing. However, there are alternatives which can replace Blockchain technology in case it turns out not to be applicable.

7.2.10.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

There are no direct costs, however, the member node as a participant of the DMA contributes by providing resources (storage, computation, bandwidth) to the DMA.

7.2.10.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc)**
- **Maintenance**
- **Regular Updates**

Probably 30-50 Days for adjustments per Year.

¹ <https://gitlab.com/datamarket/conduit>

7.2.10.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- Costs for basic implementation
- Running costs

How does the provider think the DMA element can be financed after 2019:

The concept of using the Blockchain technology as a distributed network of participants allows sharing the running costs (storage, computation, bandwidth) between partners of the DMA.

7.2.10.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?

Basic module.

7.2.11 Long Term Preservation of Data and Data Citation (AIT, Task 5.3)

7.2.11.1 Value proposition

Scope of functions

The long term preservation and data citation functionality is provided as part of the data ingest pipeline processing framework named *Conduit*.¹ It is a backend for asynchronous task execution to perform data validation, transformation, quality enhancement and semantic enrichment operations. Regarding long term preservation it includes functions such as "bitstream preservation" (backup strategies), file format characterization, and data migration. Furthermore, the basic standards for persistent identification and citation are implemented. Conduit integrates Blockchain technology for *decentralized curation, preservation, provenance and security* of Data Assets.

Interfaces to other applications

Conduit relates to central platform functions, such as user management and billing and provides access to metadata for components, such as the Semantic Enrichment components developed by WP6 (task 6.3) and the matchmaking framework developed by WP7.

Open Source and/or Standard Software

Conduit is published as open source under the GNU3 license.

¹ <https://gitlab.com/datamarket/conduit>

7.2.11.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Conduit provides the ability to store and preserve data sets which is required in case the functionality for storing data sets is needed. Alternatives for dataset archiving exist.

7.2.11.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

The service is free of direct costs, but there are costs due to using resources (storage, compute, bandwidth).

7.2.11.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- Running human support (Hotline etc):
- Maintenance:
- Regular Updates:

There is no evidence supporting this kind of information so far.

7.2.11.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- Costs for basic implementation
- Running costs

How does the provider think the DMA element can be financed after 2019:

Every node in the DMA network decides if users are going to be charged for storing data sets or if resources are provided for free use (sharing the running costs (storage, computation, bandwidth) between partners of the DMA participants).

7.2.11.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

Basis Module.

7.2.12 Improving data Quality (DUK, Task 5.4)

7.2.12.1 Value proposition

Description of the application including

- **Scope of functions**

DUK will provide a prototype for a tool for assessing and for possible improvement regarding the data quality of a submitted dataset. This prototype enables manual assessment and possible improvement of data quality as well. The prototype can theoretically be used as a stand-alone application. The primary target within Task 5.4 is to include the prototype as a micro service into the registration process (see ingest processing pipeline D5.1 chapter 4.1, p.17 and chapter 5.2, p.33-34).

- **Business processes (where appropriate)**

n/a

- **Interfaces to other applications**

In order to reach this objective, the combination with the pre-requirements leading to the submission of the dataset and the provenance-tracking which will be provided via the Blockchain technology is necessary. As the main innovation is the ingest processing pipeline as a whole, DUK's contribution in the form of the prototype (or micro-service) cannot fulfil the requirements for the innovative ingest processing pipeline alone.

- **Open Source and/or Standard Software**

The micro-service is based on non-proprietary Open Software libraries and tools, ensuring compatibility with the technology stack of the DMA project.

(For a detailed technical description, please refer to D5.1)

7.2.12.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

The micro-service as one part of the ingestion pipeline is indispensable at least for Data Market Providers since the traversal of the ingestion pipeline is compulsive for every dataset before becoming available on the DMA as a Data Asset.

7.2.12.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

The micro-service is seen as a standard component offered by the DMA-Operator. Due to technological development, this micro-service will at a certain point of time be in need of maintenance. If the DMA-Operator maintains the service (e.g. through updating and/or extending data quality metrics and/or improvement algorithms), the Operator will very likely need to re-finance this work. One possibility for re-financing would be the DMA-Operator charging a fee for the use of the micro-service. Dependent on the number of Data Market Providers, this could take the shape of a regularly charged fee, which could be distributed along all Data Market Providers. Independent of the actual detailed solution, the maintenance costs should be determined in the contract between Data Market Provider and DMA-Operator.

7.2.12.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):**
- **Maintenance:**
- **Regular Updates:**

For technological development in the area of data quality, there could be made assumptions, but no serious estimation in terms of speed, necessary update-cycles, necessary qualification of used personnel and the Operators business model and available infrastructure.

As these unclear aspects are all factors influencing running costs, the latter cannot be expressed. Additionally, running costs cannot be derived from running costs caused by a comparable service, since this information is usually treated confidentially by enterprises.

7.2.12.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

In principle, everyone, who wants to know if his/her datasets correspond to certain (quality) standards could be interested in using the micro-service. First, persons, who aim at selling data could use standard conformity and quality assurance as argument. Second, areas, where data quality might be a critical factor as e.g. in health sector (missing information about allergies in a mandatory field in a form) or financial sector (incomplete transaction details), could be highly interested in the micro-service. Those groups could support the development/implementation of the micro-service financially.

The Operator could charge a maintenance-fee.

7.2.12.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

Highly relevant for the micro-service is its embedment in the ingestion pipeline, especially important are the components registration and semantic enrichment. For a detailed description regarding these elements, please refer to D5.1, chapter 4.1, p.17 and chapter 5.2, p.33-34. This does not apply for the micro-service seen as a stand-alone application.

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

Technology as well as description of the interfaces are based on industry standards, namely REST and OPEN API. REST is a standard interface and OPEN API is a standard description for this interface. All project partners involved in the technology stack agreed upon using these two standards for the

entire DMA platform, where applicable. There is no proprietary software involved, thus no additional license fees/costs apply.

7.2.13 Service API and Profile Creation Framework (JRS, Task 6.1)

7.2.13.1 Value proposition

Description of the application including

- **Scope of functions**
- **Business processes (where appropriate)**
- **Interfaces to other applications**
- **Open Source and/or Standard Software**

Task 6.1 provides 3 software building blocks:

- Service API editor
- API code generator
- API documentation generator

All modules run within containers and can be accessed via web interface.

The service API editor, based on OpenAPI Specification 3.0 (<https://github.com/OAI/OpenAPI-Specification>) which allows to create RESTful service APIs on the DMA site. The editor produces a machine-readable API definition file and a human-readable HTML version as well.

The machine-readable API definition file will be used as input for code generation (server- and client side code) for several prominent programming eco-systems.

Most important issue is API validation, as the API description must provide mandatory information, which will be forwarded to core DMA information services.

In order to allow browsing through existing APIs, the documentation generator provides means to layout API documentation in a uniform way (e.g. <https://developer.openstack.org/api-ref/baremetal/>)

7.2.13.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Standardised service API definitions are necessary to make

- Services on data
- Services on services (service interoperability)

possible. Although DMA users are encouraged to use their own tools creating service APIs definitions, they are not required to do so. Moreover, as validation of API definitions is indispensable, API definition and documentation is necessary, whereas code-generation lowers the psychological barrier for customers to join Data Market Austria, and hence is indispensable as well.

7.2.13.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

There might be a cost-free try-out possibility to learn about the DMA workflow on services, but creating a service within the DMA has to be paid.

7.2.13.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc)**
- **Maintenance**
- **Regular Updates**

From the technical point of view, Service API development has to be self-explaining. Some example code will be provided, but currently, no human support via hotline is foreseen.

Maintenance costs are in the first place related to bug fixing.

7.2.13.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

The software implementation is based on open source codes. So, without funding, running costs will be paid by DMA participants.

7.2.13.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

Central element for service API creation is the DMA Broker Service, as it collects information about existing APIs. Its interface conforms to the DMA service metadata standard.

Service APIs have to store in databases, so the DMA storage component is needed as well.

7.2.14 Novel Approaches to Large Scale Data Analysis (JRS, Task

7.2.14.1 Value proposition

Description of the application including

- **Scope of functions**
- **Business processes (where appropriate)**
- **Interfaces to other applications**

- **Open Source and/or Standard Software**

To develop services in a toolbox for environment (change detection, forest resilience, rockfall) which tackles some key issues of forestry and disaster management:

The overall goals of the shared TAXI ride services are: efficient allocation of trip orders, high utilization of transport personnel and their vehicles, as well as minimization of transport routes. Overall this will lead to considerable cost savings. Finally, short waiting times for transported TAXI customers increase the satisfaction of customers and service users. The algorithm is part of an application.

7.2.14.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

Only forest users need these type of services in their applications and its use is case dependent. From the point of view of the forest service cannot be substituted as remote sensing is the only source of information capable to deliver wall to wall information on the forest parameters requested by the end-users.

The mobility service shared ride is relevant for the disposition process. The core of such a service is a specific algorithm. This algorithm can be substituted by different implementations.

7.2.14.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

No. Costs have to be defined with final applications and business cases.

7.2.14.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

7.2.14.4.1 Domain environment/forest:

- **Running human support (Hotline etc):** on-demand and application dependent (demanded accuracy level, number of forest parameters, scale of application, data to be used)
- **Maintenance:** on-demand and application dependent (demanded accuracy level, number of forest parameters, scale of application, data to be used)
- **Regular Updates:** on-demand and application dependent (demanded accuracy level, number of forest parameters, scale of application, data to be used)

7.2.14.4.1.1 Domain mobility

- **Running human support (Hotline etc):** on-demand and application dependent
- **Maintenance:** on-demand and application dependent – a service is part of a set of services
- **Regular Updates:** on-demand and application dependent

7.2.14.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

On-demand and dependent on the parameters defined by the user and application dependent (demanded accuracy level, number of forest parameters, scale of application, data to be used).

Depending on the application provider - abo based or fixed price software licence.

7.2.14.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

There is a link to the functional elements of the data management system EODC. Standardised interfaces are foreseen for the applications of WP9 at the end of the project. For space applications JRS will implement and bear the costs.

All technical services (algorithms) integrated in the larger application. DMA can be a hosting platform or DMA can have a broker (human way) to sell the technical services.

7.2.15 Semantic Enrichment and Linking of Data (SWC, Task 6.3)

7.2.15.1 Value proposition

- **Scope of functions:**
The semantic enrichment and linking of data tasks will provide the metadata layer of DMA including interfaces to data quality checks and improvements, to the Blockchain, to data identification services (data acquisition and harvesting) as well as it is the basis for search and matchmaking / recommendation in DMA (basic services). Furthermore we plan to realise a tagging / annotation (maybe also classification) service as generic service provided in DMA.
- **Business processes (where appropriate)**
N.a.
- **Interfaces to other applications**
 - Data acquisition and harvesting
 - Thereby to: data ingestion and data identification services
 - Furthermore to data quality checks and improvement services
 - And it's the basis for recommender / search and matchmaking features in DMA base services

- **Open Source and/or Standard Software**

This is all standard software (PoolParty Semantic Suite);

7.2.15.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

As the metadata layer is a core element of DMA without no data nothing can be searched / found and no matchmaking / recommender can work – this is an indispensable element of DMA.

Remark: the tagging and annotation service mentioned above is not!

7.2.15.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

The basic DMA metadata layer should be cost free BUT needs to be a part of DMA basic services that needs to be put into calculations of DMA operation and thereby into a price for users offering data and / or services via DMA on a commercial basis.

The additional tagging / annotation service will be a commercial service offered with a service fee to use.

7.2.15.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):**
Technical hotline
- **Maintenance:**
Updates & upgrades of PoolParty Semantic Suite
- **Regular Updates:**
see maintenance above

7.2.15.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
Parts via the DMA project; nevertheless a PoolParty license for the DMO should be discussed for the time after the FFG project.
The additional tagging and annotation service will be partly financed by the FFG project and additionally by SWC itself as an investment to provide such service afterwards.
- **Running costs**
For the metadata layer through fees of DMA.
For the add. service (tagging / annotation) via direct fees by DMA participants.

How does the provider think the DMA element can be financed after 2019:

Metadata layer: via running income of data and service providers (that pay fees to use DMA and/or the customers that pay fees for data and services and a part of this needs to be used as DMA basic service fee).

Additional Tagging Service: as commercial service directly by DMA participants.

7.2.15.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element (where appropriate use functional chart)?

See 7.2.15.1, Value proposition – interfaces.

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

Implementation will follow DMA guidelines (Docker et al).

7.2.16Analysing and Fusing Distributed Data with Differing Access Levels (DUK, Task 6.4)

7.2.16.1 Value proposition

- **Scope of functions**

DUK will provide a prototype for a “once-only download” capability, which enables providers to sell their data in a way that once it has been downloaded, no further download is possible with the same “voucher token”. Furthermore, a functionality to split and offer different parts of one large data set will be developed, without the necessity for the provider to generate different datasets for each part separately. Finally, a connector will be developed, which allows for the interconnection of externally-hosted data to be available within DMA. For a detailed description, please refer to D6.1, chapter 5.4 regarding Task 6.4.

- **Business processes (where appropriate)**

n/a.

- **Interfaces to other applications**

In order to reach this objective, the combination with the pre-requirements leading to the submission of the dataset and the provenance-tracking, which will be provided via the Blockchain technology, is necessary. As the main innovation is the ingest processing pipeline as a whole, DUK’s contribution in the form of the prototype (or micro-service) cannot fulfil the requirements for the innovative ingest processing pipeline alone.

- **Open Source and/or Standard Software**

The prototypes are based on non-proprietary Open Software libraries and tools, ensuring compatibility with the technology stack of the DMA project.

(For a detailed technical description of the planned approach, please refer to D6.1)

7.2.16.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives?

The provision of a “once-only download” capability as well as the dynamic segmentation functionality regarding the splitting of high-value, high volume datasets are not necessarily critical to all users of DMA. The same goes for the external hosting of data. However, in order to provide a high level of sustainability, these services will play an important role to address a large variety of user groups and therefore attract as many potential contract partners as possible.

7.2.16.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

The micro-service is seen as a standard component offered by the DMA-Operator. Due to technological development, this micro-service will at a certain point of time be in need of maintenance. If the DMA-Operator maintains the service (e.g. through updating and/or extending data quality metrics and/or improvement algorithms), the Operator will very likely need to re-finance this work. One possibility for re-financing would be the DMA-Operator charging a fee for the use of the micro-service. Dependent on the number of Data Market Providers, this could take the shape of a regularly charged fee, which could be distributed along all Data Market Providers. Independent of the actual detailed solution, the maintenance costs should be determined in the contract between Data Market Provider and DMA-Operator.

7.2.16.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):**
- **Maintenance:**
- **Regular Updates:**

For technological development in the area of added-value/connection services, there could be made assumptions, but no serious estimation in terms of speed, necessary update-cycles, necessary qualification of used personnel and the Operators business model and available infrastructure. As these unclear aspects are all factors influencing running costs, the latter cannot be expressed. Additionally, running costs cannot be derived from running costs caused by a comparable service, since this information is usually treated confidentially by enterprises.

7.2.16.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

One potential interest group could be providers, which are specialized in one-time, single transaction offers regarding their data. Furthermore, data providers in general could be interested in the

segmentation services as this reduces the necessity to manually split and provide one large dataset alongside n-versions in a smaller scale at the same time, which reduces data management costs significantly.

The Operator could charge a maintenance-fee, see question 7.2.16.4.

7.2.16.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element (where appropriate use functional chart)?

Highly relevant for the micro-service is its embedment in the ingestion pipeline, be it as input for the pipeline or as additional feature to be added. For a detailed description regarding these elements, please refer to D5.1, chapter 4.1, p.17 and chapter 5.2, p.33-34.

Does the provider implement standardised interfaces to those adjoining DMA elements or others? Who does, who bears the costs?

Technology as well as description of the interfaces are based on industry standards, namely REST and OPEN API. REST is a standard interface and OPEN API is a standard description for this interface. All project partners involved in the technology stack agreed upon using these two standards for the entire DMA platform, where applicable. There is no proprietary software involved, thus no additional license fees/costs apply.

7.2.17 Matchmaking framework (KOW CENTER, Task 7.1)

7.2.17.1 Value proposition

- **Scope of functions**
- **Business processes (where appropriate)**
- **Interfaces to other applications**
- **Open Source and/or Standard Software**

Know-Center is working on a recommender system to be part of the DMA core. Task 7.1 focuses on collecting meta data from the DMA framework (e.g. datasets, services and customers) to calculate the recommendations. Information extraction algorithms transform these data into a representation interpretable by the recommender. At this point, the data is handed over to Task 7.2 and the recommender core.

Further reading: Deliverable D7.1

M. Traub et al. (2017). Data Market Austria: Austria's First Digital Ecosystem for Data, Businesses, and Innovation. In Proceedings of 2nd International Conference on New Business Models. Graz, Austria. pp. 353-363.

7.2.17.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives? Or according to the respective requirements in each case optional?

The data pre-processing and information extraction is an integral part of the recommender. The recommender requires it to generate its data bases.

7.2.17.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

This DMA element is a pre-requisite and thus integral part of the recommender (see Task 7.2), therefore see 7.2.18.3 for the answer.

7.2.17.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc)**
- **Maintenance**
- **Regular Updates**

This DMA element is a pre-requisite and thus integral part of the recommender (see Task 7.2), therefore see 7.2.18.5 for the answer.

7.2.17.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

This DMA element is a pre-requisite and thus integral part of the recommender (see Task 7.2), therefore see chapter 7.2.18.5 for the answer.

7.2.17.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element? If appropriate create functional chart.

Does the provider implement standardised interfaces to those adjoining DMA elements or others? Who does, who bears the costs?

Since the data pre-processing and information extraction developed in Task 7.1 connects the recommender with its data sources, it is a vital requirement for the recommender to work. Arguably, the actual value generation is part of the recommender and the collaboration solutions generated by it. Nevertheless, Task 7.1 is an absolute requirement for the recommender to work. Task 7.1 will use the interfaces provided by work package 4, 5, and 6 to collect the required input data.

7.2.18 User and corporate profiles and brokerage KNOW (T. 7.2)

7.2.18.1 Value proposition

The recommender developed in Task 7.2 will provide DMA users with suggestions for possible collaborations helping them to find the products (i.e. data sets and services) and business partners they need. For example, data providers will be recommended potential services capable of working with their data. The recommender will provide personalised suggestions tailored for each user individually. While the Data Market Customers are interested in collaborations to find new customers for their data-centric services or vice versa, professional brokers need the recommender to keep informed about the fast changing and new offers. The technical foundation for the recommender is ScaR, a scalable recommender framework developed by Know-Center (<http://scar.know-center.tugraz.at/>).

Further reading: Lacic, E., Traub, M., Kowald, D., & Lex, E. *ScaR: Towards a Real-Time Recommender Framework Following the Microservices Architecture*. Workshop on Large Scale Recommender Systems (LSRS'2015) co-located with the 9th ACM Conference on Recommender Systems (RecSys'2015)

7.2.18.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives? Or according to the respective requirements in each case optional?

A flourishing trading platform needs a large amount and variety on offers. But customers find it difficult to navigate through a large offer and find the right product for their needs. The recommender should assist them in this regard. The recommender should provide personalised suggestions for potential collaborations. The personalisation is the key to provide the correct recommendations tailored for each user. Other search and recommendation services, like Google Search or Microsoft Bing, do not have the same high quality data basis as the proposed recommender since they do not have access to the results of Task 7.2. A non-automated recommender - that is a human expert that acts as a recommending broker - might be thinkable but only for the recommendation of only very few specific data sets and services, respectively. However, for a trading platform that is offering very many products on the one side and handling very many customers on the other side, a machine-based recommender is indispensable to conquer the expected amount of data. Furthermore, due to the personalisation and self-adaptivity of the recommender, human brokers can use it as a tool to monitor offers on DMA.

7.2.18.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

This element represents an intrinsic part of the Data Market Austria platform and shouldn't be charged additionally.

7.2.18.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** n.a.
- **Maintenance:** 1 person days / month
- **Regular Updates:** 4 person days / month

The recommender service is an important part of the platform, however it is non critical. That is the platform will remain operational even if the recommender service is temporarily out of order if the design of the platform can handle its absence. Thus support and maintenance effort can be kept low. The effort for regular updates depends how quick the DMA product portfolio (in terms of data sets and services) is growing. New data sets and services that do not follow the meta data specifications will require adaptations of the matchmaking and later the recommender.

7.2.18.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

Since the recommender is based on an already existing framework which is used and developed further in other research and industry projects, it might be co-financed by these projects. However, the functionality of the recommender will be then probably limited.

How does the provider think the DMA element can be financed after 2019:

For each transaction (e.g. service purchased, data set purchased), a transaction fee, commission or similar shall be charged. Additionally, a basic fee could be paid by each data set and service provider in order to place/trade their products on the platform. A small percentage of these fees can be used for financing this matchmaking and recommendation service.

7.2.18.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element? If appropriate create functional chart.

Does the provider implement standardised interfaces to those adjoining DMA elements or others? Who does, who bears the costs?

The recommendation service is a central player in creating the value chains in DMA. The provided recommendations can be seen as an enabler, pointing and highlighting possible collaborations not foreseen by humans. While all input data is coming from Task 7.1, Task 7.2 will provide its recommendation mainly on the DMA web portal developed in work package 4. Task 7.2 will make extensive use of open interfaces following well-established patterns to enable third-party services to also receive its recommendations.

7.2.19 Tools for service assessment RSA (Task 7.3)

7.2.19.1 Value proposition

Description of the application including

- **Scope of functions**

The functions created in this task evaluate, particularly from the point of view of effectiveness, other services available in the data market. For instance, a classification service can be tested against an existing dataset, with known classes, in order to understand how effective it is in detecting the classes associated with the data.

- **Business processes (where appropriate)**

The potential user (DMA participants) of a service wants to know how well the service works on a test collection. He or she may use an existing collection, or upload a new one (using Task 5.1). He or she uses the service to obtain a value for an evaluation measure (e.g. precision, accuracy, recall) to assist him or her in deciding whether to use one system or another.

The same may be done by the service owners themselves, before publishing their services to the public.

- **Interfaces to other applications**

The evaluation service is, as other services, available via the Portal.

- **Open Source and/or Standard Software**

In addition to the usual Docker containers, this task uses the `trec_eval` open source software https://github.com/usnistgov/trec_eval released without an explicit license, as well as various Python libraries.

7.2.19.2 Substitutability

Is this DMA element indispensable for every DMA User or are there alternatives? Or according to the respective requirements in each case optional?

There are alternatives to this evaluation. Such an evaluation can potentially be done outside of the tools provided by DMA. It is here as a facility to potential clients (DMA participants) of services to understand how well they work on known datasets.

7.2.19.3 Cost-free basic Service?

Is the DMA element part of a Cost free offer to DMA users?

Not necessarily.

7.2.19.4 Running costs

Beside the development costs for the DMA element- the following running costs have to be taken into account:

- **Running human support (Hotline etc):** not foreseen
- **Maintenance:** as part of regular updates
- **Regular Updates:** not foreseen, but potentially useful

7.2.19.5 Basic business model by provider

In an ecosystem without any funding- how does the provider think the DMA element could be financed?

- **Costs for basic implementation**
- **Running costs**

How does the provider think the DMA element can be financed after 2019:

As a consulting service, perhaps also as a certification service.

7.2.19.6 Position within the DMA value chain

As all DMA elements are part of a value chain which one are the most likely chain links (other elements) adjoining the DMA element?

**Does the provider implement standardised interfaces to those adjoining DMA elements or others?
Who does, who bears the costs?**

Basic data services (e.g. ranking, classification, clustering) can all be evaluated against existing test collections. The DMA Data-/Service Provider will implement and document APIs such that owners of any of these services may use them to assess the effectiveness of their services, for themselves, and as proofs for others.

7.3 Summary

The first very basic elicitation of running costs only in IT operations resulted in the finding, that nearly every service planned and included in the DMA should be financed directly by the DMA according to the consortium partners. This should be done either on a transaction basis or on a flat fee basis. That leads to the apprehension, that the DMA will be burdened by heavy overheads from the very beginning. The consortium partners did not give any details about costs in Euro but just expressed their vague estimations.

COST ALLOCATING	WP	SUPPORT	MAINT	CONSULT
IT-OPERATION				
Data				
Pilot I: Mobility - Taxi Demand Heatmap (SWC, ZAMG, t-Mobile, ...)	WP8			
Pilot II: Earth Observation WP9 - Forestry Services (SWC, t-Mobile, ZAMG, EODC, JRS,...)	WP9			
Data Aquisition and provision - API's for meteorological data usage	WP4/T 4.4	x	x	
Semantic Enrichment and Linking of Data	WP6/T 6.3			
Billing and Services				
Billing for Data, Service and Infrastructure	WP4/T 4.1	UNCLEAR		
Basis				
Basic Infrastructure Services DMA Portal	WP4/T 4.6		x	
User Authentication and Management	WP4/T 4.1		x	
Virtual Machine Administration	WP4/T 4.1		x	
Service Provision	WP4/T 4.3		x	
Data API and Profile Creation Framework	WP5/T 5.1		x	
Tools for Service Assessment	WP7/T 7.3		-	x
Blockchains for Security and Provenance	WP5/T 5.2		x	40 MD/y
Long Term Preservation of Data and Data Citation	WP5/T 5.3	-	-	
Service API and Profile Creation Framework	WP6/T 6.1		x	
Novel Approaches to Large Scale Data Analysis	WP6/T 6.2		x	x
Matchmaking Framework	WP7/T 7.1		x	
User and Corporate Profiles and Brokerage	WP7/T 7.2	1 MD/m	4 MD/m	
Improving Data Quality	WP5/T 5.4	UNCLEAR		
Analysing and Fusing Distributed Data with Differing Access Levels	WP6/T 6.4		x	
Developer Assistance for distributed clouds	WP4/T 4.2		x	
Cloud Interoperability				
Earth Observation Data / Service Provisioning for Pilot II	WP9			

To further develop the business model a much more detailed costs estimate must be provided by all partners. Only then a final position can be taken how the DMA can be run in a sustainable way.