e-shape

EuroGEOSS Showcases: Applications Powered by Europe

e-shape-WP2-D2.3 (Report on the experiments and feedbacks for e-shape co-design)

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ABSTRACT

This deliverable presents an updated co-design model adapted to e-shape. Our first investigations, reported in previous deliverables, highlighted that this co-design process should involve two phases: (1) a critical "diagnosis process" to identify the co-design needs (i.e. actors to be involved and problems to be addressed) based on a well-codified analysis grid, (2) the implementation of co-design actions. In the present deliverable, the outcomes of the experimentations on the "diagnosis process" for all e-shape pilots are presented. Based on these results, the analysis grid of the "diagnosis process" has been refined, especially with the classification of co-design needs in four co-design types. A new understanding of co-design objective seems to emerge, not only focusing on designing services to be provided in a transactional mode, but rather on designing the cooperation conventions between the different actors, in order to ensure an intertwined and long-term development of research topics and a range of services based on these scientific advances.

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1 INTRODUCTION

Earth Observation (EO) data has the potential to provide significant benefits to a large variety of socio-economic stakeholders: research communities, but also public authorities, private companies, academia, citizens. **However, EO data, and to a certain extent derived services, remain largely underutilised.** Indeed, developing services based on this type of data might be perceived as particularly challenging, because of:

- The **high level of technical expertise** needed, combining both knowledge on data processing and knowledge on the domain of the final usage;
- The **heterogeneity of the actors to be involved** for the successful development of user-centric services, that are not only users but potentially all other actors of the ecosystem (researchers for modelling, platform owners, IT developers, regulation authorities etc.).

"Co-design" precisely aims at managing these specific issues to develop user-centric EO-based services, and support their evolution in a long-term perspective. Generally speaking, co-design can be defined as a collective design process involving heterogeneous actors. Various methods of co-design can be found in literature, however their relevance in EO context is not guaranteed and needs to be further examined, as highlighted in previous D2.1 and D2.2 deliverables (Barbier et al. 2019a, Barbier et al. 2019b). Therefore, in e-shape, a specific approach is followed: a co-design model taking into account EO specificities is progressively designed and tested within the project, based on recent advances of design theory. This model is then used to assess the relevance and the area of validity of the different methods and tools that could support the co-design process. Based on this assessment, the set of methods adapted to e-shape co-design is built by different means: (1) reusing existing methods if assessed as valid for EO context, (2) modifying some others to make them well-suited to EO context, or (3) creating new original methods.

The D2.1 and D2.2 deliverables especially highlighted that a co-design model adapted to EO context should involve two distinct phases: (1) a critical "diagnosis process" to identify the co-design needs (i.e. actors to be involved and problems to be addressed) based on an well-codified analysis grid, (2) the implementation of co-design actions. This deliverable aims at presenting the status and results of the first phase of "diagnosis process" experimented for all e-shape pilots (partially or fully completed depending on the pilot). Based on these results, the co-design model adapted to EO context is updated and enhanced.

The following document is organized as follows: a first section synthesizes the co-design process as presented in the deliverables D2.1 and D2.2. A second section details the lessons learned from the implementation of "diagnosis process" for all e-shape pilots and how the analysis grid of this process is refined accordingly. A last part concludes on the role of co-design in the long-term development of the EO-based services ecosystem and next steps to be carried out in e-shape.

2 SYNTHESIS OF CO-DESIGN MODEL AS PRESENTED IN PREVIOUS DELIVERABLES

2.1 Main principles

2.1.1 Importance of a first phase of "diagnosis process" to identify the co-design needs

In the EO context, two main challenges were mentioned above: the high level of diverse technical expertise and the high heterogeneity of actors to be involved. Consequently, the user and the service provider cannot be reduced to single actors but need to be described as two complex ecosystems:

- **The service provider's ecosystem**, including the actors in charge of: operating and maintaining the services, commercializing them in some cases, building the scientific models to transform data into information, providing required IT infrastructures, etc. One or several actors can be

in charge of these different aspects, depending on the context and their respective capacities, resources, and organizations.
- **The user's ecosystem**, including first-tier "service users" (users directly interacting with the service provider), that can possibly develop their services for their own users, and so on, up to the "final users"; and all the other stakeholders interacting with these successive users.

In usual co-design approaches aiming at developing a service for certain users, there is an implicit diagnosis of the co-design needs: it mainly focuses on involving these users in the design of the service in order to finetune the list of requirements and make sure it is well-suited to the user's specific context. In EO context, **many more configurations of co-design might exist, involving some of the actors of these two ecosystems**. It is interesting to note that, depending on the status of the service development, co-design might not concern the service user and the service operator but other stakeholders of the ecosystem (for instance focusing on improving the interaction between scientific model builders and IT developers). Therefore, **the identification of co-design needs in EO context requires the codification of a systemic and thorough "diagnosis process"**. To be noted that existing co-design methods might also include a "diagnosis process" (identifying the tools best-suited to each situation), however the specificities of EO context call for creating a well-codified analytical framework adapted to the development of EO-based services. This leads to the first general principle:

General principle #1: ***Co-design adapted to EO context will need to include a first phase of "diagnosis process", based on a well-codified analytical framework, to identify the co-design needs, i.e. "with who and for what purpose" co-design actions might be relevant.***

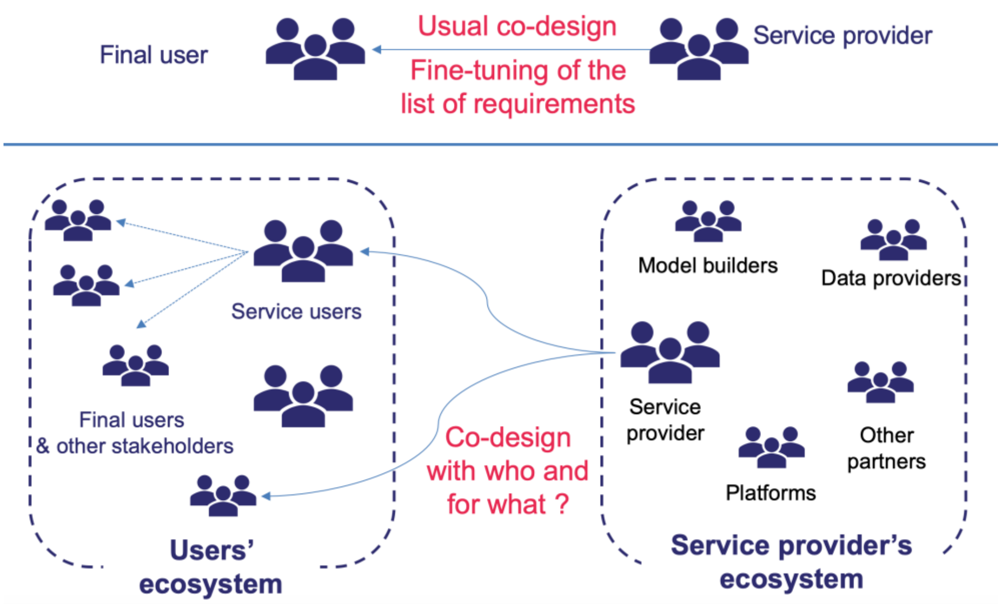

Figure 1: Comparison of settings for co-design: most common context (upper part), and EO context (lower part)

2.1.2 From a "service provider" perspective to a "design environment provider" perspective

The notion of "design environment" was introduced in D2.2 deliverable (Barbier et al. 2019b). In a co-design perspective, the actors taking part in the process are put in a **designer** position, as they are involved in the development phase of the service. Indeed, the features of the service and its possible usages are still to be designed. Two extreme configurations were highlighted in D2.2 deliverable:

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- ***Extreme configuration #1 - there is a buyer-seller relationship between the pilot's members and the users***: *the pilot's members develop ready-to-use and turn-key services to users that* *are only in a buyer position. In this situation, for each new user, the pilot's members are expected to make all necessary modifications on the existing services (or even build completely new ones) to address the specificities of this new demand. Thus, in a long-term perspective, this configuration might be overwhelming for the pilot's members if they want to address a growing number of users (that might be in the same field or market segment, or even in new fields or markets requiring even more modifications to adapt to their specificities).*

- ***Extreme configuration #2 - the user is able to design the service on its own, that is [building the relationships between its needs, related relevant information, and EO data], […]****. This situation is unlikely to occur very often. Indeed as highlighted in D2.1 deliverable, there is a significant distance between data and value because of the high level and heterogeneity of expertise related to the usage domain and the data processing chains. Moreover, even if the user decides to focus its investments and efforts on building a first data-information-usage chain, it will keep evolving over time, in order to take into account the external advances on data or usage sides. Therefore, the level of investments and efforts might be too overwhelming for a user in a long-term perspective. […]*

In between these two extreme configurations, there is a broad range of configurations of respective involvements of pilot's members and users in the service design process, where ***both pilot's members and users are in a designer position.*** *These in-between configurations seem to be the most sustainable ones in a long term perspective, both from the pilot's and from the user's points of view. The objective is then to describe what is the nature of the interaction between the pilot's members and the users to jointly design services, when they are both in a designer position. More specifically in e-shape context, the interaction is described from the point of view of the pilots' members, as the latter cannot control - but only influence - how users interact with them.* ***The way pilots' members interact with users can be described as providing users with a set of elements to support a shared development of the service [and its usages].*** *This set of elements is labelled* ***"design environment"*** *to make a parallel with the notion of "development environment" in computer science, that refers to a collection of procedures and tools helping developers to build, test and debug applications or programs. "*

2.1.2.1 Dimensions that might be involved to build an adapted "design environment"

The elements to be integrated in this "design environment" are highly dependent on users' know-how, competencies and possible needs. **For the pilot, creating this "design environment" takes the form of a long-term supporting role, involving several types of actions**. Based on the analysis of e-shape pilots, three main types of actions were proposed in D2.2 deliverable and are briefly synthesized below (see Barbier et al 2019b. for further details):

1. **"Ecosystem's capability" action: i.e. building an ecosystem of skilled users that are able to handle EO-based services and take part in their development.** To build this ecosystem, many different approaches might be considered, such as:
    a. *Building supporting tools/toolkits adapted to each user,* to bridge the gap between the users' skills and usual working usages and the expertise needed to use/build innovative services;
    b. *Improving the skills of the users by training them*, so that they are able to use the service developed by the pilot, and take part in the present and future development of EO-based services;
    c. *Working on the structure of the ecosystem*, possibly by identifying intermediary users with higher skills, and in a longer term perspective by building interactions with these actors to ensure a continuous evolution of both users' and pilot's skills**.**
2. **"Norm" action: i.e. establishing the legitimacy of the services, by meeting or creating norms.** The objective is to build a **shared reference system - in which the service, its properties and advantages are understandable and acknowledged by potential users.** It might involve:

   a. *Expressing EO-based information in a shareable and understandable language* for a community (for ex by implementing standards related to the type of information or exchange protocols)
   b. *Ensuring that potential users are able to see the advantages brought by the proposed service and acknowledge its legitimacy* (for ex development of adapted performance indicators or best practices, possibly to be validated by specific authorities)
3. **"Promise" action: i.e. enhancing the underlying promise brought by the services in a long-term perspective.** The objective is to **stimulate the interests of the actors to have them join the development efforts in the long run.** It might involve working on the content of this promise (suggesting perspectives opened by current but also future services in an evocative way), the way to showcase it (using demonstrators, or other means), and making it evolve over time.

It is important to note that the level of efforts to build such design environment is highly dependent on the considered user, its competencies, resources, willingness to take part in the long-term advances. As suggested by the variety of actions to be considered**, this "design environment" might require large resources to be built**, and thus needs to be carefully taken into account when considering the expansion of EO-based services. There is indeed an issue to identify the good enrichment level of this "design environment", to ensure that:

- **Information could effectively be integrated** in the user's operational workflows (either existing or future) ;
- **But the costs and efforts of building this design environment are not overwhelming for the service provider**, especially in a long-term perspective with possibly multiple users to be addressed.

Furthermore, different actors will need to be involved to build this "design environment", both data providers and users, and possibly external actors (standardization bodies for example). Therefore, the respective roles of these actors and their interactions will need to be closely examined.

A second general principle for a co-design adapted to EO context could be therefore formulated as follows:

***General principle #2:* Building EO-based services calls for a shift from a "service provision" perspective to a "design environment perspective", thus moving from a one-shot transactional mindset to a long-term relational mindset. Co-design process will help define and build the sets of elements to be integrated in this "design environment", the respective roles of the actors in this process, and the forms of the interactions between these actors.**

It is interesting to note that describing **the "service provider" as a "design environment provider", with a long-term supporting role** also suggests a new understanding of co-design. It should not only ensure a collective design of the product itself, but rather **the design of a cooperation convention**. This point will be further elaborated in the next stages of the project.

The following paragraph will precise the co-design process that has been constructed based on these two general principles.

2.2 Co-design process

As mentioned above in *General principle #1*, there is a need for a first phase of in-depth diagnosis process to identify co-design needs. Thus, the e-shape co-design introduces two distinct phases:

1. **Phase 1: a diagnosis process to identify the co-design needs and the actors to be involved;**
2. **Phase 2: the implementation of co-design actions based on this diagnosis**.

2.2.1 Phase 1: Diagnosis process

A specific process has been designed for this first phase and is detailed in D2.2 deliverable (Barbier et al. 2019b).

To support the diagnosis process, specific tools have been created and used. More specifically, an analytical framework has been set up, representing the "data journey" from data to information, up to usages, and the actors involved in the different transformation processes. In this framework, the development of EO-based services can be seen as building relationships between data, information and usages. In the context of e-shape, each pilot builds upon existing services, involving at least one final user (i.e. a specific usage) and aims at expanding these services (the expansion might concern the different elements of the data-information-usage chain, for example it can involve expanding the number of users, but also increasing the geographical coverage, or improving the scientific algorithms, etc.). Therefore, **the proposed analytical framework is used to represent (1) the initial state of each pilot** (when starting the co-design process) as an existing data-information-usage relationship (see Figure 3), and **(2) the pilot's targeted state** as broader and more robust data-information-usages relationships, thanks to the intertwined expansion of the constitutive elements of the service – data, information, usages, function "f" linking data and information, function "g" linking information and usage (see Figure 4). Design efforts can be then located directly on these frameworks.

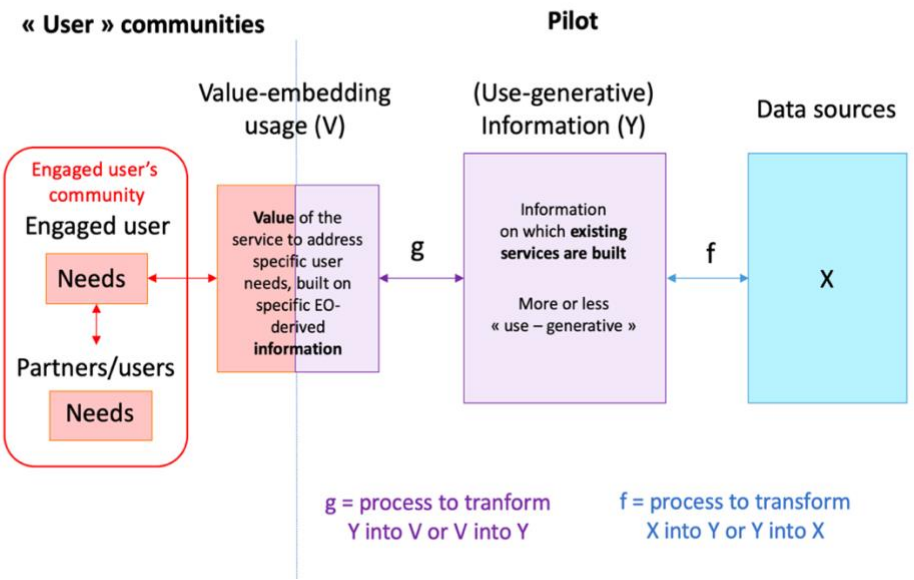

Figure 2: Representation of the "data journey" for the <u>initial state</u> based on the data-information-usage framework: data (in blue), information (in purple), usage (in purple-red), function "f" linking data and information, function "g" linking information and usage, addressing a certain users' community (in red).

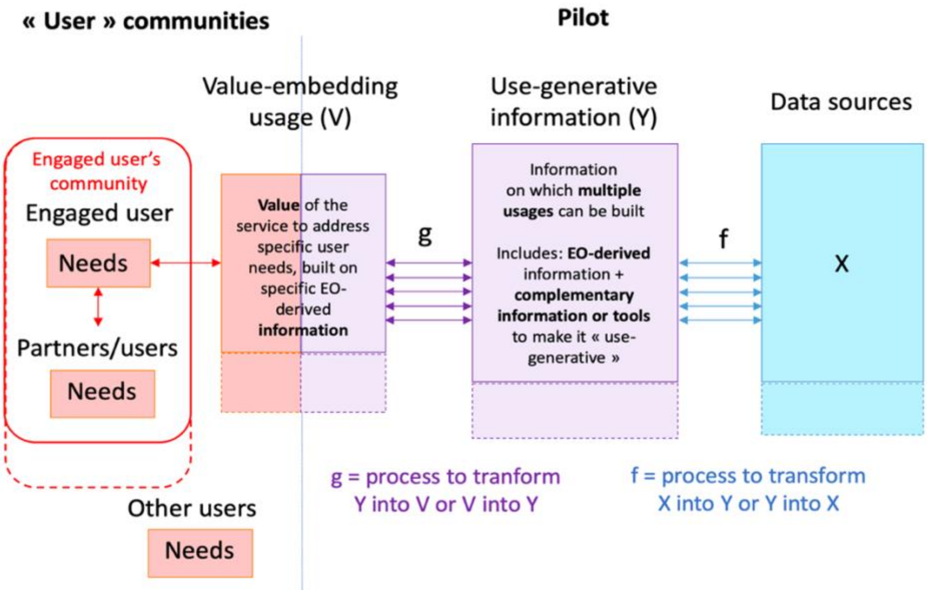

Figure 3: Representation of the "data journey" for the <u>targeted state</u> based on the data-information-usage framework: data (in blue), information (in purple), usage (in purple-red), function "f" linking data and information, function "g" linking information and usage are the different constitutive elements of the service, addressing a certain users' community (in red)

The diagnosis process has been detailed in six different steps as follows (Barbier et al 2019b):

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1. *<u>Step1:</u> **The data-information-usage framework is used as a tool to represent the situation of each e-shape pilot**. A first version is drawn, only based on existing documents already filled by the pilots. Initial and targeted states tend to be mixed up in these documents, thus they are not distinguished yet at this phase of the process. Based on the framework, the conditions needed for a sustainable development of services are examined, and blocking or unclear elements are identified.*
2. *<u>Step 2:</u> Through Confluence, this **framework is then shared with each pilot.** Specific questions are raised based on the identified blocking or unclear elements. As an illustrative example questions addressed to Showcase 3 – Pilot 2 are presented in Annex 2.*
3. *<u>Step 3:</u> These **questions are expected to be answered by the pilot** on Confluence as far as possible.*
4. *<u>Step 4:</u> A **telco discussion is then organized with the pilot leader** to clarify the elements remaining unclear and further expand on the characterization of the future users' ecosystem, through a story-telling exercise where the pilot leader is asked to take the user's point of view and imagine the sequence of actions conducted by the user to implement the service provided by its pilot.*
5. *<u>Step 5:</u> Thanks to these clarifications, the pilot framework is updated and divided into two distinct frameworks - one for the initial state and one for the targeted state (as shown in Figures 1 & 2) and each framework is accompanied with a **comparison of the users' characterization and the "design environment" provided by the pilot's members.***
6. *<u>Step 6:</u> **Co-design needs** are then identified based on these considerations. »*

2.2.2 Phase 2: Implementation of co-design actions

Based on this diagnosis, co-design actions are then implemented. Their forms will be adapted to the identified co-design needs and will involve specific tools and workshops, based on our recent works in design theory and possibly other existing methods in literature. These different forms will be progressively investigated and tested through the experimentations carried out with e-shape pilots.

3 UPDATED E-SHAPE CO-DESIGN MODEL: IMPLEMENTATION AND ENRICHMENT OF DIAGNOSIS PROCESS

3.1 Status of co-design implementation for e-shape

In the last months, WP2 work has largely focused on implementing **the first phase of "diagnosis process"** for all e-shape pilots. The process in six steps presented above can be further summarized in three main stages:

- **Stage 1: Pre-diagnosis** (steps 1 to 3): first analysis of co-design needs made by WP2 based on analytical frameworks and written answers of the pilots ;
- **Stage 2: Telco with pilot** (step 4) – discussion of the pre-diagnosis made by WP2 ;
- **Stage 3: Diagnosis** (steps 5 & 6) – analysis of co-design needs updated based on discussion outcomes.

The status of the "diagnosis process" differs from one pilot to another and is presented in *Annex 1.* Our analysis is either a pre-diagnosis of co-design needs (if telco has not been carried out yet) or a diagnosis of co-design needs (if telco has already been carried out). These different levels of analysis are illustrated in *Annex 2* on the example of a pilot that has already completed the whole diagnosis process. The analyses for all pilots have been compiled in a separate document.

These last advances have enabled us to test the relevance of this diagnosis process and further enrich the analysis grid used in this process. More specifically, the main outcomes are:

- Learnings on the process itself ;
- For the characterization of the customization tools to be developed in addition to information (part of the "ecosystem's capability" dimension of the "design environment"), introduction of a typology of systems describing different levels of customization ;
- And more importantly, for a simpler diagnosis of co-design needs, the introduction of a typology of co-design needs based on the analysis of e-shape pilots.

3.2 Learnings on the process itself

3.2.1 How the process unfolds

The telco with the pilot appears to have a strong influence on the conclusions of the diagnosis process. Indeed, this diagnosis highly depends on the history of the pilot, the status of the relationships between the pilot and the users and the capacities of these users. These elements are particularly difficult to assess with a single questionnaire. Consequently, **the objective and format of the "pre-diagnosis" have been further specified. The objective is not to make a definite judgement of co-design needs, that would only need to be validated by the pilot. But the "pre-diagnosis" should rather be considered as a preparation for the discussion with the pilot, highlighting WP2 assumptions** based on the available sources of information, the co-design needs that might occur given these assumptions, and the questions to be raised during telco to discuss these assumptions. This analysis especially covers the following aspects:

- *Users' ecosystem:* global vision of the users' ecosystem, including the history and the structure of this ecosystem (links between actors, underlying rules and regulations, etc.) and the entry points of the pilot in this ecosystem.
- *Types of systems to be developed by the pilot:* given a certain identified use case EO-based information is expected to be integrated with a certain sets of supporting elements (customization tools mentioned above). A typology of a few recurrent systems is detailed next paragraph.
- *User's competencies:* for each actor identified as entry point in the users' ecosystem, the following elements need to be addressed: the existing tools these actors already use in their day-to-day operations, their ability to transform EO-based information provided by the pilot into actions (on their own, with the help of additional support/tools,…).
- *Pilot-user relationship:* clarification of the history of the relationship between the pilot and a given user, the existing interaction loops (frequency, adequacy to the learning needs), and the strength of this relationship (interest of the user, potential competitors of the pilot from the user's point of view).
- *Ability of the pilot to provide the required service (prototype/operational)*: given a certain identified use case, with a clear vision of what is required in terms of "design environment", capacity of the pilot to meet these requirements in practice (either for a first prototype, or for an operational service). Specific efforts, possibility involving new partners, might be needed.

During telco, the storytelling exercise mentioned previously might not be sufficient to address all the unclear elements. In those cases, the telco can be rather carried out using the structure of the "pre-diagnosis" analysis presented above.

3.2.2 Which actors to run this process

In e-shape, WP2 has been in charge of running this process, in interaction with the pilots at certain points in time. This corresponds to **one possible configuration where the "diagnosis process" is implemented by a third-party actor.** However, it would be interesting to **wonder if other configurations might be considered.** For example, one part of the process could be formalized in guidebooks and performed by the pilots in autonomy. However, our experimentations also underlined that in some cases an external actor proved to be very helpful to bring about a shared holistic view of the pilot's situation. This question will need to be further investigated, as it has large consequences on how to "routinize" e-shape co-design model. For instance, if third-party actors are helpful on some specific elements, it might be worth considering training a pool of experts that would be in charge of supporting co-design in EuroGEO or GEO community.

3.3 Classification of main types of systems integrating EO-based information

The service developed by the pilot could be described as a system, integrating EO-based information but also other elements (such as visualization or editing tools) in order to be integrated into user's actions. Based on the analysis of the different e-shape pilots, a typology for these systems is proposed:

- **Monitoring system** when the objective is to allow the user to monitor a certain variable or phenomenon - information is then complemented with visualization tools and other customized tools depending on user's operations ;
- **Warning system:** monitoring system complemented with an alarm when the monitored variables exceed certain thresholds ;
- **Decision support system:** monitoring system complemented with other customized tools based on specific decision rules, helping the user to choose between a certain set of options ;
- **Design support system:** monitoring system complemented with other customized tools helping the user to design new operations.

- In some cases, **information can be used as such directly by the user**, we could then refer to a simple "information provision or data brokering system" (better name could be probably found). It is for example the case when users are research communities. In this case, information could be complemented with access to models or other resources.

To illustrate the differences between these types of systems, we take the example of mercury pollution based on S2-P1 pilot *EO-based surveillance of Mercury pollution*. This pilot aims at developing a decision support system that will assess the efficiency of the measures taken by policy makers to reduce mercury emissions. By comparison, the other types of systems could have been described as follows:

- A simple monitoring system would only focus on following mercury concentrations in different environments.
- A warning system could be a system sending notifications when mercury concentrations reach certain levels ;
- A design support system could be a system helping actors to design new ways of tackling mercury pollution phenomenon.

This typology is still under construction and will need to be later updated.

3.4 Classification of co-design needs in four types

Co-design needs have been identified based on the thorough analysis of each pilot's context. A certain variety of co-design needs could be identified. However, it was noticeable that the same types of issues were faced by the different pilots, leading us to classify co-design needs in four main types.

Before presenting these four types, the following vocabulary needs to be introduced: *usefulness* and *usability* as two crucial aspects to be taken into account in the service design:

- **Usefulness,** i.e. the user is able to see the advantages of using EO data for its existing or future operations ;
- **Usability,** i.e. EO data can be effectively integrated in the user's operations and can be easily used.

The several types of co-design are differentiated depending on the status of the usefulness and usability of EO data for a given user, and the interaction between the service provider and this user:

- **Co-design type 1 - *Usefulness & usability assessment and enhancing:*** in cases where the usefulness is not clearly established but the user is interested and willing to take part in the development of the service.
- **Co-design type 2 – *Usefulness identification***: in cases where the usefulness is not clearly established, AND the user is problematic (impact of EO data on his actions not clear, difficulties in the interactions, etc.)
- **Co-design type 3 - *Extensive usefulness & usability realization***: in cases where usefulness is already established, but there is a need to implement it and make the service operational and robust in compliance with the established requirements. This might involve extending the network of partners to ensure this process.
- **Co-design type 4 - *Usefulness re-invention***: in cases where usefulness is already established, but it might be interesting to go towards a longer-term strategy and explore new types of usefulness, new users etc.

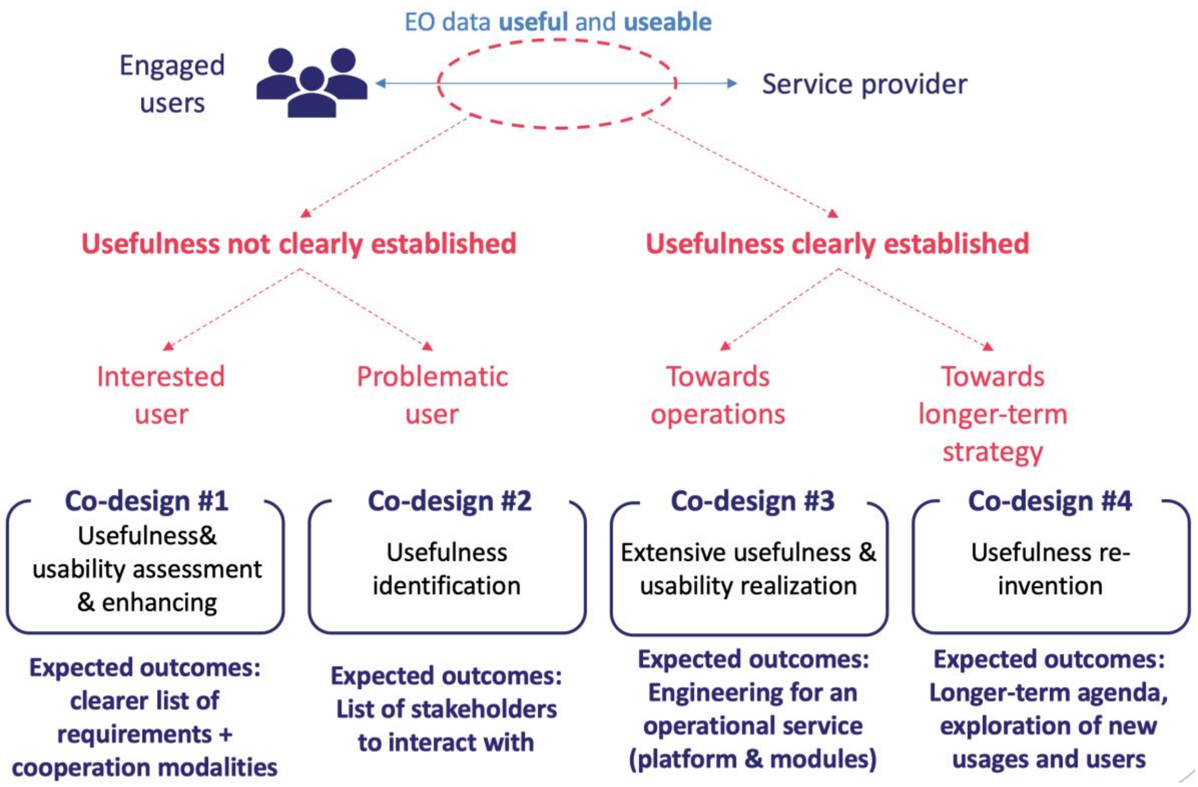

Figure 4: Classification in four co-design types

In previous deliverables, the co-design needs were expressed differently for each pilot, relying on the specificities of the pilot. Thanks to the classification of co-design types, these specificities are still considered in the analysis of the pilot, however **the outcomes of the "diagnosis process" are expressed in a harmonized and simpler way.** This typology and the differentiation criteria are still under investigation and are expected to be further refined in the future developments of e-shape.

Three elements are important to be highlighted:

1. At a given time, there might be **several types of co-design for each pilot**. Indeed, the co-design type depends on the relationship between the pilot and a given user community. Different user communities might be considered by the same pilot, with different levels of interactions.
2. This "diagnosis" of co-design needs has to be considered in a **dynamic perspective**: one can expect that **each pilot goes through different co-design types at different moments in time**, depending on its evolution and the issues faced all along.
3. **The order in which co-design types can occur in the life of the pilot might differ from one pilot to another** (to be noted that the numbers #1, #2, #3, #4 of the classification do not correspond to the order in time). However, it appears that **these co-design types are linked in certain ways, that would need to be clarified**. For example, implementing a co-design type 3 implies having already run a co-design type 1 (not necessarily in e-shape timeframe but in the pilot's history), as it starts with a clearly defined usefulness. This is only one example and the different possible transitions from one type to another will be further examined.

4 CONCLUSION AND NEXT STEPS

In this deliverable, the e-shape co-design model has been further updated based on the outcomes of the "diagnosis process" run for the different e-shape pilots, especially **enriching the analysis grid and tools used to make this diagnosis.**

The major result is the classification of co-design needs in four main types. Interestingly, the analysis of the pilots suggests that **co-design is not to be seen as a "one-shot" process**, that is implementing one these types once and for all, but **as a dynamic process**. Indeed, these **several types of co-design might be involved at different moments in time**, to deal with the successive issues occurring in the development of the services and its research counterpart. A renewed vision of co-design could be thus proposed: it could be rather described as a **strategic tool to support the expansion of EO ecosystem.** Its objective should **not be reduced to designing the services and providing them in a transactional mode.** But it should rather be described as **designing the cooperation conventions between the different actors,** in order to ensure an intertwined and long-term development of research topics and a range of services based on these scientific advances.

This e-shape co-design model and its implementation will be further constructed and experimented as the project goes forward. In the next months, WP2 will run in parallel the "diagnosis process" for remaining pilots and the implementation of co-design actions for the pilots that need it. These future works should allow us to:

- Strengthen the cross-pilots analysis, possibly identifying new shared patterns or issues ;
- Set-up and experiment co-design actions for each co-design type ;
- Update our e-shape co-design model, based on the lessons learned from these experimentations. The following questions will be more specifically investigated:
    - Interpretation of co-design as designing the cooperation conventions between the actors, and not only the services themselves ;
    - Routinization options (third-party actors, automated processes etc.) ;
    - Possible transitions between co-design types.

5 References

Barbier R, Le Masson P, Weil B (2019a) *Deliverable 2.1 : Initial model for e-shape co-design.* Deliverable for e-shape project.

Barbier R, Le Masson P, Weil B (2019b) *Deliverable 2.2 : Revised model for e-shape co-design.* Deliverable for e-shape project.

6 ANNEX

6.1 Annex 1 - Status of co-design process for e-shape pilots (end of April 2020)

Pilot	Phase 1: Diagnosis process						Phase 2: Co-design actions	Challenge 3 selected by the pilot for Sprint 1[1]	Co-design type ST	Co-design type LT
	Frameworks	Questions shared	Pilot's answers	Co-design pre-diagnosis	Telco	Co-design diagnosis			Short term	Longer-term
S1 – P1: GEOGLAM	DONE	DONE	DONE	DONE	DONE	DONE	ONGOING		Type 1	Type 3
S1 – P2: CAP support	DONE	DONE	DONE	DONE	-	-	-		*Type 3 (?)*	*Type 4*
S1 – P3: VICI Insurance	DONE	DONE	DONE	DONE	-	-	-		*Type 3*	*Type 4*
S1 – P4: Agroindustry	DONE	DONE	DONE	DONE	DONE	DONE	-	x	Type 2	
S2 – P1: Mercury	DONE	DONE	DONE	DONE	DONE	DONE	-		Type 1 (by the pilot)	Type 4
S2 – P2: POPs	DONE	DONE	DONE	DONE	DONE	DONE	-		Type 1 (by the pilot)	Type 3 & 4
S2 – P3: Air quality	DONE	DONE	DONE	DONE	DONE	DONE	ONGOING	x	Type 1 (generative) for city scale (offering position)	Type 2 for global scale? + Internal type
S3 – P1: NextSENSE	DONE	DONE	DONE	DONE	-	-	-		*Type 1/2/3*	*Type 4*
S3 – P2: PV urban scale	DONE	DONE	DONE	DONE	DONE	DONE	1	x	ARMINES : Type 3 & 4 *DLR : type 1 & 3*	Internal co-design
S3 – P3: Wind offshore	DONE	DONE	DONE	DONE	-	-	-	x	*Type 1 (list of requirements + coordination modalities) Or type 3*	*Type 4*
S4 – P1: mySPACE	DONE	DONE	DONE	DONE	-	-	-		*Type 1 (list of requirements)*	*Type 4 (at SC level)*

[1] To be noted that there is no direct link between the selection of *Challenge #3 ("Specific co-design process")* and WP2 involvement in the implementation of such process. Indeed in some cases, pilots already have their own procedure and might not need WP2 support. Moreover, even if *Challenge #3* was not initially selected, WP2 might be involved in supporting the pilot on co-design needs, that were not initially considered by the pilot but that have emerged in the diagnosis process. These questions are discussed with the pilot during telco.

S4 – P2: mySITE	DONE	DONE	DONE	DONE	-	-	-		Type 1 or 3	Type 4 (at SC level)
S4 – P3: myVARIABLE	DONE	DONE	DONE	DONE	-	-	-		Type 1 or 2	Type 4 (at SC level)
S5 – P1: Historical water	DONE	DONE	DONE	DONE	-	-	-	x	Type 1 (features of enriched product to be tested, learning loop to be precised)	
S5 – P2: Floodwater	DONE	DONE	DONE	DONE	-	-	-	x	Type 1 for GFP members	Type 4 (GFP) + Type 2 for new user communities
S5 – P3: Diving visbility	DONE	DONE	DONE	DONE	-	-	-		Type 1 (list of requirements + coordination modalities)	Type 3 / Type 4
S5 – P4: Sargassum	DONE	DONE	DONE	DONE	-	-	-		With OECS, GCFI --> type 2 With existing users (Metéo France?) --> type 1/4/3	Type 4
S5 – P5: Fisheries	DONE	DONE	DONE	DONE	-	-	-	x	Type 1 / Type 3	Type 4
S6 – P1: Volcanic ash	DONE	DONE	DONE	DONE	-	-	-	x	Type 1 / 3 / 2	Type 4
S6 – P2: Disasters urban	DONE	DONE	DONE	DONE	-	-	-		Type 1 (by the pilot for classical one, but possiby with WP2 for more generative one)	To be merged with type 4?
S6 – P3: Vulnerable cities	DONE	DONE	DONE	DONE	-	-	-		Type 1 (without WP2 for Planetek, with WP2 for EGS-IGME?)	Type 4 + integration of sub-pilots
S6 – P4: Resilient agri	DONE	DONE	DONE	DONE	-	-	-	x	Type 1 for GAIA + Type 1 (more generative) for INTERAMERICAN	Type 3 & 4
S7 – P1: GHG emissions	DONE	DONE	DONE	DONE	-	-	-		Type 3	Type 4
S7 – P2: Urban extreme weather	DONE	DONE	DONE	DONE	PARTIALLY DONE	-	-	x	Type 1 & 4 (FMI - specific learning loop)	Type 4
S7 – P3: Forestry harvesting	DONE	DONE	DONE	DONE	-	-	-		Type 1	Type 4
S7 – P4: Hydropower	DONE	DONE	DONE	DONE	-	-	-		Type 1	Type 4
S7 – P5: Seasonal preparedness	DONE	DONE	DONE	DONE	-	-	-	x	Type 1	Type 4

6.2 Annex 2 – Example of the pre-diagnosis & diagnosis of co-design needs for S1-P1 GEOGLAM

1. **Characterization of the pilot:**

a. Users' ecosystem

The ecosystem related to crop monitoring is already well-structured globally. Especially with the creation in 2011 by the G20, following global food price hikes, of:

- AMIS (Agricultural Market Information System) assesses global food supplies (focusing on wheat, maize, rice, soybeans) and provides a platform to coordination policy action in times of market uncertainty
- GEOGLAM = Global Agricultural Geo-monitoring Initiative that coordinates satellite monitoring observation systems in different regions of the world in order to produce and disseminate relevant, timely and accurate forecasts of agricultural production at national, regional and global scales.

GEOGLAM is the main user targeted by VITO in this pilot.

- Current products developed by GEOGLAM:
  - Crop Monitor for AMIS: Monthly reports providing an international and transparent multi-source of crop growing conditions, status, and agro-climatic conditions likely to impact global production. Coordinated by NASA Harvest University of Maryland), 40 partners participating for input data (national, regional and global organizations such as space agencies, agriculture organizations...)
  - Crop Monitor for Early Warning: created in 2016 to focus on the countries at risk of food insecurity (Africa for ex). Used by food security organizations, including the United Nations Office for the Coordination of Humanitarian Affairs (OCHA).
- Foreseen activities for the next few years:
  - Encouraging Crop Monitor Bulletin at national and regional level (by mandated national agencies) → will also result in a higher-quality Crop Monitor at global level
  - Going from a qualitative assessment of crop condition towards a more quantitative approach, especially developing EAV's (Essential Agriculture Variable)

b. Type of the service developed by the pilot (monitoring, warning, decision support system, design support system etc)

- **Crop calendar information,** especially for two regions: Greece and Ethiopia
- To be integrated in a monitoring system with other EAV's?

c. User's competencies

For each user community mentioned above: what are the existing tools they already use in their day-to-day operations (decision support system, other monitoring systems etc...)? Are they able to integrate information provided by VITO in their existing operations? On their own? Need of additional support/tools?

GEOGLAM already familiar with EO data.

d. Pilot-user relationship

History of the relationship: good communication network established

Interest of the user:

- Users willing to participate in the design of the service, however list of requirement to be further defined
- → *organization of shorter coordination loops needed?*
- ***Need to persuade GEOGLAM*** *to use VITO product?*
- *From GEOGLAM's point of view, other information providers competing with VITO?*

d. Ability of the pilot to provide the required service (prototype/operational)

- Prototype: provided information probably needs to be completed with a certain set of customized tools in order to be compatible with an operational us. VITO should be able to provide this level of customization.
- *Operational service: to go towards a fully operational service, is the existing network of the pilot's partners sufficient? Additional competencies/actors to be involved?*

2. Co-design pre-diagnosis

a. First steps

The situation described above seems to correspond to:

- **Co-design type 1** to clarify the list of requirements + coordination modalities with GEOGLAM (quick learning loop might be needed).
- **Co-design type 3** if usefulness of the service is already clearly described but there might be difficulties related to its operationalization. Network of partners for VITO to be further robustified?

→ *Pilot already dealing with the situation on its own? Need of support to better organize operationalization?*

b. Longer-term perspective

Co-design type 4 for future extension of the service?

3. Co-design diagnosis

For S1-P1 GEOGLAM, 2 types of co-design to be considered:

1. **Short-term: co-design type 1** *(Usefulness not clearly defined but interested user).* Indeed, the telco revealed that GEOGLAM did not provide fully-defined requirements: nature and form of the information to be provided, and how it would be integrated in current logics of action still need to be clarified.
2. **Longer-term: co-design type 3** (*Usefulness clearly defined but to be implemented operationally*): if help is needed by VITO