NGI TRUST CHAIN

D.4.1₁ METHODOLOGICAL GUIDELINES FOR THE OPEN CALL #1 HUMAN CENTRED APPROACH

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D4.1 METHODOLOGICAL GUIDELINES FOR THE OPEN CALL #1 HUMAN CENTRED APPROACH

HOW TO IMPLEMENT THE HUMAN-CENTRIC APPROACH AND THE USER CENTRIC DESIGN IN THE DEVELOPMENT OF DIGITAL SOLUTIONS ON DIGITAL IDENTITY.

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EXECUTIVE SUMMARY

About the EXECUTIVE SUMMARY:

Throughout this deliverable, a human-centred approach is defined, as well as the phases in which the user is incorporated, and the methodologies used to incorporate the user in each part of the process. It also justifies the decision as to why most of the methods used have to be qualitative. This is because it is necessary to holistically understand the needs that users have and to demonstrate that it is possible to build a decentralised digital identity solution that meets their needs. In addition, this deliverable explores how to incorporate users into the research process: examples of methodological approaches will be presented, as well as challenges, risks, and requirements. Furthermore, this deliverable explores how to incorporate users into the research process: examples of methodological approaches will be presented, as well as challenges, risks, and requirements. Furthermore, the identified requirements, representativeness, co-creation, validation, and iteration process are described in depth. Finally, it explores the expected outcomes of the Open Call 1 winning projects.

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ABBREVIATIONS

IP	Internet Protocol
TCP	Transmission Control Protocol
SSI	Self- Sovereign Identity
DI	Digital Identity
UX	User Experience
UI	User Interface
HCA	Human Centred Approach
UCA	User Centred Approach
UCD	User Centred Design
HCD	Human Centred Design

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1 INTRODUCTION

As privacy and information security are growing concerns, decentralised identity solutions are a promising alternative to empower individuals to control and manage their own digital identity. These solutions based on blockchain, and self-sovereign identity (SSI) technologies offer the ability to create and use unique and authenticated digital identities in a secure manner without relying on centralised intermediaries.

However, the success and widespread adoption of decentralised identity solutions is highly dependent on user experience and acceptance. To ensure that solutions are accessible, as well as intuitive and satisfying, a human-centric approach is essential from the early stages of their development.

The human-centred approach is a methodological approach that puts the end-user, stakeholders and citizenry at the centre of the design and development process. It is based on understanding the needs, objectives, and contexts of the users, as well as actively and continuously involving them in all phases of the solution lifecycle. By adopting this approach in the development of decentralised digital identity solutions, challenges and barriers associated with the mass adoption of these solutions can be addressed and more effective and satisfying user experiences can be delivered.

This deliverable presents a framework for the application of the human-centric approach in the development of decentralised digital identity solutions. It will explore the main stages and practices involved in this approach, from user research and requirements definition to iterative design and continuous evaluation. In addition, it will highlight the key benefits of adopting this approach, both for end-users and for developers and solution providers.

At the end of the reading, it is intended to generate a holistic understanding of the human-centric approach and its importance in the development of decentralised identity solutions. Furthermore, it is intended to provide the tools and practical knowledge to integrate this approach into the winning projects of TRUSTCHAIN Open Call 1.

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2 HUMAN CENTRIC APPROACH AND USER CENTRIC DESIGN

The human-centred approach is a design philosophy which places the user, stakeholders, and citizenry at the centre of all design decisions when creating digital products, and in the case of TRUSTCHAIN in creating decentralised digital identity solutions. To follow this approach, one should consider the user needs and requirements, while also considering other factors such as usability, user experience and user interface design.

This approach is used to create digital products that are more enjoyable, easy to use and meet the user's needs and requirements. By looking at an individual user's goals and needs, the designer can create a digital product that is tailored to their particular goals and needs. This can be beneficial not only for the user but also for the designer, as the solution will be more effective and have higher user engagement and satisfaction. User centred design principles emphasise understanding the user, designing for their needs, creating digital solution that are easy to use and enjoyable, and testing the digital solution with users to ensure it meets their needs.

User-Centred Design (UCD) is an iterative design process that puts the user at the centre of all decisions, by involving them throughout the design process. UCD follows specific principles, such as the design being based upon an explicit understanding of users, tasks, and environments; being driven and refined by user-centred evaluation; and addressing the whole user experience. This approach includes multiple steps, such as empathizing with users first to understand their needs, creating a prototype to test with users, and measuring the user's impact. User-centred design is a set of processes that prioritize the user's needs, behaviours, values, and expectations from start to finish, in order to create an optimal experience with a product or service. Tests are also conducted with potential end-users during each stage of the process to ensure that the journey is as smooth and intuitive as possible. Following the Human-Centred Approach (HCA) the user is the centre of every part of the development process; ideation, design, development, and validation, resulting in a product that is both usable and accessible (Chammas et al., 2015).

There are several approaches that are used to develop digital products. One of the most common is the HCA as it is one of the most successful approaches in terms of time and money efficiency. Its efficiency is because the digital solution is tailored to the individual. It is an iterative process that focuses on the user and their tasks, ensuring that the product serves its purpose and meets the users' needs. Many UCD methodologies follow the international standard 13407 (ISO 12407, 1999) of Human-Centred Approach (HCA) and have been proven to lead to highly successful products.

As discussed above, UCD is a cost-effective approach since it avoids costly oversights and errors and reduces rework or wasted time by placing an emphasis on user experience to ensure the product meets their needs and expectations. Through employing UCD principles and practices, businesses can make iterative improvements to their product development process and benefit from the feedback of users.

This approach also offers an engagement of users, allowing them to be productive and motivated, ultimately leading to a successful product that meets their needs. It is thus clear why the human-centred approach is important when creating digital products.

A 5-step design thinking process is used to identify problems and iterate solutions by focusing on users, with the ultimate goal of creating a product that is tailored to the user's needs in an effortless way. This process involves understanding the users and their context, specifying requirements for both the business and user, designing solutions, and evaluating and iterating. Popular techniques of UCD include researching the user's needs and context, conducting user tests and interviews, creating prototypes and wireframes, running usability reviews, and A/B testing[1], which will be explained in detail later. As a result, User-centred Design has been shown to be effective and offers many advantages to businesses, including improving user experience, increasing sales, reducing development costs, and enhancing customer loyalty (Mofokeng, 2022). It is a powerful approach for creating digital solutions that puts the user at the forefront of each stage of the design process and ensures that their requirements are met, thus enhancing the product, and making it more successful.

It is worth to note the ISO standard defines HCA but not UCD, as it defines human-centred design and consider both terms synonyms. although the ISO 9241 preferably uses the first by considering that it impacts all the humans involved in the system, not only the end users of the product. The preference for the term "User-Centred Design" is justified by common usage in the market (ISO 9241, 2010). And also, the UCD considers the relationship between the user and any type of element. This may include interactive systems or non-interactive. For example, the cases that Don Norman exposes in the “Design of everyday things” (Norman, 2013).

Moreover, Farinango et al. (2018) exposed that the user-centred design can be defined as a framework of processes (not restricted to interfaces or technologies). In this framework, usability goals, user characteristics, environment, tasks and workflow of a product, service or process are given extensive attention at each stage of the design process. Therefore, throughout this deliverable, the terms Human-centred approach

[1] An A/B test is a simple experiment where the users interact with two different versions of a design to find out which one performs better.

and user-centred design will be used as they are the definitions that best fit with the approach that the TRUSTCHAIN portfolio should have.

Finally, the ser-centred design, as discussed above, can be characterized as a multi-stage problem-solving process. It requires designers to:

- Envision and analyse the way users are likely to consume a product.
- Validate their assumptions regarding user behaviour in real-world tests.

During TRUSTCHAIN, these tests have to be conducted with actual users or potential end-users during each stage of the process from requirements, pre-production models and postproduction. The selection of the participants should be justified.

1.1 PHASES THAT END-USERS PARTICIPATE IN

To create a decentralized digital identity solution following the HCA is crucial to ensure that the end-users are involved in the process of creation, design, development, and validation. End-users should be involved in each stage of the process, from the conceptualization phase to the development and testing phase, all the way to the final product launch. During the conceptualization phase, end-users should be consulted to identify their needs, concerns, and preferences. This information is crucial to designing a digital product that meets the needs and expectations of the users. Users should provide feedback on prototypes and participate in usability testing through the different stages of development. The final validation phase should include testing with end-users to ensure that it is released in line with user's needs.

The human-centred approach process takes four steps:

- identifying the users' needs and the context around them,
- specifying requirements for both the business and the user,
- designing solutions and creating a product that has been tailored to the user so that interacting with it is effortless, and
- end-users should be consulted to ensure that the product will meet their needs and the stakeholders' goals in a way that they find value in and look forward to using[2].

[2] https://www.factcheck.org/2019/08/a-field-guide-to-trumps-dangerous-rhetoric/

To gain a deep understanding of user needs, designers use a mixture of investigative methods and tools and generative[3] ones. Involving end-users throughout the design process is essential to ensure that the product is usable and practical.

According to the Interaction Design Foundation, the user-centred design method involves understanding the context of use, which can be achieved through contextual inquiry and observing actual users in their context. The human-centred approach is also necessary for ensuring that design requirements relating to a device are appropriate and address the intended use of the device, including the needs of the user, as mandated by 21 CFR 820.30 (c). Ultimately, involving end-users in the design phase ensures that their needs, preferences, and learning styles are taken into account, making the final product more appealing and effective for its intended audience (Arsand et Demiris, 2008).

Collaboration between customers, product managers, business analysts, developers, and QA maximizes overall team efficiency and ensures that the product meets the needs and expectations of end-users.

1.2 METHODOLOGIES

To achieve an effective user-centred design, various qualitative and quantitative methodologies can be employed. **For the TRUSTCHAIN OC1 it is requested that the majority of methodologies applied are qualitative, around 80% of the methodologies implemented to develop a user-centred digital product should be user interviews, open surveys, focus groups, and participant observation.**

Qualitative methods, such as user interviews, open surveys, focus groups, and participant observation provide a deeper understanding of user needs and preferences. These methods allow businesses to gather rich and detailed feedback that can influence the design of the product.

When it comes to detecting user needs and feedback in the creation of a digital product, there are various qualitative methodologies that can be used. For instance, user interviews, focus groups, and observation studies are some of the most common methods.

- **User interviews** involve asking participants (users of the product or service) to share their thoughts and opinions about a product, while observation studies require researchers to observe how users interact with a product.

[3] Generative research is a method that "generates" a deep understanding of people's motivations, pain points, behaviours, etc.

- Focus groups, involve bringing together a group of people to discuss a product and share their thoughts and opinions.
- Observation studies is one of the easiest methods to get data. It does not require technical expertise. It is also one of the key sources for developing hypotheses. Observation studies refer to the interpretation and recording of data. The term could also be applied to any data gathered during an activity that is interesting for the study. Observations can be qualitative, which means that only the lack or presence of a property is noted, or quantitative, which means that a numerical value is assigned to the observed phenomenon by counting or measuring it.

Each of these methods has its pros and cons. For example, observation studies are great for capturing real-time user behaviour, but they may not provide insights into why users behave the way they do. Also, while conducting observation studies in some environments, some information could be missed, especially in a crowded context. In addition, if there is no observation guide (See Annex 1: Observation Guide), hence the observer could focus on what they want to see. Valid observations cannot be hastened, and observations alone cannot allow us to complete our inquiry quickly.

Focus groups allow for discussion and interaction between participants, but they may not represent the views of the wider population. User interviews can be tailored to specific users, but they may be time-consuming and costly. Therefore, the choice of method may depend on factors such as the goals of the research, the target audience, and the budget.

Overall, a combination of different qualitative methods can be used to provide a more comprehensive understanding of user needs and feedback, allowing for the creation of a digital product that is more user-centric and effective.

Quantitative methods, such as A/B testing, data analytics, and user behaviour analysis, provide statistical data about how users interact with the product. Quantitative methods are useful for testing hypotheses and identifying trends and patterns in user behaviour.

When it comes to gathering user needs and feedback for digital products in the validation phase, one effective way is through quantitative methodologies. These include surveys, A/B testing, and analytics.

- Surveys are a cost-effective way of collecting large amounts of data from a diverse group of users. Longitudinal and cross-sectional surveys can be conducted to

gather data at different time durations and analyse it quantitatively. The advantages of survey research are its ease of administration, low cost, and remote accessibility. However, it may suffer from a lack of flexibility in design and may not provide complete data.

- A/B testing involves comparing two versions of a digital product to see which one performs better. This method allows for objective measurements and statistical analysis of user behaviour. The disadvantage is that it requires a large sample size to be statistically significant.

- Analytics involve tracking user behaviour through metrics such as page views, bounce rate, and click-through rate. This method provides real-time insights into user behaviour and allows for quick decision-making. The disadvantage is that it may not capture the full breadth of user experience and may require advanced technical skills to analyse.

Quantitative research provides numerical data, while qualitative research gives more in-depth insights into opinions and motivations. To gain a complete understanding of user needs and feedback, it is best to use both methods together. For instance, in usability testing, both qualitative and quantitative data can be collected through observing and identifying design features that are easy or hard to use and gathering measurable data points, respectively. A/B testing, multivariate testing, web and app analytics, card sorting, and tree testing are all popular quantitative research methods. On the other hand, qualitative research methods involve user interviews, focus groups, observational studies, and formal experiments designed to measure aspects of the user and user behaviour. Co-produced research is another qualitative method that can be used to gain new knowledge through the inclusion of perspectives from those traditionally excluded from knowledge production. Combining qualitative and quantitative methodologies can help improve the quality of research and impact. Hence, having a comprehensive approach to product creation that includes both qualitative and quantitative research methods can lead to a better understanding of user needs and feedback, resulting in a digital product that satisfies its users.

Both qualitative and quantitative methods have their strengths and limitations, and a combination of these methods is often used to achieve comprehensive and meaningful insights into user needs and feedback. By using these methodologies to gather information about user needs and feedback, businesses can create digital products that are user-friendly, effective, and meet the needs of their target audience.

Ultimately, the success of a digital product relies on its ability to solve a problem for its users, and the only way to achieve this is by understanding their needs and feedback.

1.3 WHY IN TRUSTCHAIN IS REQUIRED THAT THE MAYORITY OF THE METHODS IMPLEMENTED ARE QUALITATIVE?

Although qualitative and quantitative methods can be complementary and provide a holistic view of the issue, it should be noted that qualitative methods are indispensable when constructing digital solutions. Qualitative methods make it possible to study cultural aspects (Cremers et al. (2014: 35) without isolating them from their historically shaped contexts, nor from a single point of view. This makes it possible to explore the underlying emotions, perceptions, and motivations of users. It is also due to the holistic view that qualitative methods provide that they allow understanding the user, enabling designers and developers of digital solutions to better understand users' needs, desires, and behaviours. Qualitative methodologies help to obtain detailed and in-depth information about users' experiences, problems, and opportunities to improve their digital experience.

In addition, qualitative methods are essential to validate and iteratively improve digital solutions as they are developed. Usability testing allows designers to observe users interacting with a prototype or a preliminary version of the solution and gather qualitative feedback on its usability, effectiveness, and satisfaction. This information can guide adjustments and improvements to achieve a more effective solution.

Qualitative user research could be conducted at any point in the design process, and it is both formative and summative and is used to inform design decisions at any point in the design cycle and help ensure that you are on the right track. Qualitative research identifies key design problems, pinpoints usability issues, and helps to uncover possible solutions for them within the design process. All of this ensures a human-centred, and therefore user-centred, approach to design.

3 HOW INCORPORATE THE USERS IN THE RESEARCH PROCESS: EXAMPLES OF METHODOLOGICAL APPROACHES

One of the best ways to involve users in the creation and validation phases of digital products is through usability testing. In this project, this relates to the piloting phase mentioned in section 2. This technique involves observing how real users interact with the product to identify areas of improvement and the areas of difficulty or frustration

that users experience with a digital solution. To begin the process of usability testing, it is important to create a test plan that defines the goals of the test and how the results will be measured. It is recommended to create a task list that focuses on specific features of the product. During the testing process, the users are observed, and data is collected by researchers or facilitators, as already mentioned above. The collected data is then analysed to determine the usability and functionality of the product. Feedback can be used to make improvements to the product or service and to understand the effectiveness of the design. User feedback can also help businesses identify areas for optimization and growth.

- Surveys: One effective way to incorporate users in the creation and validation phases of digital products is through the use of surveys. Surveys allow for the gathering of feedback from a larger pool of users, which can be helpful for validating assumptions and identifying common user needs and preferences. In order to ensure a positive survey experience for customers, it is important to make the process enjoyable and satisfying by showing that their concerns and complaints are being heard. Surveys also offer the advantage of being easily adjustable to meet new market environments without too much hassle, unlike other types of feedback collection tools that require staff training and re-engineering of the whole feedback process. However, there are some disadvantages to surveys, including the fact that they provide sampled data rather than complete data, which can lead to survey fatigue and reduced response rates. Respondent honesty and intention can also impact accuracy, as well as unintentional biases and effects. Therefore, it is important to implement surveys using advanced survey software solutions in the initial stages of new product development and keep the questions short and snappy to avoid increasing the effort required to complete them. Despite some drawbacks, user research through surveys is a cost-effective means of collecting feedback from target markets that can have a big impact on new product development plans and is crucial for high-quality product design work.

- Focus groups: These informal and loosely structured customer interviews usually consist of 8 to 12 participants and a trained moderator who guides the discussion based on a predetermined outline (Krueger et al., 2020). Focus groups provide an opportunity for users to engage in an open discussion about the product and share their thoughts on its features and functionality. Through this process, valuable insights and ideas for future iterations may emerge. To conduct a successful focus group, it is important to set clear objectives and to recruit the right participants who represent the target audience. The moderator should keep the discussion focused on the topic, involve all participants, and encourage reactions to each other's comments. The number of focus groups needed may vary depending on the topic, but it is important to ensure a diverse representation of users. By incorporating user feedback through focus groups, digital products can be tailored to better meet the

needs of users and improve their overall satisfaction with the product. This approach can lead to more successful outcomes for businesses and users alike, and ultimately contribute to the development of innovative and user-friendly digital products.

- **User onboarding** is a crucial component to successful user acquisition and retention, but it is also one of the biggest challenges. It offers functional training to users and demonstrates how to use the main features of the product in simple steps, driving adoption through regular user engagement and increasing stickiness. It also helps users to understand and use the product, understand its value, and achieve their goals in less time. A good onboarding flow can help users understand the value of the product and reduce friction, increasing engagement and retention. User onboarding should be designed to align with business objectives and guide users towards meaningful interactions with the decentralised digital solution, with the aim of creating power users. It is a process that requires balancing user experience with the friction of customer education and data gathering to prevent churn, while developing an effective retention strategy.

Launching a digital solution requires more than just the solution itself: it necessitates the implementation of a comprehensive user onboarding strategy to ensure that the solution is adopted efficiently and effectively. Whether or not a digital solution will be successful is often determined by the user onboarding process. The strategy should give users the information and tools needed to start using the product quickly, while also establishing an ongoing positive user experience. It should also include clear instructions on how to use the digital solution, a detailed onboarding checklist, and a process to monitor user feedback. A successful user onboarding strategy should also address user needs and use data to inform improvements to the overall user experience (Terres et al., 2019) even after the digital solution is launched.

The key elements of an effective user onboarding strategy include defining clear goals, understanding the customer lifecycle, creating a product adoption program, keeping an eye on user status, keeping communication open, measuring success objectives, and automating the process with technology (Terres et al., 2019). When user onboarding is done correctly, it can be the key to a successful product launch.

- **User testing,** or usability testing, is a key component in designing, finalizing, and launching a great digital product. It's about detecting usability issues at any stage

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of the product development cycle with the aim of improving the overall user experience. The User Testing Platform allows digital product teams to validate concepts, get customer feedback, and understand how their ideas will evolve into the right solution. Continuous user testing provides a powerful avenue to build confidence that you're headed in the right direction, which saves you from costly rework later on. Mitigating risk in digital product development and finding the best User Testing Software are integral steps necessary to effectively launch a digital solution. Furthermore, obtaining executive buy-in, staying user-centric and using training methods and tools that are digital, modern, and effective can help ensure successful User Onboarding Solutions. With the help of a Digital Adoption Platform (DAPs), HR Platforms and HCM Software, Training Solutions, and Intelligent Automation Solutions, users can onboard quickly and easily, and receive real-time transaction monitoring that can quickly identify any suspicious activity. Ultimately, ensuring great user onboarding experiences requires following best practices such as knowing the users before onboarding and providing interactive guides, product tours, walkthroughs, and user onboarding checklists.

4 BRIEF SUMMARY OF HUMAN CENTRED APPROACH

All the projects funded by the OC1 digital identity are requested to follow a human centred approach in their testing approach. To do so, it's not only to research and test with the end-user, but also know the cultural behaviour of citizens that could potentially use the digital solution (for example: adults on behalf of their child or an elder people). It has to be used in the different steps of the ICT tool development: from the definition of the use cases to the testing and piloting of the final tool. As Ortiz Crespo et al. (2020: 3) highlight, this avoids large gaps between design and reality.

To ensure the success and adoption of a decentralised digital identity tool, it is crucial to understand how to adapt a technology to the end-users, stakeholders and citizenry needs and how to answer it throughout each digital identity solution. Each project will provide a trustworthy technology, behind the interface but also the effectiveness of the interface itself: content and UX wise.

As it clearly appears in the research made by Roehrer et al. (2011) using user-centred design requires not only to involve the user from the beginning in the process and in all the steps, but it also requires a multidisciplinary work permitting the constant "translation" of the users' reality into technical requirement as to understand how to adapt the technological barriers as close as possible to the user's needs.

To achieve that the above, it is important to take into account:

- Deep understanding of the citizens/users/stakeholders, involved through the process and implicate them from the beginning.
    - making them part of the process since the beginning may avoid making presumptions about their reality or their needs in terms of managing digital identity. As Roehrer (2011) it enables a holistic view of the problem to be solved.
- To clearly link the functionality and the form (Roehrer, 2011).

It is important to understand the implications of the above point for each project's methodology.

1. Methodological approach: Qualitative research and concept exploration,

Starting from an extended state of the art, a qualitative approach should be the first step to deeply understand the context of the specific topic (in this case decentralised digital identity).

The concept of decentralized digital identity should be explored taking the context of citizens, custodian on behalf of an elderly person, a legal guardian on behalf of a child and users into account. As exposed by Cremers et al. (2014: 35) cultural aspects, as are those previously mentioned, should be studied holistically, neither in isolation of their historically formed contexts, nor from one single point of view. It is the reason why, starting the research with a theoretical background is necessary, it outlines the contexts from which the problem statement originates and puts the foundations for the qualitative fieldwork on which the human centred approach is based on.

This initial, exploratory qualitative fieldwork provides the cultural perspective within the research that allows the researcher to ascertain the triggers to be applied within the TRUSTCHAIN OC1 technology projects. The qualitative fieldwork can take place as observation, individual or group interviews or focus groups. The best methodological tool to be used may result from the specific research questions coming out of the previously made theoretical research.

2. Definition of requirements

The outputs of the above-mentioned phase will be used as the base for defining the requirements[4] that each project tool has to fulfil. Broader user involvement in concept

[4] The requirements are the result of the analysis and the key usability point that are needed for the users, and therefore need to be implemented.

thinking but also in the requirement definition may enable the findings of, otherwise, unidentified requirements (Roehrer, 2011).

To define these requirements, scenarios [5]of use will be defined looking after common patterns from the analysis of the qualitative research carried out with citizens.

From these scenarios, user stories[6] and requirements will drawn. At this point, the multidisciplinarity of the team will be crucial in order to ensure the "translation" of the citizens scenarios and stories need into feasible technological requirements.

3. Platform interface design and prototype

Mock-ups should be defined once the platform starts to be developed.This should be done in harmony with the user testing.

This is required to happen in order to check that the platform development flow and the interface design continuously satisfies the requirements. This should be done in an iterative way. Each new sprint may include the application (when possible) of the user's comments received in the previous iteration phase to test its convenience and the new designed requirements/flows may be tested.

4. Piloting

This phase takes place towards the end of the process. Its purpose is to check if the new platform or tool responds as expected to the different stakeholders'/users' needs in a daily use.

This means checking whether the requirements extracted from the user's feedback in the first phase are properly implemented and translated into the platform.

5 CHALLENGES

One of the biggest challenges that all projects participating in TRUSTCHAIN OC1 must face is **time**, which depends on the sample and the methodologies selected to carry them out. Locating end-users and getting them to participate in the time frame the team has planned, can be complicated and the process may be delayed. It is therefore

[5] Different ways of use the use case.
6 General explanation of a software feature written from the perspective of the end user

recommended that more people are contacted than the number identified for the sample. This will make it easier to reach the numbers during the project.

Another challenge that projects funded in OC1 may face, is the **access to the end-users**. This means that only one team, usually not the research team, has direct contact with the users. Despite possible reluctance, it is necessary for the research department to have direct access to users in order to be able to carry out the designed methodologies with them and collect the necessary information.

Another possible challenge is to make the designs **stand out from the market competitors**. The interface must be accessible and usable. However, the balance between innovative and differential designs must be found, but perfection is not sought in theoretical terms.

Another challenge faced by OC1 funded projects is **integration.** Integration involves the design of the sections, buttons and functions in a way that must be fully interrelated.

In addition, consideration has to be given to the possibility that, when dealing with digital identity issues, **users may feel reluctant about the use of their data**, transparency issues with developers, and so on. To avoid such reluctance in validation sessions, one possible way is to ask them to participate in the sessions without the need for them to register. That way, they can see how the digital solution works and start the process of trust and engagement with the product.

Constructing an empathetic design, this is one of the main challenges. Because as Hudson (2008) explains, "the people who are the best at creating technology are often the worst at understanding how and why other people find it difficult to use".

Another challenge is the ability to **combine, sometimes conflicting needs of different end-user groups**. This challenge has many faces depending on the specific scenarios where conflicts appear. Depending on the different users and the topic of the decentralised digital identity, a conflict can appear around the demo, the features and the pricing or business model.

In order to overcome the above challenges, it is necessary to follow a multidisciplinary design, field research of users and a collaborative design technique such as card sorting.

6 RISK AND MITIGATIONS

Risks	Mitigation actions
Do not have enough time to conduct the methodologies and to translate them into design specifications	Before starting the project, organise the tasks, the activities, and deliverables, foreseeing that some activities could be delayed for external reasons.
Do not have access to people who are the end-users	Contact associations, organizations, institution, post a survey online that your end-users could sign, or use Facebooks groups as a way to contact the end-users you need.
The design does not stand out from the market competitors	Study the design of your competitors and detect their weaknesses and try to improve your design overcoming these weaknesses
The components are not well integrated	From the beginning, pay attention that all components have a coherence of being together and that they have a link, and that this link is also perceived by the user.
The design is not usable by the end-user	Go back to the data of their needs and try to redesign the solution answering their needs and in the simplest and easiest way.
After the sessions there is contradictory information from the end-user	If groups have many conflicting requirements, a possible solution is to create two interfaces adapted to each user category, to respond to their needs. If not, try to find common grounds and try to address conflicts in a way that it is not limiting for the other user.

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Participants do not want their personal data collected during the pilot	Ask them to try it out without the need for them to register

7 REQUIREMENTS

Decentralised user identity management that will have successfully implemented a human-centred approach will be one of the main outcomes of the months of work of OC1. During the 9 months the projects need to develop their solution. To do so, implementing the UCD, **the first step is to create a roadmap** with the methodologies that better suit the projects' objectives and the phase in which the project team will gather information about the participants. Once the various methods are identified, the user sample needs to be defined.

7.2 REPRESENTATIVENESS

The sample needs to be representative, which means that it must have the appropriate size, has been selected using a random procedure, and the characteristics observed in the sample correspond to the population from which it was drawn (Ras, 1980). It is not possible, in any case, to be certain of the degree of representativeness, but there should be a reasonable probability of representativeness.

Representativeness is a function of several factors, depending not only on randomness and sample size, but also on the sample design, which is very specific to each case, the use of key auxiliary information, the sample design, and a useful and up-to-date sampling frame. The term representative is used as long as the sample faithfully represents the variable under study, which has a probability distribution in the population and the frequency distribution in the sample should be a mirror or very similar to that of the population.

Representativeness can be achieved through.

- sample selection (selecting careful few participants after a careful study of the sociodemographic composition of the target audience (Ladner, 2014)) to represent,
- or though sample size (Omair, 2014). It is essential to have the required sample size as well as to select a representative sample using the appropriate sampling

technique. Among others some sample techniques are purposive sampling, random sampling, simple random sampling, stratified random sampling, cluster sampling and systematic random sampling (Singh et Masuku, 2014).

The different methods to be followed should mostly be qualitative research methods. It is possible to complement the data collected in the qualitative sessions with other quantitative methods. These can only be complementary. It is not possible to base the whole research on a quantitative questionnaire and use qualitative methods as a support.

7.2 CO-CREATION

Another requirement is the inclusion of users or potential users during the co-creation phase (if applicable) and the validation phase Include users and stakeholders or potential users during the validations and the co-creation phase of the tool. Complementarily, insights can be proposed by non-users. This decision must be justified in the corresponding deliverable. One example of a methodology that is not carried out with users is usability testing with experts that can provide a lot of usability knowledge in general terms, but not as rich as the data provided by end-users. Ultimately, both methods and samples could be combined as the experience has two components: the subjective or user-perceived component, related to emotions triggered by the use of the digital product or service, and the objective or technical component, referring to design principles, best practices, and any other elements of the experience that are more likely to be seen only by experts.

7.3 VALIDATION

The main requirement in the Open Call 1 is that all the tools are validated by the end-users of the decentralized digital identity solution.

Once the tool is ready on a TRL 7 and the use case is completely developed, it must be validated. The validation process consists of conducting usability tests, could be moderated or unmoderated. In the validation process, the tool will be passed, or it will need some implementation before launch.

It could be possible that after the launch some implementation will be needed. So, in this process it is key to evaluate and justify the launching of the solution to the market. In every usability test there will be some requirements and specifications to implement in order to refine the human centric approach. But, if these requirements are not fundamental to use the solution, it could be launched.

7.4 ITERATION

The **last requirement involves iteration, in the case of digital solutions that are already created with a medium TRL, at least one iteration is sought,** that is, a validation round with users in which the status of the tool is acknowledged and improvements implemented. In those projects that are going to carry out a preliminary study of needs identification and/or co-creation with the end users, it is required that the feedback from the users has been correctly implemented in the development of the digital solution.

8 EXPECTED OUTCOMES

Regarding the user centred approach, there are several expected outcomes that are requested to the TRUSTCHAIN OC1 funded projects, which are the following:

- Frame the sample and the ideal candidates to participate in the research. Based on the representativeness requirement (See Section 6.2)
- Define and describe all the recruitment process either for the co-creation ideation stage and/or the validation stage of the project.
- While the sample is being framed, the methodological roadmap must be prepared. In the document it is requested to define the specific methods to answer the project objectives.
- To have the information about the piloting execution, it will be necessary to adequately describe the phases.
- Reflect the pilot analysis made by the team, showing the key point that were raised from those sessions.
- Reflect the decisions that the team made about the iterations and justify them with the pilot analysis.

The results of all the processes are to develop an empathetic design. This design should integrate all the design specifications provided by the users that participate in the previous pilots. The design needs to be validated but a representative sample and the final prototype needs to be validated by the end-users.

Because users should be the centre of the solution, the whole process should take into account their needs and perspectives.

The overall expected outcome is to build a decentralized digital identity solution that is a more efficient, satisfying, and provides a user-friendly experience for the users.

9 CONCLUSIONS

This deliverable has been explained the HCA and UCD procedure and all of its the stages, and discussed how they should be implemented by the Open Call 1 projects, following the specifications of TRUSTCHAIN. It also exposed some guidelines on how to incorporate the users in the research process and provided some examples, and it identified the challenges, risks and proposed mitigations, requirements and expected outcomes.

A human

-centred approach should be incorporated in all aspects of the creation, design, development, and validation of a digital product, with special emphasis in the creation and validation processes that are where the potential end-users will participate. Throughout the process, end-users should be actively involved, providing their feedback and insights to make the product successful. From the initial design phase, it is important to consider the needs and preferences of the users, as this will determine the direction and functionality of the decentralised digital identity digital solution. During the development stage, the end-users should be interviewed to evaluate the product's usability, and to refine the design and features based on their feedback. User testing should be carried out frequently to ensure that the digital product is meeting the user's needs, and that the design and functionality of the product are aligned with the user's expectations. In the validation phase, the end-user's feedback remains critical to assess the effectiveness of the digital product, and to make any necessary changes. Ultimately, a human-centric approach ensures that the digital product is designed to meet the needs and preferences of the end-users and will result in a product that will be well received, used frequently, and achieve the desired outcomes.

To satisfy the requirements, product creators should take a predominantly qualitative approach, which can be complemented with quantitative methods. By combining these methodologies, product creators can gain a comprehensive understanding of their users and create products that meet their needs. It is important to note that user needs and feedback can change over time, and it is crucial to continually gather data and reassess the product to ensure that it remains relevant and user-friendly.

Involving users in the creation and validation phases of digital products is paramount to producing products that satisfy customer needs and expectations. Developers can embrace several tools to connect with users throughout the design process, including usability testing, surveys, and focus groups. For instance, through usability testing, developers can gain real-time feedback on how customers interact with products, which aids in refining the user experience. In addition, surveys provide a platform for customers to express their preferences and opinions, thereby enabling developers to

tailor their products accordingly. Meanwhile, focus groups can offer more in-depth insights into customer attitudes, motivations, and behaviours, leading to more targeted and effective product design. Incorporating users in the creation and validation phases of digital products not only enhances customer engagement but also drives profitability.

To ensure the best possible user experience, a comprehensive onboarding strategy should include setting goals and objectives, organizing user information, and providing the right resources, such as user guides, tutorials, and customer support. Furthermore, an effective user onboarding strategy should take into account the user's preferences, provide tailored support, and be continually monitored and evaluated. With careful planning and proper resources, a digital solution launch can be successful and lead to positive user adoption.

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APPENDIX 1

Observation Guide

What are users doing? The solution could be designed with other interaction flow.

- Do they understand what to do in order to achieve one objective within the app?
- Do they follow the same steps that the team thought they'd do?
- What are their steps?
- How do they feel during the process?
- Do they stop interacting with the solution? When?

What routines do users have with the product? How are they integrating it into their lives?

- Do they integrate it during their routine?
- When and where do they integrate it?
- If they do not integrate, why so?

During all observation sessions recording details, it'd be better if you can record the session to obtain specific data such as, clicks, time, etc. Ensure you're examining activities in their whole; look at how the product is used in context with their device and the flow of their lives and not just at the product itself.

And also observe all attitudes and behaviours that you think it could be repeated in other sessions.

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