



D2.2 Guidelines for inclusive design processes for digital products and services

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Authors: Mike Bradley & Joy Deane, Engineering Design Centre, University of Cambridge (UCAM)

Contributors: Anke Bracke & Sam Delespaul, Mobiel21

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Coordinator: Silvia Gaggi

Email: sgaggi@isinnova.org





Executive summary

The Inclusive Design Wheel offers a structured process for generating solutions to challenges, with an emphasis on creating solutions that are usable by as many people as reasonably possible. This approach can be applied to specific problems affecting a particular user group, all the way up to addressing widespread societal challenges. It is a flexible, managed creative design process, which provides for explicit design iteration and addresses the need for measurement of success.

There are three principal phases, *Explore*, *Create* and *Evaluate*, which are mediated by activities coordinated in the *Manage* phase. The approach and activities in each phase are outlined briefly within this document to provide easy to refer to guidance for project teams aiming to design an inclusive solution.

The process starts in the *Manage* phase with the *Review progress & agree next steps* activity. This facilitates the fledgling team to think about the goals of the project and then to identify and start putting together the team and stakeholders who may be able to support the project. Other activities in the *Manage* phase support team communication and focus and develop the arguments for putting the solution into practice.

Once the project team is sufficiently formed, they carry out a selection of activities in the *Explore* phase to help them understand the problem(s) that they are going to address. These include understanding who the relevant stakeholders are, and examining available information to help them understand the users' needs. Based on this, the team then identifies the goals of the project in terms of the needs to be addressed and potential key performance indicators for the project.

In the *Create* phase, the emphasis is on finding as many potential solutions to the needs as possible. The bigger the potential solution pool the team can choose from, the better the final solution is likely to be. As a part of this process, examining the results of the scenario-building process from Dignity's deliverable D2.3 can help to contextualise and understand the problem in more detail, and can inspire ideation. There are also various methods to stimulate the generation of ideas and concepts. These ideas can then be developed into more cohesive concepts which can be expressed in storyboards and prototypes for team and wider communication.

The *Evaluate* phase captures the activities that need to take place to ensure that the project is on track, and will deliver a solution that solves the needs identified in the *Explore* phase. An activity prompts the team to check that the project is aligning with the requirements of the Key Performance Indicators (KPIs) and that the KPIs still reflect the goal of the project. The *Identify improvements* activity reminds the team to seek opportunities for improvement in the solution, following the evaluation activities. The remaining activities focus on gaining useful guidance and information from users and stakeholders, experts and through exclusion assessment.

Specific guidance for the Dignity pilots to appropriately adopt and adapt the process for their needs is contained in this document, although further help and guidance is available from the authors and at www.inclusivedesigntoolkit.com.





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1. How does this deliverable fit into the wider Dignity project?

1.1 Dignity Project Summary

The overarching goal of DIGNITY is to foster a sustainable, integrated and user-friendly digital travel eco-system that improves accessibility and social inclusion, along with the travel experience and daily life of all citizens. The project delves into the digital transport eco-system to grasp the full range of factors that might lead to disparities in the uptake of digitalised mobility solutions by different user groups in Europe. Analysing the digital transition from both a user and provider's perspective, DIGNITY looks at the challenges brought about by digitalisation, to then design, test and validate the DIGNITY approach, a novel concept that seeks to become the 'ABCs for a digital inclusive travel system'. The approach combines proven inclusive design methodologies with the principles of foresight analysis to examine how a structured involvement of all actors - local institutions, market players, interest groups and end users - can help to bridge the digital gap by co-creating more inclusive mobility solutions and by formulating user-centred policy frameworks.

The idea is to support public and private mobility providers in conceiving mainstream digital products or services that are accessible to and usable by as many people as possible, regardless of their income, location, social or health situation or age; and to help policy makers formulate long-term strategies that promote innovation in transport while responding to global social, demographic and economic changes, including the challenges of poverty and migration.

By focusing on and involving end-users throughout the process of designing policies, products, or services, it is possible to reduce social exclusion while boosting new business models and social innovation. The aim of DIGNITY is to provide an innovative decision support tool that can help local and regional decision-makers formulate digitally inclusive policies and strategies, and digital providers design more inclusive products and services.

1.2 Objectives of Deliverable 2.2

The deliverable contains the guidelines developed in task 2.2.1 to apply the Inclusive Design Wheel approach adapted for the specific needs of digital mobility services in the context of DIGNITY. This adapted wheel will be used as a basis for guidance for the pilot co-creation event inputs and activities in the four pilots, in conjunction with a template for capturing information in task 3.2.

Based on the information and feedback collected from the pilot cities and regions, the methodology will be honed for exploitation in task 2.3.

Due to the breadth of possible goals in the pilot projects, it is not envisaged that all of the activities described in this document will be applicable to all the projects. Thus this document contains guidance for a **range of possible activities**. The pilots need to decide which of these are appropriate for them and manage their projects accordingly. **Not all the activities will be**





required for all projects. The Engineering Design Centre team at the University of Cambridge (UCAM) will be on hand to help guide and provide inclusive design expertise to the pilots where appropriate.

1.2.1 Relationship between this and other relevant Dignity deliverables

The Inclusive Design Wheel (IDW) approach utilises the information gained from many of the previous Dignity activities to provide the background context, rich user insights and potential future scenarios to help the teams predominantly in the process of identifying the correct problems to solve:

- Framing the digital gap (Dignity task 3.1) which provides input to the IDW *Manage* (in particular, the stakeholder mapping) and *Explore* phases.
- Customer Journey Mapping (Dignity task 3.1.2) which provides input to the IDW *Explore* phase.
- Scenario Building (Dignity task 3.3) which provides input to the IDW *Explore* and *Create* phases

1.3 Outline of this deliverable

This deliverable contains the information required for project teams to be able to carry out an inclusive design approach in the context of Dignity with their selected stakeholders. Section 2 contains key information to understand the British Standard definition of Inclusive Design, what digital exclusion is, and the rationale behind an inclusive design approach. Section 3 covers the inclusive design steps and process. Section 4 describes how this will be implemented in the Dignity pilots.





2. Introduction to Inclusive Design and Digital Exclusion

2.1 What is Inclusive Design?

Inclusive Design is defined in the British Standard BS7000 (BS 7000-6: 2005 - Design Management Systems. Managing Inclusive Design. Guide – BSI British Standard, 2005) as:

“The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible, on a global basis, in a wide variety of situations and to the greatest extent possible without the need for special adaptation or specialised design.”

Often called ‘Universal Design’ in the USA and ‘Design for All’ in continental Europe, Inclusive Design offers a response to the increasing challenge of satisfying the requirement to account for diversity and to meet the needs of groups who are often under represented in design teams, such as women, migrants, people of low income and education as well as older people and people with capability impairments (Clarkson et al., 2015).

Designing inclusively enables leading organisations to develop products and services which exclude fewer people and delight more people. Furthermore, doing so can benefit the wider society – the first cordless kettles were developed for people with arthritis who found plugging and unplugging a cord difficult. Now we all use them because they are easier and quicker to use (Clarkson et al., 2007). More recent application of visual inclusive design to the images of products used in a digital ecommerce interface has not only substantially reduced exclusion but has also resulted in increased sales of the products for the manufacturer (Goodman-Deane et al., 2018).

2.2 Why design inclusively?

The goal of designing inclusively is to provide mainstream products and services appropriate and usable by as many people as reasonably possible. It is recognised that people can feel excluded from a product or service for many different reasons – including culture (‘that’s not for me - it’s meant for others’), language (including jargon – ‘that’s not for me – I don’t understand it’), capability (‘that’s not for me – I can’t read it’), ageism (‘that’s not for me, that’s for young people’) and attitudes (‘I don’t do that’).

The focus on the work at the University of Cambridge’s Engineering Design Centre has been to research the exclusion caused primarily through capability impairments, in vision, hearing, thinking, reach, strength, dexterity and mobility. The experience of designing products and services inclusively has shown that appropriate application of Inclusive Design tools has benefits beyond identifying and solving issues that exclude only those with capability impairments. Application of the tools has identified many products and services with tasks so difficult that they also hinder users without capability loss from achieving their goals. This implies that the successful application of an inclusive design process has the opportunity to improve the user experience for many, if not all, users.



In addition, designing inclusively often has the attendant benefits of accommodating those who have no intrinsic capability loss, but are temporarily impaired. These situational impairments affect all of us from time to time and can arise from things like injury, illness, being occupied looking at a phone, being stressed, managing responsibilities for others (e.g. children, pets), alcohol, carrying food or drink, carrying baggage (or pushing buggies, cycles etc.), or even simply from feeling tired. These situational impairments can interact. For example, someone pushing a buggy with a child and carrying baggage may be stressed when trying to move quickly to board a train that is about to depart.

For the Dignity project, the emphasis for inclusion is on digital mobility services. One significant challenge in this domain, is the potential for exclusion caused by the access to the technology and connectivity required, as well as the digital interface capability of the user. The Dignity Survey results (from task 1.2) will provide data for the quantification of the potential levels of population exclusion that will arise from the digital mobility services envisaged, as well as provide some design insight into reducing the exclusion.

The desired effect of an inclusive design approach to the user experience can be shown in Figure 1.

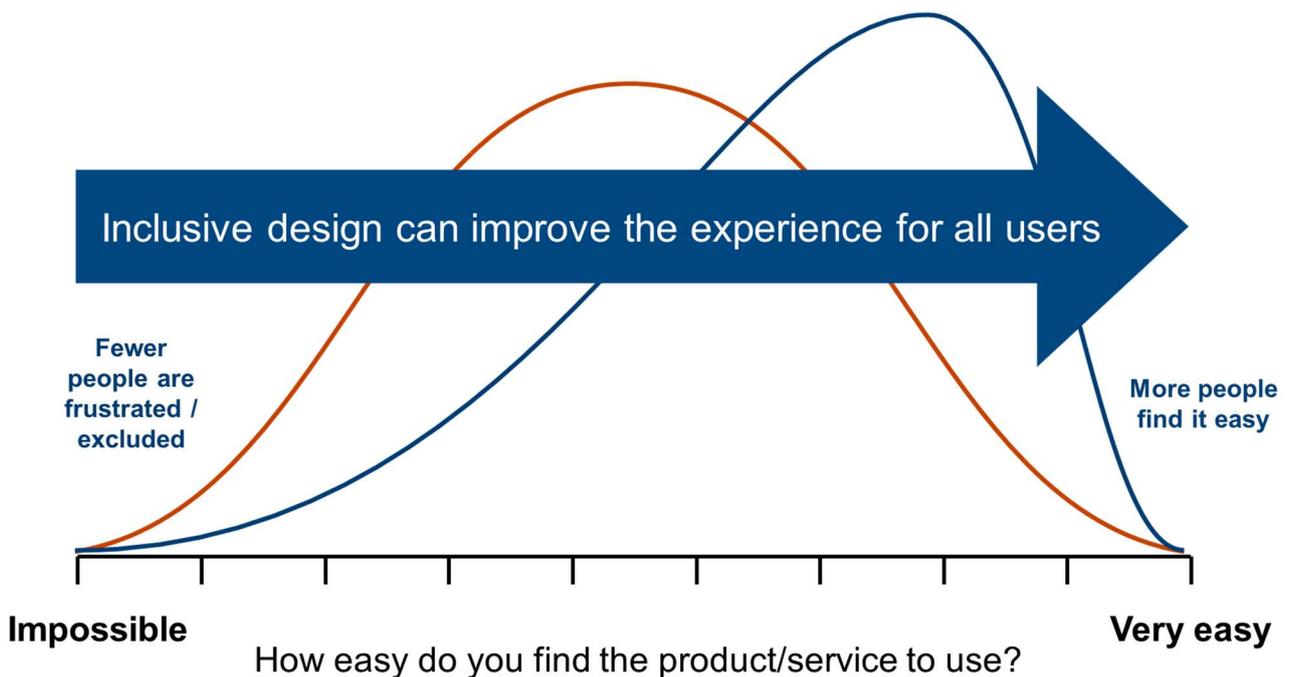


Figure 1: User experience and Inclusive Design



2.3 What is the Dignity approach to Inclusive Design, and why this is appropriate?

An existing, proven inclusive design process, developed by the University of Cambridge, has been refined for the domain of digital mobility services, in the context of the Dignity project. In particular, it has been made suitable for use by pilot regions leading the design activity with a selected stakeholder team. The approach makes explicit the principal design phases of *Explore*, *Create* and *Evaluate*. The key management and decision making phase, *Manage*, is also described in detail to ensure that the design team is able to focus on the most important parts of the iterative design process and are able to develop solutions which increase inclusion.

2.4 What is digital interface exclusion and what causes it?

Digital interface exclusion is the exclusion caused by the complexity, unfamiliarity and difficulty of an interface for people who do not have compatible characteristics. It closely relates to the concept of 'Digital Exclusion', which conventionally refers to lack of facility to access the internet, whether caused by issues relating to connectivity, cost, hardware or lack of skill. People who do not access the internet tend to have low digital technology capability and limited prior experience in using digital technologies (Bradley et al., 2013; Goodman-Deane et al, 2020a; Langdon et al., 2007).

People who experience digital interface exclusion are typically those who also have limited (or no) experience of using the internet, and the digital technologies that facilitate access to it. As a result of this low exposure to digital technologies, and often in tandem with a low desire to interact with technology can lead to digital interface exclusion. The model developed for understanding the relationship between the demand (made by the digital interface on the user) and the user's characteristics (their technical capabilities and desire to engage with digital technology) which cause exclusion for digital products is shown in Figure 2.



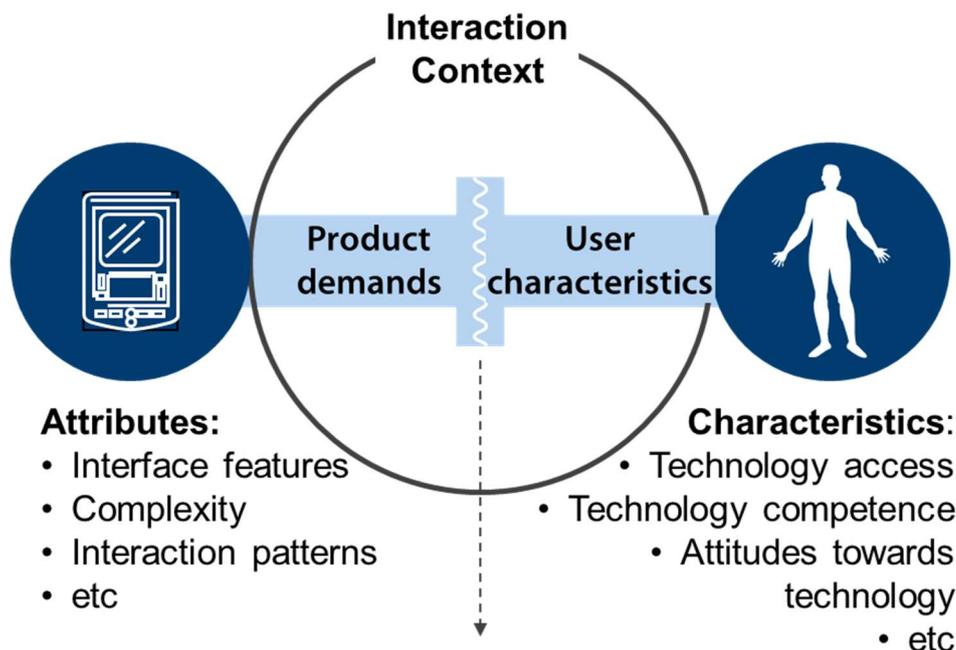


Figure 2: Model of demand and user characteristics which can give rise to exclusion for digital products. Taken from (Goodman-Deane et al., 2020a).

Everyone experiences digital interface exclusion from time to time. Examples include being unable to work out how to use a complicated ticket machine without needing assistance, or being unable to operate a satellite navigation system in a hire car. However, those who experience digital interface exclusion frequently in their lives will tend to avoid further digital technology interactions. As a result, their digital skills will fall further behind, and their reduced confidence in engaging and exploring digital interfaces will further impact their capabilities. This vicious circle of descending capabilities in the person, with continual changes to the way that digital interactions are carried out, can further increase digital interface exclusion.

From a recent survey (Goodman-Deane et al., 2020b) to explore the prevalence of digital interface exclusion, eight simple digital interface performance tests were presented to a quota sampled proportion of the UK population. An example task is shown in Figure 3, where participants were shown a paper image of a Google maps app on a smartphone. They were asked “What would you do to see a menu with more options?”. The results show that only 59% of the population correctly identified the ‘burger menu’ icon in the top left part of the interface (circled in pink on this image only, not on the tested image), and over 20% said that they didn't know.

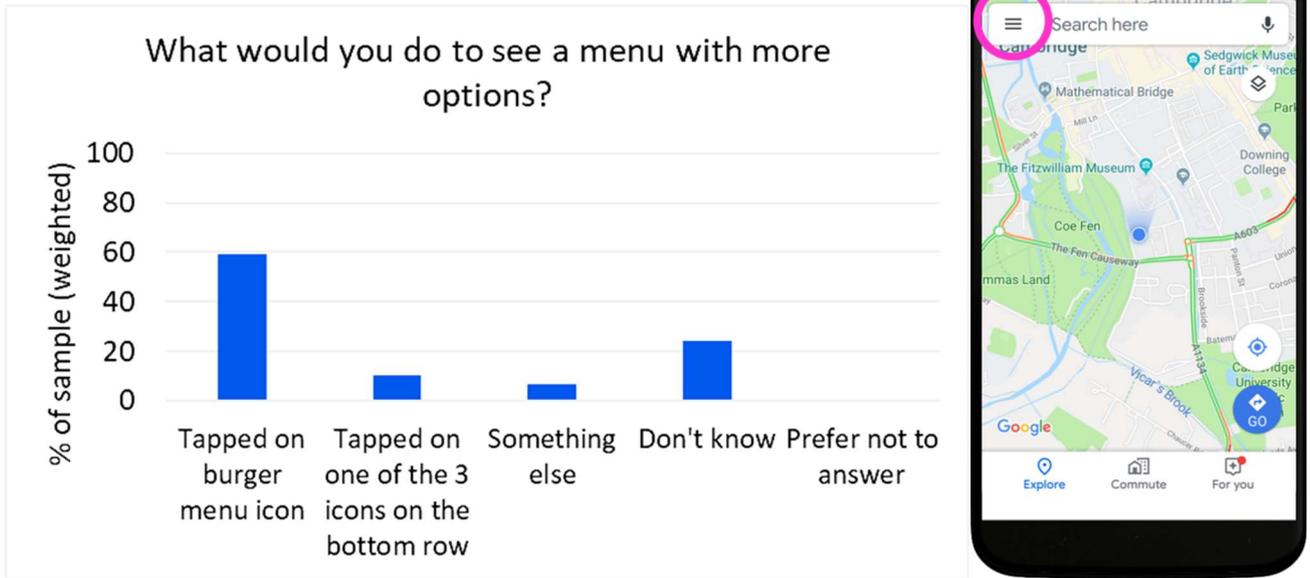


Figure 3: One of eight survey questions used to test digital interface capability in the survey described in (Goodman-Deane et al., 2020b)

Typically people who experience significant digital interface exclusion will be older, although other factors include education level and socio-economic grouping (Goodman-Deane et al., 2020b). Of the eight interface tasks presented to the participants, the number of tasks performed correctly declined with increasing age (see Figure 4). It is important to note that 27% of the over 65's and 45% of the over 75's did not answer any of the eight tests correctly.

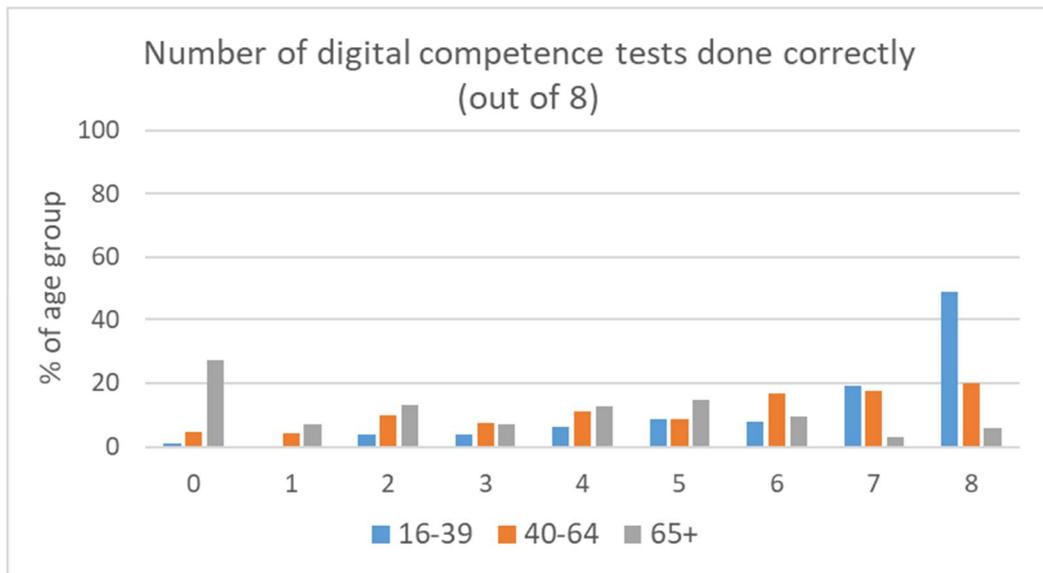


Figure 4: Summary results from the eight survey questions presented to test digital interface capability by age cohort (Goodman-Deane et al., 2020b)

2.5 Designing for digital interface inclusivity

Successful engagement with digital interfaces involves a range of user characteristics, key ones of which are summarised in Figure 5 (Goodman-Deane et al., 2020b). In particular, previous research (Langdon et al., 2007; Wilkinson et al., 2009; Bradley et al., 2015) has shown that basic technology competence depends on prior experiences with related digital technologies, which help to develop mental models of how similar technologies behave. In addition, psychological factors play a big part since many digital interfaces rely on a set of attitudes in the user, such as a willingness to engage with new technology and to explore an unfamiliar interface. Thus, those who do not like interacting with technology will have neither the willingness to engage and explore, nor the prior experience to bring to bear on using a new digital interface.

This can result in high levels of exclusion. Previous work carried out by the University of Cambridge team shows that many people lack the digital technology prior experience and attitudes required to engage with digital technologies successfully (Goodman-Deane et al., 2020a).

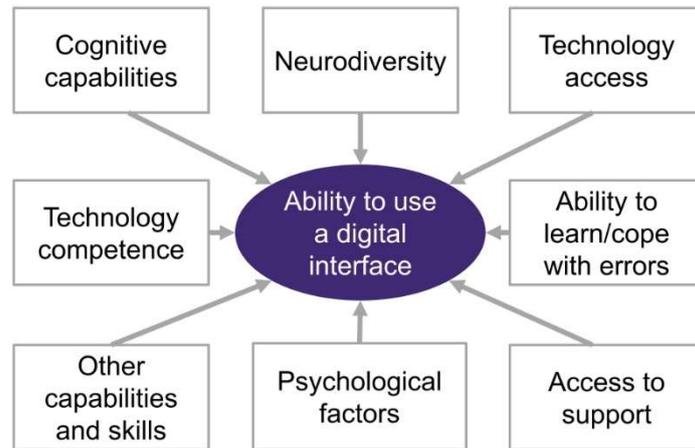


Figure 5: Key user characteristics that affect a person's ability to use a digital interface. Taken from (Goodman-Deane et al. 2020a).

Therefore, a key challenge is to design so that interfaces will be useable by people who only have prior experiences with analogue interfaces, and are easily put off by interfaces that appear complicated. An example of two interfaces that achieve the same goal (that of controlling a heating and air conditioning system for a hotel room) appear in Figure 6. One is significantly more digitally inclusive than the other.



Figure 6: Two examples of digital temperature control interfaces

The control interface on the left of Figure 6 looks more sophisticated and complicated than the one on the right, and may well have more functionality. However, this appearance alone is likely to put off someone who is nervous of using digital technologies from even



attempting to use it. If they do attempt to use it, they may or may not notice the '- O +' labels beneath the screen which attempt to indicate the location of three integrated touch controls. The O acts as a menu button and allows the user to access different functions. This interface has prioritised functionality and appearance over digital inclusivity and usability.

The control interface on the right, although also digital, provides relatively clear labelling for the four controls, although the power symbol for the top right button requires either prior knowledge or willingness to explore the interface to discover what it does. The fan control button cycles through four fan speeds and the screen displays a number along with the word 'Fan' to indicate this. Whilst this interface may not be perceived as so attractive or modern as the other one, for many people this would be the only one that they would be able to use successfully.



3. The Inclusive Design Wheel approach

3.1 Overview of the Inclusive Design Wheel Process

3.1.1 Background

The Inclusive Design wheel was developed by the Engineering Design Centre at the University of Cambridge to help designers to structure the inclusive concept design process. More information about the general version of the Inclusive Design Wheel is available at <http://www.inclusivedesigntoolkit.com/>, along with further information.

The principle behind the wheel is that a design process is iterative. Furthermore, although there are individual activities in each phase, the sequencing of these is dependent on the decisions taken by the team in the central *Manage* phase.

The wheel has been developed from previous work (Clarkson et al., 2007; Waller et al., 2015) within the Dignity Project to make it more specific to the needs and context of digital transport products and services, and to interface with other parts of the Dignity approach such as the self-assessment framework, customer journey mapping and scenario building.

3.1.2 The top level inclusive design wheel

At the top level, Figure 7 shows that the inclusive design wheel consists of four main phases:

1. **Manage:** Review the evidence to decide **'What should we do next?'**
2. **Explore:** Determine **'What are the needs?'**
3. **Create:** Generate ideas to address **'How can the needs be met?'**
4. **Evaluate:** Judge and test the design concepts to determine **'How well are the needs met?'**

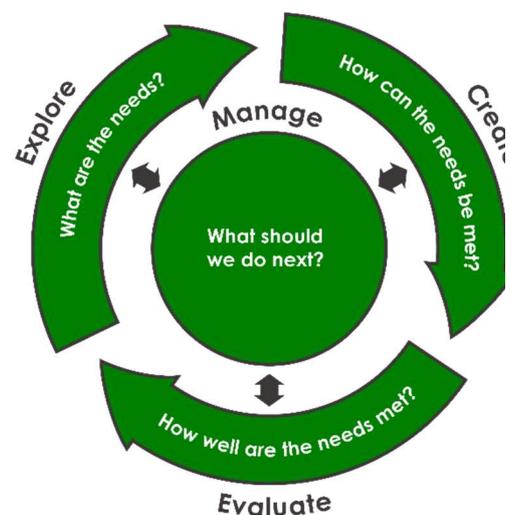


Figure 7: Overview of the inclusive design wheel

3.1.3 How do the phases fit together?

Figure 8 shows that successive cycles of the *Explore*, *Create* and *Evaluate* phases are used to generate a clearer understanding of the needs, better solutions to meet these needs and stronger evidence that the needs are met. The *Manage* phase guides the process, keeping it on track.

The inclusive design process is necessarily iterative – as all design processes are. Mediated by the management decisions identified in the *Manage* phase, the team will carry out activities in all the phases multiple times before the end of the project.

The key to a successful inclusive design process however, it to ensure that the *Evaluate* phase is explicit, and recognised as an integral and essential part of that iteration, to ensure that which is created is going to achieve the goals agreed by the team, and provides a solution for the identified users. Therefore, it is important to include an *Evaluate* phase in early iterations, in order to test the ideas and concepts early and often. To achieve this, it is recommended that design team evaluate rough prototypes, mock ups or storyboards, early enough in the process that meaningful change is still possible. This evaluation can take multiple different forms, as described in the section on the *Evaluate* phase.

If a project team has an existing design process, they may find it helpful to check whether it already includes some of the key activities in the wheel, or whether they have other activities that can help contribute to one or more of these phases.

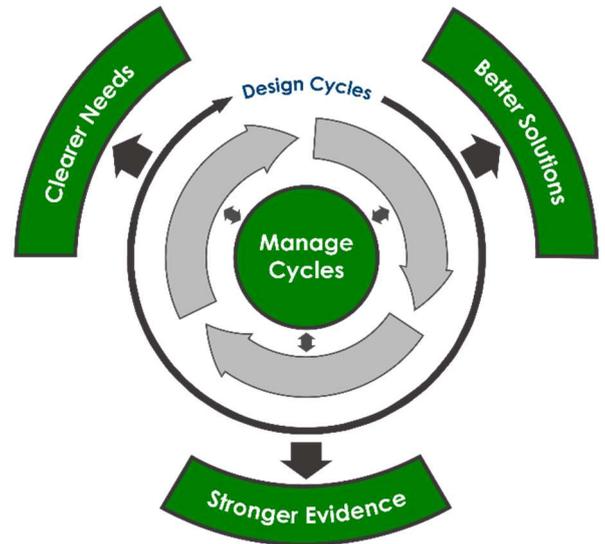


Figure 8: The iterative nature of the inclusive design wheel

3.1.4 The Dignity Inclusive Design Wheel

Each of the phases includes several activities, as shown in the diagram in Figure 9. Each of these activities is described in more detail in the section on its phase. Some of the activities are essential and others may be more relevant for some pilot projects than for others, or for different stages within a project.

The process starts within the *Manage* phase with the fledgling team identifying the nature of the project goals and starting to build the larger team that will carry out the project work. They also start to engage the stakeholders whose support and input are required for the project to be successful.

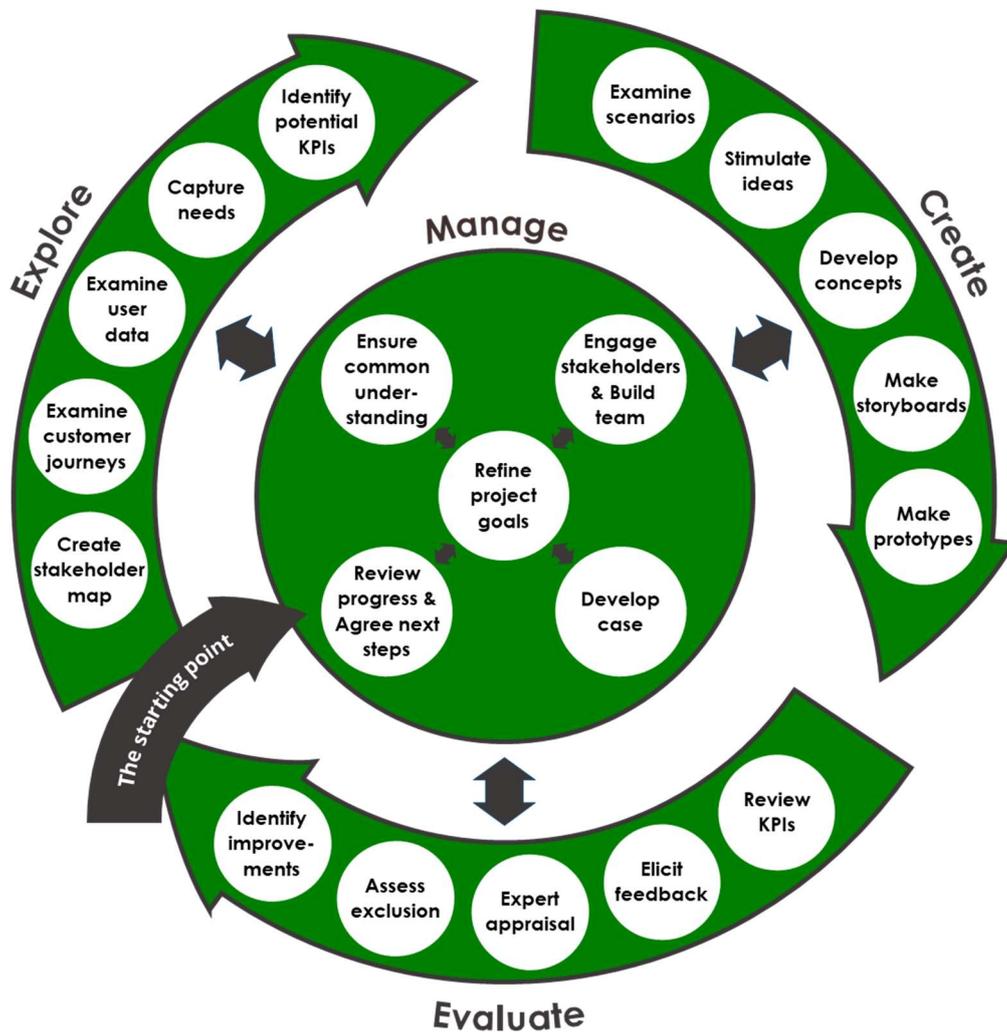


Figure 9: Dignity Inclusive Design Wheel with detailed activities in each phase adapted from (Clarkson et al., 2007; Waller et al., 2015)

3.2 The Manage phase

3.2.1 Overview of the Manage phase

Project management is vitally important to keep a project on course and on budget. It determines what further work is needed and when to move on to the next stage. To do this effectively, it is important to review your progress and refine your goals, as well as to ensure good communication between project partners.

Activities in the *Manage* phase (see Figure 10) include:

- Review progress and agree next steps
- Refine project goals
- Ensure common understanding
- Engage stakeholders and build team
- Develop case

Each of these activities are described in more detail in the rest of this section.

Key principles to keep in mind during the *Manage* phase include:

- **Repeat to refine.** The process of evaluation should lead to a clearer understanding of 'What matters?' for users, the business, the wider society and the planet. Successive cycles of *Explore*, *Create* and *Evaluate* should improve the solutions and eventually deliver one lead concept.
- **Plan to be flexible.** Make sure the plan can accommodate the 'game-changers' that are inevitably discovered during the process.

3.2.2 Review progress and agree next steps

The starting point for the inclusive design wheel process is to review your current status and plan the next steps. In the Dignity pilots, the teams will start the inclusive design wheel process after conducting various other activities, such as scenario building activities and the self-assessment framework. We recommend that the team reviews what activities they have already done, how these map onto the activities in the *Explore*, *Create* and *Evaluate* phases and what they have found. The teams can then decide on an informed approach to determining what needs to be done next.

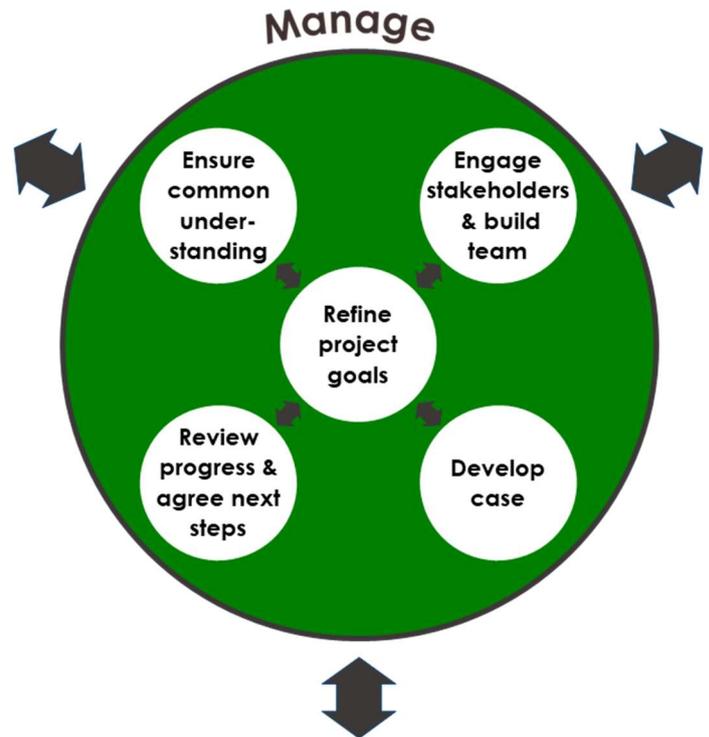


Figure 10: Activities within the *Manage* phase



The following questions help with this review activity:

- What have we got?
- What are we missing?
- What resources are available?
- What are the deadlines?
- What are the risks?
- What should we do next?

Reviewing and planning should continue throughout the project, monitoring the current level of confidence in:

- The understanding of the stakeholder needs, developed through the *Explore* phase
- The concept solutions that satisfy those needs, produced by the *Create* phase
- The evidence that these solutions meet those needs, provided by the *Evaluate* phase

3.2.3 *Refine project goals*

The aim of this activity is to ensure that the project remains on track to solve the identified issue/s, or get agreement to make explicit changes to the project goals.

The first iteration will involve identifying the project goals. This includes identifying the target user group and scenario of use. Later on in the process, this activity will involve checking that the project is still on track to address these goals. If not, the work can be modified to put it back on track, or explicit changes can be made to the project goals.

The goals state the factors that will make the project successful. Determining and refining the goals of the project underpins the whole process of inclusive concept generation, as it provides focus and direction for all subsequent activities. The following questions can help this activity:

- What problem are we trying to solve?
- What are the big issues?
- Which people are currently being excluded, and why?
- What is the proposed solution and how does it improve the situation?

Reducing the problem statement and solution summaries down to one or two sentences helps to capture the real essence of what the project is aiming to achieve. These statements should be outlined at the beginning of the project, and updated and refined throughout concept development.

During the main phases of the project, it is often easy to get stuck in the detail and find it difficult to see the way forward. Such difficulties can often be resolved by referring back to or clarifying the goals for the project.





While delivering the lead concept to market, the clear statement of project goals should be used to prevent subsequent decisions and compromises from eroding the concept's strength.

3.2.4 *Ensure common understanding*

Ensuring common understanding is about making explicit the need for the project team to have:

1. A shared vision of the project goals
2. Alignment with an agreed plan
3. A common terminology

To address the third, it is important to seek out and resolve the communication difficulties that can easily occur due to the diverse range of backgrounds amongst different stakeholders.

Acronyms and jargon benefit from being precise but may not be understood by all team members. Examples include 'Wi-Fi', '4G' and 'http://'. Conversely, everyday words may appear to be understood but can easily be misinterpreted (e.g. user, client, customer, design and test). A glossary of terms with agreed definitions for the project can provide a simple but valuable solution to these issues.

3.2.5 *Engage stakeholders and build team*

This is an ongoing process – the team evolves as the project progresses to take advantage of different contributions and skills. The stakeholders need to be kept engaged appropriately depending on their influence and interest in the project.

This is very important because stakeholders:

- can provide important information for understanding how the system works and what could go wrong and why;
- can be affected by problems with the current system and it is important to give them some say in how these are addressed;
- can provide helpful suggestions on how to address the problems;
- may be affected by the changes that will be made;
- may be able to help implement the changes and to sustain them in the future.

This activity is related to the *Create stakeholder map* activity (Section 3.3.2) in the Explore phase. However, rather than focusing on identifying stakeholders, the current activity focuses on keeping these stakeholders engaged throughout the whole process. These two activities are linked. For example, a project may start with an idea of who the stakeholders are. They may then be invited to an initial meeting where, through activities such as the *Create stakeholder map* activity, further stakeholders may be identified, who need to be involved in later work.





A key strategy for encouraging continual involvement of stakeholders is to invite them to key project meetings, where they can be directly involved in the discussions and provide immediate input. In particular, their input is essential to make sure that the understanding of the current situation is accurate. Stakeholders can explain how things actually work in practice, rather than in theory, and how issues are currently tackled. They provide crucial insight into the problems in a system and how these can best be addressed.

When organising such meetings, it is important to give careful thought to who and how many people to invite, and how well they might work together as a group. A group size of about five to 12 people tends to work well, as it allows a number of different perspectives to be represented, while remaining small enough to manage well. If the groups become too large (over 15 tends to be unwieldy), then it may be worth asking those who represent a similar perspective to select a single delegate to the session.

When setting such meetings up, remember that some professional groups will require significant advance notice, for example, some senior stakeholders may require two months notice. Also bear in mind the possibility of them cancelling and the need to rearrange the meeting. Remember that input from different stakeholders may be most valuable at different points in the process and it might not be necessary to invite all of them to all of the meetings.

Other ways to engage stakeholders might include:

- using smaller subgroups to feed into the main discussions;
- conducting surveys to elicit people's opinions and preferences, particularly where there is a key stakeholder group who cannot be represented at the meeting;
- obtaining senior management buy-in and permissions outside the main meeting;
- keeping people informed of proposals and decisions to ensure continued support and acceptance of new measures;
- appointing 'champions' who are influential and enthusiastic about the project to encourage other stakeholders to accept it and take part in it.

3.2.6 *Develop case*

This step involves reviewing evidence from the evaluation activities, identifying important evidence and collating it into a case for the concept to be taken forward. The exact nature of the case will be heavily dependent on the key stakeholders who may need to be convinced. In the Dignity project pilots, these stakeholders could include funding bodies, politicians and the general public.

The case for implementation demonstrates the potential for success for a proposed solution, in the context of the investment and running costs, and any other potential disadvantages. It enables key stakeholders or budget holders to assess the viability of the proposal.

The case may include collating the following information:

- Timescales for proposal implementation



- Provision of cost estimates for investment (capital expenditure - capex) and running costs (operating expenditure - opex) for the proposal
- An evaluation of the utility of the benefit of the proposal to the users, communities and businesses affected
- A reduction in population exclusion as a result of implementation of the proposal
- Assessment of the scope of the target market

3.3 The Explore phase

3.3.1 Overview of the Explore phase

The *Explore* phase is about gaining a deeper understanding of the criteria that the project needs to fulfil. This is important to ensure that the resultant product or service meets the right needs.

This phase involves understanding the needs of all the stakeholders. These include the end-users but also all who have something to gain or lose from the product. In Figure 11, the various activities are shown that can help to build this understanding and then draw the findings together:

- *Create a stakeholder map* - of the people involved with the product or service
- *Examine customer journeys* - from earlier in the Dignity project
- *Examine user data* - including previous Dignity results
- *Capture needs* - of stakeholders including users
- *Identify potential KPIs* - Key Performance Indicators

Each of these are described in more detail in the rest of this section

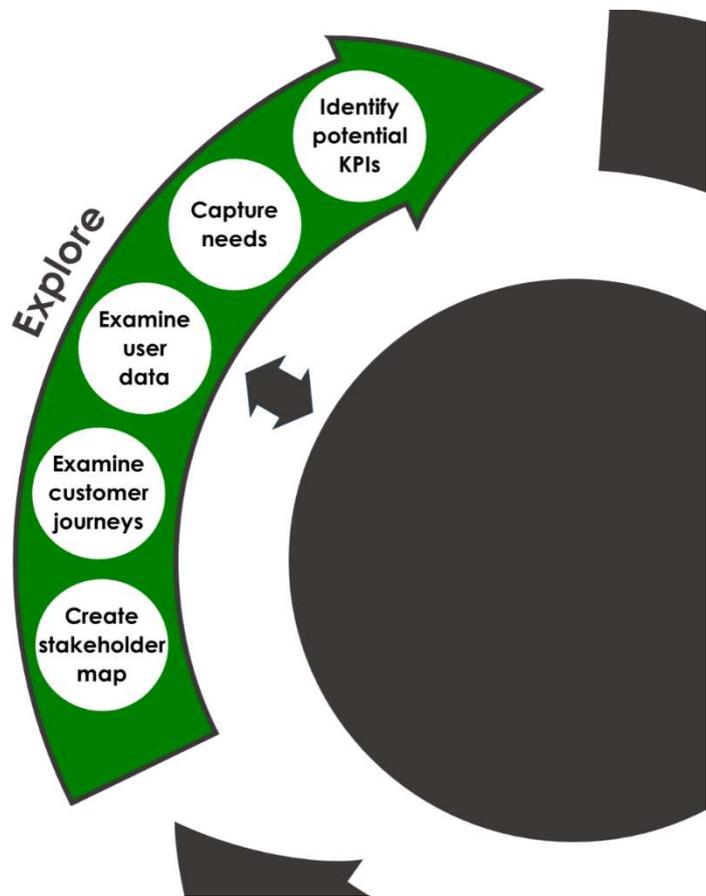


Figure 11: Activities within the *Explore* phase



3.3.2 Create stakeholder map

A stakeholder is a key player who has something to gain or lose from the project. Missing the needs of any of the stakeholders could result in the project failing. A stakeholder map helps to identify all the different stakeholders, to understand the relationships between them and be able to assess their influence and interest in the project. Stakeholders have an impact across the development, use and support of a product or service throughout its lifecycle, although those stakeholders will vary with time.

One important category of stakeholder, who is often overlooked and/or misunderstood in product and service development, is the end user. The variability of the different end users is such that they can be seen as presenting a too complicated picture to be able to fully understand their needs. However, understanding the users' needs well is a prerequisite to a successful product or service. Engaging with users at the earliest phases of the project and recruiting appropriate representatives to participate as stakeholders can be very powerful, but the appropriateness of this approach will depend on the nature of the project.

Within the Dignity project, pilots should review the key stakeholders already identified from Task 2.1 (self-assessment framework), although depending on the goal of the pilot project, there may be significant other stakeholders who need to be identified. The relevant stakeholders can then be identified and then involved in the project as described in Section 3.2.5 on the *Engage stakeholders & build team* activity.

The purpose of a stakeholder map is to show all the key players who will contribute to the project being successful. This helps later when trying to capture all the needs that the product should fulfil, especially ensuring that both user and business needs are considered. An example stakeholder map including a simple interest and influence assessment is shown Figure 12. This assessment provides a framework taking into account the differing needs of stakeholders from a project perspective, which can inform the decisions about how to engage which stakeholders, and when.



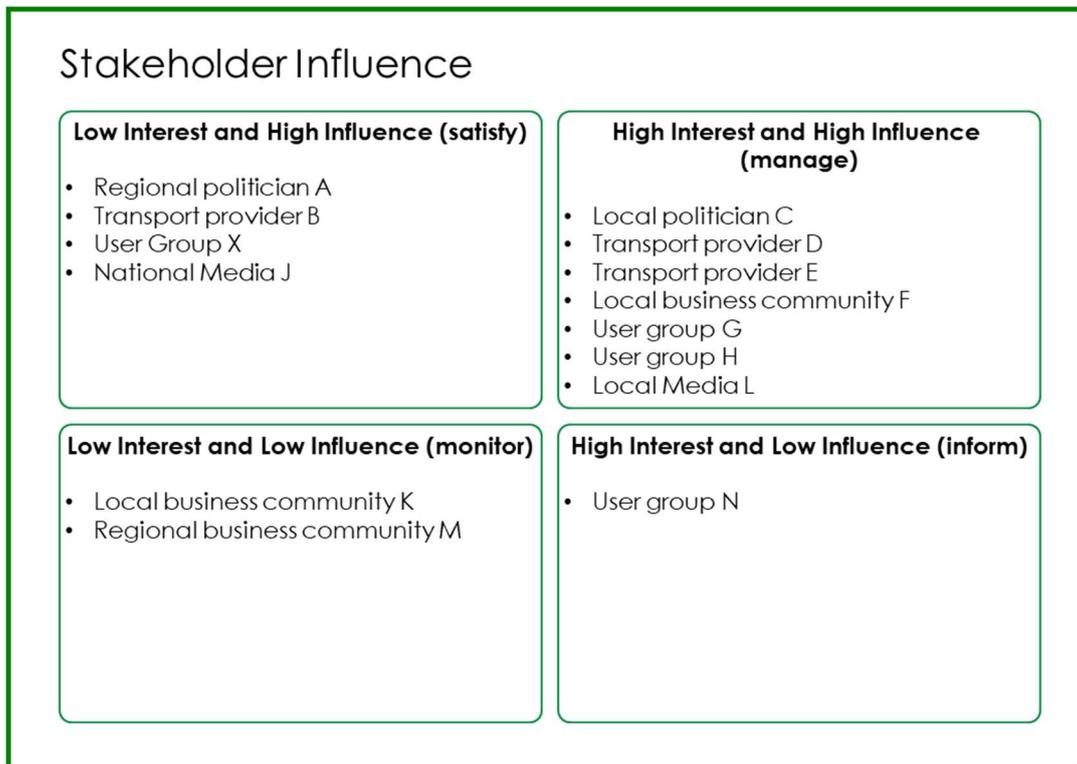


Figure 12: Stakeholder map showing levels of interest and influence

3.3.3 Examine customer journeys

User observation is about uncovering what people really want, what they really need, and what they really do. Observing actual behaviour is vital because people often struggle to clearly articulate their real needs because they:

- Have poor awareness of their own habits and practices
- Change what they say depending on what they think the interviewer wants to hear
- Cannot imagine all the possible alternatives to the current situation
- Have become accustomed to poor design

Focusing on real user needs helps the design team avoid overloading a product or service with every feature that the design team wants or thinks the users want. Identifying and addressing latent needs (the ones that users are not able to articulate) can be helpful to enable a 'surprise and delight' improvement in user experience, and can provide a competitive advantage over other solutions.

Customer journey mapping is one form of user observation. A customer (or user) journey is a step-by-step description of a user's interaction with a product or service. It may also describe what the user does immediately before and after using the product or service, as this provides some context of use. It should consider activities such as ticket purchase, first-time use, getting



support and dealing with difficulties, as well as 'normal' use. Customer journeys help the design team to understand the user experience and help to ensure that the needs list is complete.

Within the Dignity pilots, some customer journey mapping is likely to have already taken place as a part of the Dignity project. This can be used to provide relevant information for the team to understand the current customer experience in a rich and nuanced way.

User observation, such as customer journey mapping, helps with other *Explore* activities, as well as with refining the product goals.

3.3.4 Examine user data

User observation is very important, but it should be complemented with other methods to uncover the full range of user needs. These methods include interviews, questionnaires, diary methods, and focus groups, among others.

In the Dignity project, there will be data available from the surveys in Task 1.2 regarding the characteristics of the people living in the surveyed regions. These surveys examine technology experience, use of digital transport, attitudes towards technology, basic measures of technology competence, physical, sensory and cognitive capabilities and demographics. This will provide a quantitative view of the spread of technology use and capability in the pool of potential users.

The self-assessment framework also can provide useful pointers to the user population that may be relevant to design. In addition, there may be other quantitative customer data for your region that is relevant e.g., complaints from one group about buses in their village, focus group data, other survey data, petitions etc. which may provide insights as to issues that users are experiencing with the current situation.

Developing personas based on user data is one route to inspiring the team to empathise with the users and keep them in mind throughout the process. Care should be taken to ensure that the personas represent the breadth of users' diversity. An example of personas (Goodman-Deane et al., 2020a) developed from the UK Digital Exclusion Survey (Goodman-Deane et al., 2020b), which was the precursor to the Dignity surveys, are available here:

<http://www.inclusivedesigntoolkit.com/digitalpersonas/>

3.3.5 Capture needs

A needs list is used here to refer to a comprehensive and categorised list of the user and stakeholder needs that the design solution should satisfy. It may be helpful to express each need with a statement in the form:

As a ...insert role description... **I need** ...insert need description... **so that** ...insert reason...

The purposes of the needs list are to:

- Provide an explicit link between the requirements of the project and the needs of the users and stakeholders
- Enable prioritisation of needs, based on the outcomes that they enable or prevent





The previous activities in the Explore phase provide stimulus to help ensure that the needs list is complete and correct. At the highest level, the needs list should be able to answer questions like 'what constitutes success of the project?' and 'what do the users want to achieve?'. These high-level questions should also tie in with management activities, such as refining the product goals.

An example needs list for a medical product is shown in Appendix 1, showing the relationship between the stakeholder, their needs and the reasoning for their needs.

3.3.6 *Identify potential KPIs (Key Performance Indicators)*

It is important to set criteria for determining if a project is successful. These should include quantifiable indicators that reflect the priority needs that were identified in the *Capture needs* activity.

The KPIs should cover a range of issues. It may be helpful to think of the following categories to ensure that a good range of issues are considered: People, Profit and Planet. People issues include: user experience and social impact. Profit addresses: costs and revenues, technical risk and commercial business risk. Planet covers: depletion of scarce resources, energy use and waste impacts.

These criteria have some relevance to any project. However, their relative importance may vary. At this stage in the design cycle, it is important to review the criteria and discuss which are the most important: deal-breakers or unique selling points.

At this point, it is also important to plan how the criteria will be tested. We recommend starting by choosing a benchmark to test against. This is helpful because it is much easier to judge whether something is 'better' or 'worse' than something else, than to make an objective assessment of whether something is 'good' or 'bad'. The benchmark could be an existing product or an existing way of accomplishing a similar task.

It is also important to plan how the various criteria will be measured. For example, user experience may be measured using time taken, error rate and satisfaction during a user test. Headline criteria can also be used on their own for quick and initial evaluation during the early prioritisation of ideas and concepts.



3.4 The Create phase

3.4.1 Overview of the Create phase

The *Create* phase is about creating possible solutions to meet the needs and criteria identified in the *Explore* phase. This includes a range of activities shown in Figure 13 from the generation of ideas through to development of concept designs. It ranges from producing initial fledgling ideas, all the way to their development into prototypes that can be tested. There are various activities involved:

- *Examine scenarios* - to set the context and help generate ideas.
- *Stimulate ideas* - Idea generation and co-creation
- *Develop concepts* - by combining ideas together into complete solutions that could satisfy the needs identified in *Explore*
- *Make storyboards*
- *Make prototypes* - to demonstrate concepts, if appropriate

Each of these are described in more detail in the rest of this section.

Key principles to keep in mind during the *Create* phase include:

- **Strive for simplicity.** Simplicity is powerful but elusive; it requires a clear and succinct vision of what the solution is about. Ask: 'can you do it with less?'
- **Challenge assumptions.** It is easy to get stuck in thinking that the way things have been done is the only way they could be done. List your assumptions and ask 'why?'
- **Let ideas breathe.** Give wacky ideas the chance to become great ideas. They may not be feasible now, or in their current guise, but they may inspire a more feasible idea.

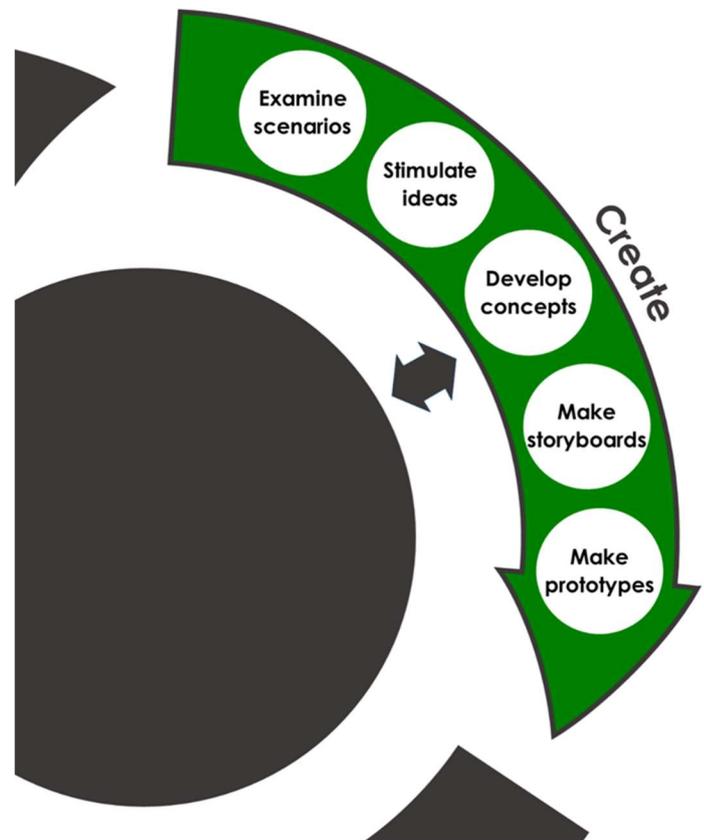


Figure 13: Activities within the *Create* phase

3.4.2 Examine scenarios

As part of task 2.2.2 the pilots will have built future scenarios with IZT, describing possible high-level futures and context for potential solutions to exist within and these alone may include relevant ideas for consideration in this activity. The scenarios produced with IZT should be reviewed as part of the *Create* phase. The process of building scenarios will have helped to define the problem areas and initial ideas at the macro level. As such, they can help the pilot teams to understand the wider context in which the solutions developed in this part of the project will function. An understanding of this context can suggest ideas and possibilities in response to constraints, opportunities and problems in the context.

The scenarios may also contain ideas at the meso and micro levels, relating to individual products and services and/or how users interact with or relate to the future scenarios. Some of these may be closely related to the current project. Even if they are not, they can help to spark ideas of possibilities.

3.4.3 Stimulate ideas: Idea generation and Co-creation

Stimulating ideas is about setting up a creative environment in order to break out of established ways of thinking. The human brain is extremely good at recognising patterns. However this fixation with patterns can impede lateral thinking, and most creative tools use techniques to help thought processes break away from existing solutions.

Some key principles to keep in mind during this activity include the following:

- Don't get stuck in old ways of thinking: listing and then challenging assumptions about how things are done can help with this;
- Start by trying to get as many ideas as possible, and avoid making judgements too early on;
- Encourage wacky ideas, look for inspiration in unusual places, and ask 'How else could it be done?' Make sure to record all the ideas (clearly) to help with further discussion, and with choosing and building on ideas.

Once a good number of ideas have been generated, it can be helpful to group them to draw out key themes. Producing an initial prioritisation of ideas can also be useful, e.g. using anonymous voting by relevant stakeholders. Evaluation activities can also be used at this stage to inspire further creativity.

Co-creation

Involving users at this stage of the *Create* phase can be extremely helpful to focus ideas on current needs and ensure that proposals work in the real context of users' experiences. In addition, this co-creation process can assist with downstream acceptance of a solution, e.g. within a community. Users can also produce valuable and inspiring ideas from a different perspective.

When running co-creation activities, it is important to select the users very carefully to ensure that they represent the range of target users and that particular individuals' needs do not dominate the ideas produced. What this will look like in practice depends on the particular



target groups the pilot is interested in, but teams should consider aspects such as gender, capability and age. For example, if a team is focused on supporting migrants in rural areas and is not specifically addressing issues of age or gender, it should nevertheless ensure that a mix of ages and genders is included in the co-creation activities.

Co-creation typically takes the form of in-person co-creation workshops. Such workshops are more easily accessible to users who are digitally excluded and allow physical collaboration on materials such as idea boards. However, Covid restrictions may make in-person workshops difficult or even impossible. At the very least, care will need to be taken in the size of the group, social distancing measures and having participants handle shared materials. It may be necessary to create separate materials for each individual.

If in-person workshops are not possible, then virtual (online) workshops can be held. However, care needs to be taken to ensure that they are accessible to a wide range of participants and do not overtire participants (some of whom may not be used to virtual meetings). There are specific tools available to manage online workshops, talk to UCAM for further details.

Furthermore, it is vital that ideas are still elicited from digitally excluded groups who may not be willing to participate in an online workshops. These groups include those who have access to the internet but find it difficult to use unfamiliar technology. Some possible ways of involving digitally excluded users include sending out packs with creative prompts, questions for them to answer, and places for them to add their own ideas and suggestions. These need to have very clear instructions. Participants could complete them on their own and send them back and/or be interviewed over the telephone about their ideas.

Whether held in person or virtually, there are some key co-design principles that should be remembered (Cruickshank et al., 2013):

- Agree how the success of the project will be recognised
- Move in and beyond your normal design practice
- Involve and respect lots of people in the ideas generating parts of the process
- Use the expertise of all participants in the process
- Let everyone be creative in their own way
- Explore and challenge assumptions
- Expect to go beyond the average
- Bring the process to the best possible conclusion with the best possible design outcome

It can be helpful to start a co-creation workshop with some kind of ice-breaking activity to introduce participants to each other and help them to relax. These activities should help participants to feel more comfortable speaking up in the group, and so should encourage participation from everyone and be easy for everyone to engage in.

It can then be helpful to introduce the context of the project. Participants may know little about digital transport systems, so this introduction needs to cover any background they need to make informed suggestions. However, it should not be lengthy or technical as this is likely to reduce levels of engagement. Ideally, it should be presented in short chunks throughout the workshop, interspersed with interactive activities, rather than in one big section.

The main focus of the session should be on the participants generating ideas which have potential to address or partly address the problem/s identified in the explore phase (see Figure



14 for examples). The exact nature of this activity will be guided by the nature of the particular Dignity pilot project goal and the user groups affected.

There are a variety of activities that can help with this. IDEO lists some of these on their Design Kit (see link below), together with more detailed information about how to put them into practice. Some examples include: Conversation Starters, a Brainstorm, Role Plays, Rapid Prototyping. There are various websites and other resources to support you in setting up a co-creation workshop. Here are just a few examples:

- The Design Kit produced by IDEO gives some general advice on running a co-creation session together with links to more information about different prompts you can use within a session: <https://www.designkit.org/methods/co-creation-session>
- An article from Futurice lists some of the things to consider when setting up a co-creation workshop remotely: <https://futurice.com/blog/5-things-to-consider-when-facilitating-remote-co-creation-workshops>
- A blog article from Leanne Fischer describes an example of a co-design kit used with older adults: <https://leannefishler.co.uk/?p=3884>
- An example of a co-creation workshop carried out on digital service ideas within a bus transport context: <https://hal.inria.fr/hal-01676155>

In addition, the UCAM team will be available to help advise pilots on how to set up and run their co-creation workshops.



Figure 14: Example ideas from a workshop (also showing the use of red dots for voting by the delegates for ideas with merit for consideration to take forward), and an individual idea described on an idea template sheet



3.4.4 Develop concepts

Developing concepts is the process of combining together different ideas to make a complete solution that could satisfy all of the user and business needs identified within the Explore phase of the design cycle.

Although closely linked with *Making storyboards* and *Making prototypes*, the primary purpose of concept development is to consider how different ideas may be combined to address the complete goal of the project. In contrast, the primary purpose of making storyboards and prototypes is to enable testing, refinement and communication.

Concepts can be described according to the ideas that they combine together. A systematic approach to concept development first involves grouping the underlying ideas that are related. A starting set of concepts can be created by selecting one idea from each group, either through purposeful selection, or randomly.

The set of concepts can then be improved by substituting, combining or eliminating different ideas from each of the groups. Grouping ideas has the additional benefit of identifying areas where few ideas have been generated, which helps to stimulate further ideas.

Concepts should initially be prioritised using an agreed set of criteria, such as those identified for use in the Evaluate phase. The prioritisation should be done in consultation with relevant stakeholders, identified in the Explore phase.

An example concept from a workshop carried out in automotive context is shown in Figure 15, and Figure 16 shows a concept having been re-rendered after the workshop where it was originally conceived. It contains sufficient detail for the project team to be able to assess its suitability at this stage, and further refinements and annotation later in the process make it appropriate for eliciting feedback from users and other stakeholders.



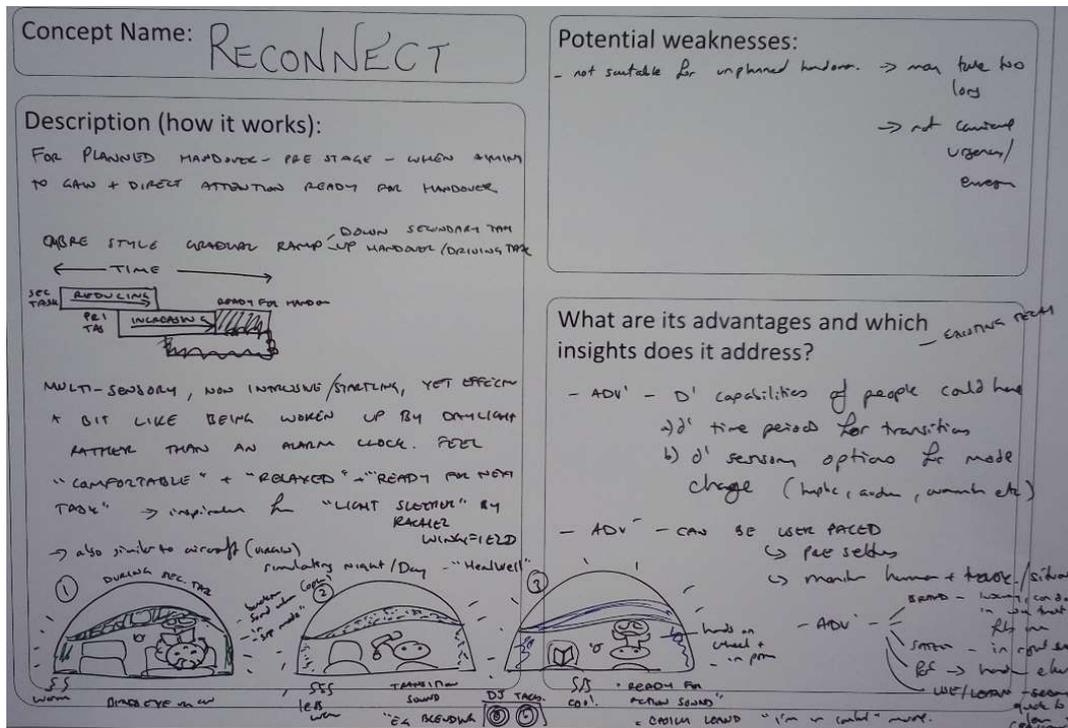


Figure 15: An example design concept as rendered in a workshop setting

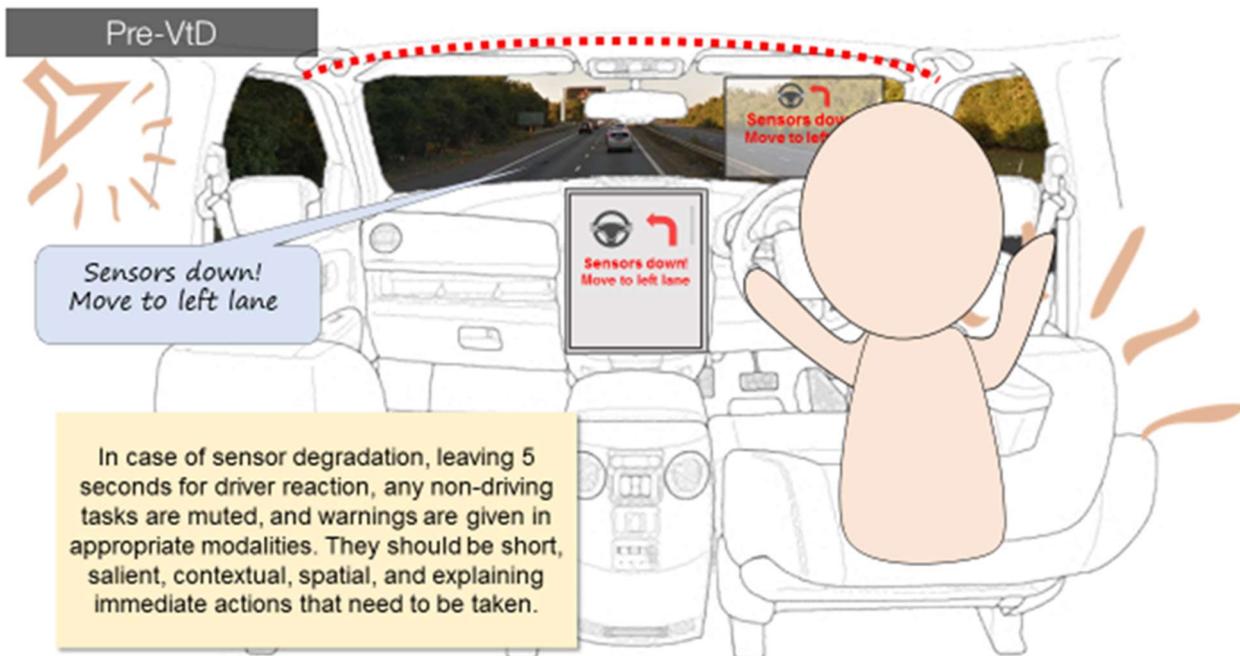


Figure 16: An example design concept re-rendered after the workshop for clarity

3.4.5 Make storyboards

A storyboard is a pictorial representation of a sequence of events. It can be very useful to describe an idealised or actual user journey, enabling a shared visualisation of the proposed experience. Storyboards are particularly useful for services where prototypes may be difficult or expensive to produce, or where a prototype alone will not be able to explain important elements of the user experience. These can be sketched during a workshop to communicate a concept or idea, or can be developed afterwards to allow a clearer and more nuanced story to be described. An example of a more detailed storyboard developed after a workshop (by someone with an artistic talent – this level of artistry is rarely required) is shown in Figure 17.

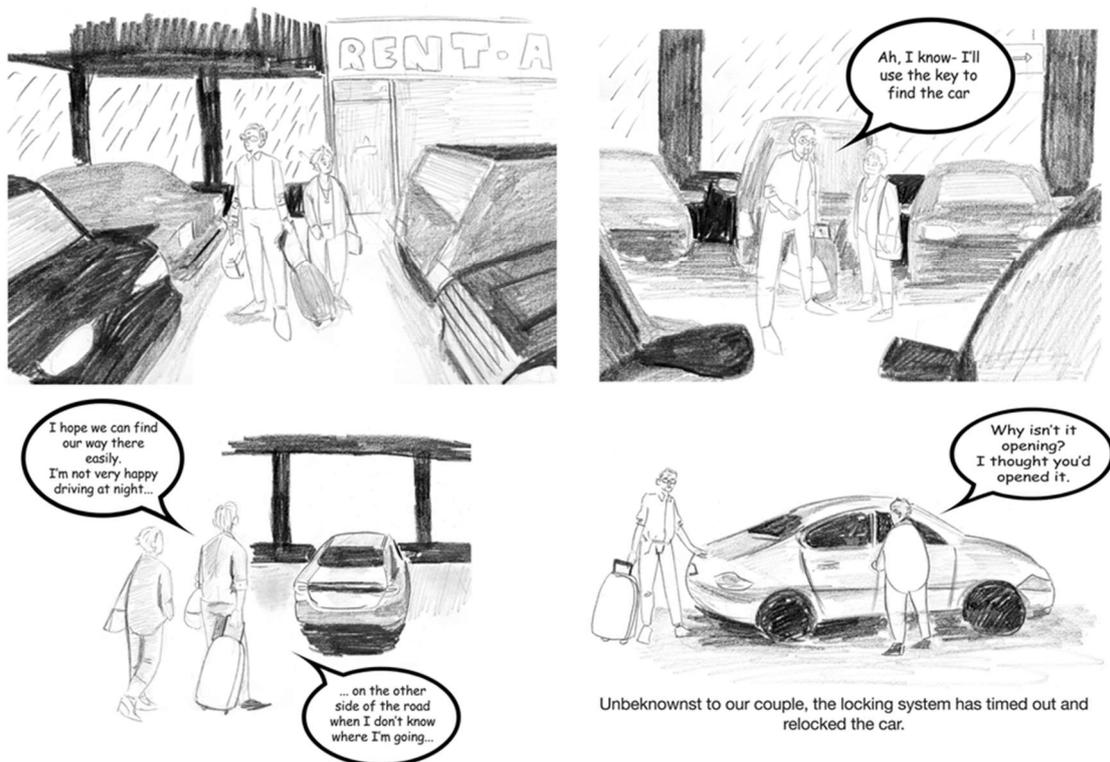


Figure 17: Storyboard example for renting a car at an airport

3.4.6 Make prototypes

Making prototypes involves producing physical or virtual demonstrations of a concept. Prototypes have various different purposes, including communicating the potential look and feel of the product to a client, user or others in the design team. Prototypes are also used to enable evaluation and refinement of the concept, perhaps by simulating how an interaction would occur. They can also be used to demonstrate technical feasibility or explore means of production.

Different kinds of prototypes are best suited to different objectives. For example, a sketch or cardboard model may be adequate for communicating look and feel, but not for demonstrating technical feasibility. It is often the case that multiple different prototypes are required to fulfil different purposes.

Prototypes can include sketches, as well as models constructed with paper, cardboard, foam and computer software. Interactions can also be prototyped using combinations of these methods, together with someone who manipulates the materials to simulate the behaviour of a fully working system.

Prototypes are often thought of as expensive, high fidelity demonstrations of finished concepts. However quick tests with rough prototypes can be used to gain vital feedback before all the important decisions are finalised. They can help the design team to spot critical issues and in some cases can be instrumental in determining whether to continue with or stop a project, or to be able to evaluate feasibility of a proposed solution.

For more information on prototyping:

<http://designingwithpeople.rca.ac.uk/methods/prototyping>

<https://www.usability.gov/how-to-and-tools/methods/prototyping.html>

3.5 The Evaluate phase

3.5.1 Overview of the Evaluate phase

The *Evaluate* phase is about examining the concepts to determine how well they meet the needs. This is vitally important to ensure that the needs are actually met. Without this, the team runs the danger of just choosing concepts that they like the look of and that work for them but not for the wider target population.

To evaluate the concepts effectively, it is important to first decide on the Key Performance Indicators (KPIs) that will be used to judge them. These KPIs are then used to guide the testing the concepts with both experts and users. There are various activities involved in Evaluate (see Figure 18):

- *Review the KPIs*: that will be used in the evaluation

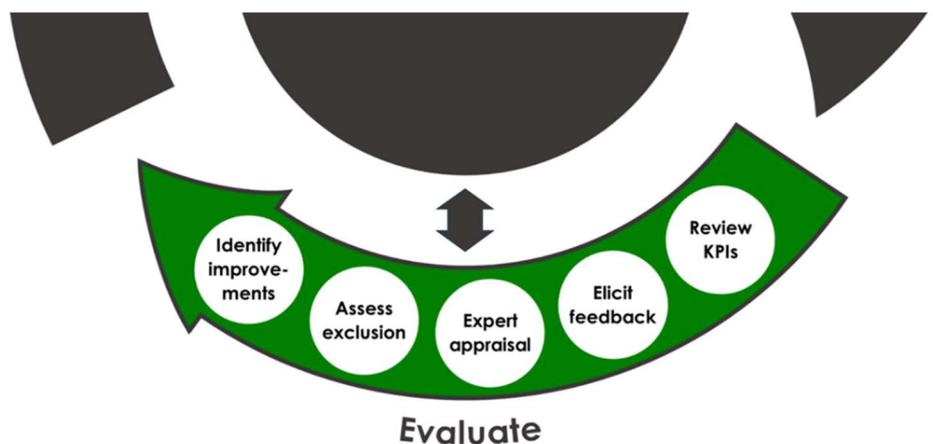


Figure 18: Activities within the Evaluate phase



- *Elicit feedback*: from users and stakeholders
- *Expert appraisal*
- *Assess exclusion*: Estimate the number of people who will be excluded from using the product or service due to the demands it places on the users
- *Identify improvements*: Review the results of the evaluation in order to identify possible improvements to the design

These activities are described in more detail in the rest of this section.

Key principles to keep in mind during the Evaluate phase include:

- **Test early and test often.** Perform quick tests with rough prototypes, early enough in the process that meaningful change is still possible.
- **Prove it.** Complement opinions with evidence.
- **Wear different hats.** Be creative, be critical and know when to switch.

3.5.2 Review KPIs

The teams will review the previously agreed KPIs and consider whether they are still relevant in the light of any new information or changes to the focus that have arisen. This step will be influenced by the development of the solutions and further understanding of the need from the iterations through the design wheel process. If so, the teams have the opportunity to revise and agree the KPIs before using them in the Evaluate phase to examine the suitability of the proposed concepts and solutions.

3.5.3 Elicit feedback

Soliciting feedback from the differing groups of stakeholders and users during the development process is crucial to ensuring that the project remains on track. It is extremely easy for a team to convince themselves that their decisions are good, but this does not alone ensure that the project does not drift from meeting the needs of the users and stakeholders.

There are an infinite number of ways that feedback can be solicited, but one of the key factors is to ensure that whichever methods are chosen, and from whom the feedback is gained that appropriate questions are asked in a way to ensure they are as free from bias as possible. For example, demonstrating how a product or service works and asking if a participant thinks it is easy to use is not appropriate, as their discovery of the ease of use is not representative and they will be unaware of any potential pitfalls. It is also worth evaluating feedback based on the perspective of a stakeholder or user, for example if they have a vested interest in a particular outcome for example, then their feedback may be unduly biased.

User testing can take place at different levels of formality and detail. In the early stages of a project, it is common for design team members to make their own assessments about which ideas and concepts are to be progressed. This is because they have a detailed understanding of the goals of the project and the system and feasibility constraints. They may also feel that concepts are not yet developed to a stage where they can be formally tested. Nevertheless,





even at these stages, it is good to obtain some external feedback. This can be done in informal ways with very rough sketches, or even using verbal descriptions of ideas. Even very rough feedback can provide valuable insight, especially when some of the users and other stakeholders have very different needs and capabilities from the design team members themselves.

Later on in the project, when concept solutions have been better defined (for example, with storyboards or paper prototypes) eliciting feedback can be obtained through more objective measures, such as timings and formalised questionnaires, to ensure that products fulfil criteria and standards.

When prototypes are available, then these can be tested more formally with end users. This evaluates whether they can use the prototypes, and how difficult or enjoyable they find this. It can identify sources of frustration and difficulty so that they can be addressed. Early user testing is vital because it is hard for designers and experts to correctly imagine the details of what users will do.

The understanding of users and stakeholders, developed within the Explore phase, can help to choose who should be recruited for the user tests. Participants who represent the diversity of end users can be particularly useful to evaluate the functionality and usability of a system. The dimensions of diversity that may be relevant will depend on the goal of the pilot, as well as the nature of the solution being proposed. So for example a cycle hire service to help with poor public transport in a region may need to focus on communities or types of potential users who do not currently cycle often, or do not have access to a car. Participants who represent those types of people should therefore be sought for feedback of any potential solution.

The task analysis produced as part of the *Expert appraisal* and *Assess exclusion* activities can help to identify the tasks that the participants might be asked to perform as part of usability testing.

For further information on user testing methods see:

http://www.inclusivedesigntoolkit.com/GS_evaluate/evaluate.html#testuser

<http://designingwithpeople.rca.ac.uk/methods>

3.5.4 *Expert appraisal*

This refers to specific analysis and appraisal by members of the team or external experts to bring to bear specialised knowledge or experience on the design or concept. There are many methods that can be brought to bear.

In this activity, a range of relevant experts use their skill and knowledge to systematically judge and test concepts against the agreed criteria. Expert judgement is needed because it may be difficult to formally test how well initial concepts could ultimately perform against the different criteria.

A multi-disciplinary team is needed in order to make judgements against all the different criteria. This ensures the complete set of criteria is appropriately represented and prioritised.





The initial descriptions of user journeys produced in the Explore phase can be extended into a comprehensive task analysis in order to provide a framework for the expert appraisal. This task analysis should cover all aspects of the use of the product or service, including discovery, installation, registration, ongoing use, updating and deprecation. For each aspect, the concept's performance should be evaluated against the relevant criteria.

3.5.5 Assess exclusion

The purpose of this activity is to identify areas where exclusion is going to be caused by the proposed solution, and to quantify the size of the population who may be excluded from it. It is normally carried out by the UCAM team using the Dignity created survey data to estimate the percentage of the population in the region who are likely to be unable to use or access the service due to the combination of the hardware, connectivity and complexity of the service's digital interface.

In the early stages of the concept development, UCAM can help by reviewing to identify likely areas of exclusion and difficulty for users.

When the solution is at a sufficiently mature level, UCAM will carry out a digital interface exclusion audit for your project as part of Dignity. As part of the pilot process, UCAM will liaise with the team to discuss what would be appropriate to audit.

It can be helpful to identify who would be excluded from using a product or prototype based on their technology access, technology competence, attitudes towards technology and other capabilities. This can help in evaluating the accessibility of a product for a diverse range of users.

To do this, it is helpful to work through the task steps involved in using the product (such as those identified in the task analysis produced during 'Testing with experts' above). For each step, the assessor examines the demands placed by that step on the various user capabilities. Reducing these capability demands (while achieving the same features or functions) should lead to a more effective service that can be used by a wider percentage of the population. More information on the various user capabilities and the impact they can have on product use can be found in the inclusive design toolkit at:

<http://www.inclusivedesigntoolkit.com/usercapabilities/usercap.html>

Estimating exclusion should not be used in isolation but should be complemented by the other activities in the *Evaluate* phase of the design cycle. In particular, user testing can be carried out on particular aspects of the solution based on whether the exclusion audit identifies that a particular task step is likely to be difficult, or it is unknown how users will respond to a particular novel feature.

3.5.6 Identify improvements

This activity involves reviewing the findings from the rest of the evaluation activities and considering how well the proposed solutions meet the needs and the KPIs. This may identify where further evaluation is needed because there is a gap in the evidence. It can also





highlight areas where changes or improvements need to be made. Identification of improvements may be at a detail level (e.g. altering the design of an interface) or may show that the concept solution itself needs major changes.

To do this in a systematic way, it is helpful to look back at the evaluation criteria agreed on in 'Review KPIs', and document the evidence obtained in each of the key areas, such as user experience and social impact. Doing this highlights if evidence is missing in some areas, and can help to determine if more evaluation is needed.

The evidence in each area can then be compared with the criteria to drive the objective choice of the lead concept to focus on in the next cycle of concept design.



4. Implementation for pilots within the Dignity project

4.1 Overview

In the Dignity project, pilots will use the wheel and activities described in Section 3. Exactly what activities they do, what these look like in practice and when they take place will depend on various factors. These factors include: the scale and type of the problem a team wants to address, the scale and type of initial ideas for solution(s), how much prior thinking they have done on the topic, who the end users are, and whether they are adapting an existing solution or building a new one. As a result, the timeline described in this section gives an overall framework for the process but the individual activities used within this framework may vary. An overview of the timeline is given in Table 1.

Table 1: Timeline for the Inclusive Design Wheel work in the Dignity pilots

Month	Inclusive Design Wheel activity	Other activities that feed into the Inclusive Design Wheel
Feb 2021	Kick-off workshop (all together) on the Inclusive Design Wheel (26 Feb)	Finish up customer journey mapping Kick-off workshop (all together) on Scenario Building (25 Feb)
Mar 2021		Scenario Building work
Apr 2021		
May 2021		
Jun 2021		
Jul 2021	Initial individual pilot meeting with UCAM focusing on <i>Explore</i>	
Aug 2021	Preparation for the pilot workshops	
Sep 2021	Pilot workshops (run by the pilots)	
Oct 2021	Individual meeting with UCAM focusing on <i>Create</i>	
Nov 2021	Development work by the pilots on their concepts and prototypes	
Dec 2021		
Jan 2022		
Feb 2022	Individual workshops with UCAM focusing on <i>Evaluate</i>	

4.2 Kick-off workshop with all pilots together

The process will start with a kick-off training workshop on the 26th Feb 2021. This will be conducted with all of the pilot teams together. It will introduce the teams to the basics of inclusive design, and to the Inclusive Design Wheel approach.

4.3 Post kick-off workshops

Apart from the kick-off workshop in February, the Inclusive Design Wheel work will be carried out by the individual pilots, with support from and meetings with UCAM researchers. This will



allow UCAM's support to be adapted to the specific needs of each pilot, without causing exclusion to the engagement of participants the pilots' use of the IDW process through a language barrier.

After the kick-off workshop, the pilot teams will focus on the scenario building approach with IZT before focusing on the Inclusive Design Wheel (IDW) work in July 2021. Note that there is some flexibility in this timetable. If individual teams wish to start their IDW work earlier than July, that can be accommodated. Other dates on the timeline should then be adjusted accordingly.

4.4 Initial individual pilot meetings with UCAM

The more focused IDW work will start with a meeting between a few representatives from each pilot team and researchers from UCAM. The pilots should consider in advance who to send to this meeting as it will be held in English, and subject to COVID restrictions is likely to be virtual. The pilot representatives for this meeting will need to describe the domain of the pilot project goal and the known issues with the current situation. The pilot representatives should include the pilot project leaders and ideally with the organisers and facilitator(s) for the pilot workshops with their stakeholders. Note that it is fine if the teams do not have the chance to think about the composition of the team fully before the first meeting.

This initial meeting will focus on *Reviewing progress and planning next steps* (Section 3.2.2). The teams will review the work done on other parts of the Dignity project that feed into the IDW. This includes *Examining customer journeys* (Section 3.3.3) and *Examining other user data* such as survey information (Section 3.3.4). Pilot teams will use the findings so far to *Capture the needs* of stakeholders (including users) (Section 3.3.5) and *Identify potential KPIs* (Section 3.3.6). They will also identify where gaps in the current understanding exist and whether further *Explore* work is needed.

One of the activities covered in this meeting will be to understand how to *Create a stakeholder map* (Section 3.3.2) and identify who to *Engage* in the IDW process going forward (see Section 3.2.5). The UCAM researchers will also help the pilot teams to plan and prepare for *Stimulate ideas* activities, such as the co-creation workshops (Section 3.4.3).

4.5 Pilot led workshops and meetings

It is important to involve key stakeholders of different types (including end-users), but this does not necessarily mean that they all need to be present at the meetings. It is also important to keep the team down to a manageable size. Groups of between 5 and 10 people tend to work best if meeting physically. Large pilot teams may need to consider dividing their team into smaller groups and allocating a sub-group to focus on IDW work. This allows space for other stakeholders to be involved, either for a particular meeting or later in the process. If the workshops need to be virtual, lower numbers of attendees are likely to be more successful, and the less technically capable the smaller the group also. However, in that case the likelihood is that the more excluded user groups are much less likely to be able to attend or contribute.



4.6 Co-creation workshops

The pilot teams are expected to run co-creation workshops with end-users in Sep 2021. However, these may take place earlier if a pilot team starts their IDW work earlier. These workshops will be run by the pilot teams (not UCAM) to allow them to be run in local languages.

The co-creation workshops are part of the *Stimulate ideas* activity in the *Create* phase. More information is provided about them in Section 3.4.3, but the details of the workshop will be very specific to the goals of each pilot project. Teams will be briefed on how to set up and run these workshops by the UCAM team, and we also recommend ongoing engagement with UCAM to discuss the most appropriate way to carry these workshops out given the topic and context of each pilot project.

The co-creation workshops will be followed by a meeting with UCAM researchers to review the ideas and concepts produced in the workshops. The UCAM researchers will help the teams to *Develop concepts* (Section 3.4.4) based on the solutions the team have devised. The concepts differ from the ideas in that they combine multiple ideas into complete solutions that can satisfy the variety of needs identified in the *Explore* phase. UCAM will also encourage the pilot teams to put together a plan for developing these concepts further in the following few months (Nov 2021 to Jan 2022) into *Storyboards* and/or *Prototypes* (Sections 3.4.5 and 3.4.6).

4.7 The Evaluate phase

Pilots will be encouraged to engage in *Evaluate* activities (Section 3.5) as soon as they develop concepts and ideas. The IDW is intended to be iterative with early feedback on initial concepts allowing early changes to concepts and designs before a lot of effort has been invested in the details. Pilot teams should *Elicit feedback* (Section 3.5.3) from a variety of stakeholders including end-users, rather than relying solely on their own judgement.

UCAM researchers will also be available to perform *Expert appraisal* (Section 3.5.4) and *Assess exclusion* (Section 3.5.5) of concepts and prototypes. In particular, they plan to have a meeting with each pilot in Feb 2022 to examine the findings from the evaluation activities so far and *Identify improvements* (Section 3.5.6) that could be made to the concepts.

References

- Bradley, M., Goodman-Deane, J., Waller, S., Tenneti, R., Langdon, P. and Clarkson, J. 2013. 'Age, Technology Prior Experience and Ease of Use'. In *Contemporary Ergonomics and Human Factors 2013*, 363–69. Taylor & Francis. <http://www.crcnetbase.com/doi/abs/10.1201/b13826-77>.
- Bradley, M., Langdon, P. and Clarkson, J. 2015. 'Assessing the Inclusivity of Digital Interfaces - A Proposed Method'. In *Universal Access in Human-Computer Interaction. Access to Today's Technologies*, edited by Margherita Antona and Constantine Stephanidis, 25–33. Lecture Notes in Computer Science 9175. Springer International Publishing. https://doi.org/10.1007/978-3-319-20678-3_3.
- BS 7000-6: 2005 - Design Management Systems. Managing Inclusive Design. Guide – BSI British Standards. 2005. Accessed 3 October 2019. <https://shop.bsigroup.com/ProductDetail/?pid=000000000030142267>.
- Clarkson, J., Coleman, R., Hosking, I. and Waller, S. eds. 2007. *Inclusive Design Toolkit*. Cambridge: Engineering Design Centre, University Of Cambridge.
- Clarkson, J. and Coleman, R. 2015. 'History of Inclusive Design in the UK'. *Applied Ergonomics*, Special Issue: Inclusive Design, 46, Part B (January): 235–47. <https://doi.org/10.1016/j.apergo.2013.03.002>.
- Cruickshank, L., Coupe, G., and Hennessy, D. 2013. 'Co-Design: Fundamental Issues and Guidelines for Designers: Beyond the Castle Case Study - Imagination Lancaster'. In: <https://imagination.lancaster.ac.uk/update/co-design-fundamental-issues-and-guidelines-for-designers-beyond-the-castle-case-study/>.
- Goodman-Deane J., Waller S.D., Bradley M., Clarkson P.J., Bradley O. 2018. 'Using Inclusive Design to Drive Usability Improvements Through to Implementation'. In: Langdon P., Lazar J., Heylighen A., Dong H. (eds) *Breaking Down Barriers*. CWUAAT 2018. Springer, Cham. https://doi.org/10.1007/978-3-319-75028-6_6
- Goodman-Deane, J., Bradley, M., Waller, S., and Clarkson, J. 2020a. 'Quantifying Exclusion for Digital Products and Interfaces'. In *Designing for Inclusion*, edited by Patrick Langdon, Jonathan Lazar, Ann Heylighen, and Hua Dong, 140–49. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-43865-4_15.
- Goodman-Deane, J., Bradley, M. and Clarkson, J. 2020b. 'Digital Technology Competence and Experience in the UK Population: Who Can Do What'. *Contemporary Ergonomics and Human Factors*, 8.
- Langdon, P., Lewis, T. and Clarkson, J. 2007. 'The Effects of Prior Experience on the Use of Consumer Products'. *Universal Access in the Information Society* 6 (2): 179–91. <https://doi.org/10.1007/s10209-007-0082-z>.
- Waller, S., Bradley, M., Hosking, I. and Clarkson, J. 2015. 'Making the Case for Inclusive Design'. *Applied Ergonomics*, Special Issue: Inclusive Design, 46, Part B (January): 297–303. <https://doi.org/10.1016/j.apergo.2013.03.012>.
- Wilkinson, C., Langdon, P. and Clarkson, J. 2009. 'Investigating Prior Experience and Product Learning through Novel Interface Interaction: A Pilot Study'. *Universal Access in Human-Computer Interaction. Addressing Diversity*, 654–64.

Appendix 1: Example Needs List from a Medical Product

As a...	I want to be able to...	so that I can...
General Practitioner		
	make better initial diagnosis of Lower Urinary Tract Symptoms	make better referrals to consultants or prescribe appropriate interventions
Consultant		
	be able to focus on the patients that most need my expertise	treat more patients with chronic needs
	review a frequency-volume chart on the first consultation	speed diagnosis and treatment
Continence Nurse		
	give patients a solutions that requires the minimum of explanation and support	I have more time to spend other patient issues
	a more detailed bladder diary to include items such as drinking	perform a more detailed assessment without requiring the patient to have to complete another diary
	encourage patients to adopt good patterns of behaviour and not bad through use of the diary	work towards an effective resolutions for patients that need to modify their behaviour
Clinic administrator		
	have a solution that is easy to post	get the solution to patients quickly & cheaply

As a...	I want to be able to...	so that I can...
Non-user		
	avoid incorrect use of the device	be safe and not disrupt the patients use
	not be embarrassed by the device	maintain my dignity
	carry on using the loo as normal	not have difficulties with loo access when I need it
Re-cycler		
	Identify how the product can be re-cycled	I correctly re-cycled the materials
User		
	know when to start and stop measuring	perform the required number of measures
	know the impact on my day	plan in measurement
	remember to carry to carry the necessary things with	measure all urinary events
	carry any items discreetly and conveniently	maintain my privacy and keep items with me at all times
	(Store the device in the zipped pocket of my handbag	avoid it falling out or people seeing it)
	(Store the device in my trouser pockets	easily keep it with me)
	remember to make the measurement	collect the information the doctor needs
	perform measurements without anyone knowing	maintain my privacy and dignity
	use it as quickly or quicker than using the loo normally	avoid having an accident
	avoid any spillage or contact with urine	maintain hygiene

As a...	I want to be able to...	so that I can...
User (cont'd)		
	to be able to use the device without putting anything on the floor including storage items such as a bag	maintain hygiene
	hold the device without people working out what it is	maintain my privacy and dignity
	retrieve the device from the toilet if it falls in	keep the loo operational
	measure in different locations such as home (upstairs & downstairs, office, restaurant, travelling)	keep to my normal routine
	clean the device without anyone knowing	keep hygiene and privacy
	clean the device at a later stage	avoid doing it in public
	know that the device is clean	be confident it is hygienic
	use the device one-handed	steady myself with the other arm
	read any measure without my reading glasses	do it without glasses
	keep records accurately and hygienically	get the information to the doctor while maintaining hygiene
	make accurate measurements	get the right diagnosis
	understand what I have to do if I miss a measurement	report this correctly
	understand what I have to do if I have an accident e.g. a leak	report this correctly
	understand why I am doing the procedure	be motivated to do it
	understand the importance of the sub-totals and total volume measured	be motivated to record all events
	measure high volumes of outputs	avoid an accident and record correctly



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