TU Delft

510 AN INITIATIVE OF THE NETHERLANDS RED CROSS

Applying Human-Centered Design in the development of digital products for disaster response

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Visual research summary

Applying Human-Centered Design in the development of digital products for disaster response

PROBLEM ANALYSIS

The context of disaster response is incredibly complex due to its chaotic nature and the large number of variabilities per disaster. This complexity makes it difficult for developers of digital tools for disaster response to understand the context of the products they develop. However, a lack of understanding of the use context can result in the development of ill-suited products that do not fulfill the user needs. Human-Centered Design (HCD) is a method to generate a better understanding of the user and the use context through the perspective of the user. It is an approach that is rooted in the belief that the people who face the problems are the starting point when developing a solution.

510 is a Netherlands Red Cross initiative that develops accessible digital tools for humanitarian response across the world. 510 has as a goal to: "improve the speed, quality and cost-effectiveness of humanitarian aid by using and creating data and digital products." 510 products, which can be databases, models or software tools, are developed for different types of disasters in different countries across the world. In order to ensure that the products are solving user needs and in order to ensure that the products are suited for the context in which they will be employed, 510 aims to incorporate a Human-Centered Design (HCD) approach to their product development. However, the HCD methods are not yet structurally employed across all projects.

RESEARCH AIM

The aim of this thesis is to understand how Human-Centered Design can be applied in the development of data and digital tools for humanitarian response. In order to achieve this, the reseach aims to (1) understand the factors that enable and hinder the implementation of HCD, to (2) translate these into required elements for HCD implementation, to (3) understand the needs for HCD in the development of response technology and to (4) make a proposal for the implementation of a human-centered product development process for 510.

LESSONS ON HCD IMPLEMENTATION

The factors that enable and hinder the implementation of HCD are clustered into three lessons on the implementation of HCD:

1. HCD is already practiced in many ways
It is found that HCD is already practiced throughout the product development in many ways. A lot of information on the user, their tasks and their context is already available within the projects and stakeholders are involved throughout product development.

2. Embedded HCD is interactive with the existing development
HCD is applied in varying ways across projects. Whereas the HCD team has worked on developing methodologies, there was limited room for documentation. Because of this, it is unclear to 510 staff when the methods should be applied and how they will bring value to the project.

3. Everyone within 510 has a role in the implementation of HCD
Whereas applying HCD methods is the responsibility of the HCD team, implementing an HCD approach requires a shift within the entire team.

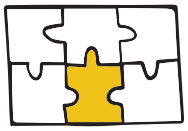
ELEMENTS OF EMBEDDED HCD

The three lessons are translated into three elements of embedded HCD. These three elements are developed into the proposal.

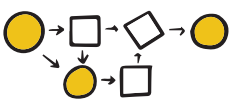
1. A clearly defined role for HCD within 510
HCD is not starting from scratch but rather finding what is already done and what is still needed for the organization. This is why the first element of embedded HCD is defining a clear role for the HCD team.

2. An embedded HCD workflow
In order to be structurally included in product development, HCD needs to provide overview for the rest of the 510 team. A workflow is proposed of HCD methodologies that is linked to the larger 510 development process.

3. A communication plan that helps the HCD team guide 510 in implementing HCD
The HCD team is not only responsible for performing HCD activities but is also responsible for guiding the rest of 510 in the implementation of HCD. To support this, a communication plan for the HCD team is proposed.



ROLE

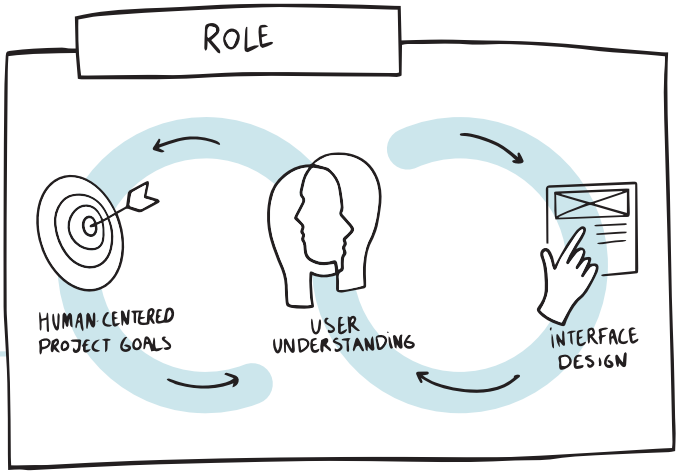


WORKFLOW

COMMUNICATION

Identified needs for HCD in the development of digital tools for humanitarian response are supporting the formulation of human-centered project goals, generating an understanding of the user and their direct context and the design of usable and suitable products.

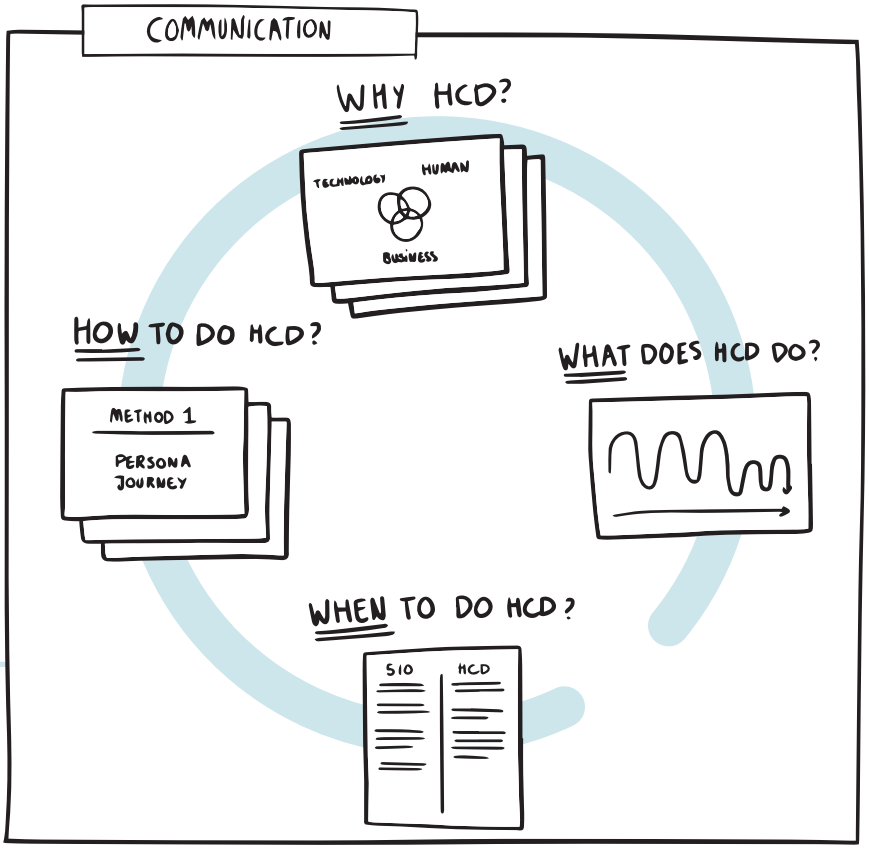
ROLE



WORKFLOW

HCD role	HCD method	Project exploration	Proposal writing	Feasibility study	Database/ model building	Product development	Implementation support evaluation
Human-centered project goals	Strategy sheets		1ST FILL	2ND FILL, UNKNOWNS, INSIGHTS, UNKNOWNS	3RD, GOAL		USER PROJECT GOALS
User understanding	Persona journey	OLD DATA	1ST FILL	2ND FILL	3RD FILL, USER, TASKS, CONTEXT		PJ
	Codesign	OLD DATA		1ST CODESIGN, INSIGHTS, 2ND CODESIGN			
Interface design	User testing				1ST USER TEST	1ST TEST, DESIGN, FEEDBACK	FEEDBACK
	Prototyping			1ST PROTOTYPE		2ND PROTOTYPE, DESIGN	

COMMUNICATION



Abstract

In the development of digital tools for use during disaster response, often referred to as 'response technology', generating an understanding of the user and the context of use is challenging. The context of disaster response is incredibly complex due to its size, its chaotic nature and the variabilities per disaster. This complexity makes it difficult for developers of response technology to understand the context of the products they develop. However, a lack of understanding of the context of use can result in the development of ill-suited products that do not fulfill the user needs. Human-Centered Design (HCD) is a method to generate a better understanding of the user and the context of use through the perspective of the user. It is an approach that is rooted in the belief that the people who face the problems are the starting point when developing a solution. HCD is seen as a possible approach to improve the development of response technology.

The aim of this thesis project is to understand how Human-Centered Design can be applied in the development of digital tools for disaster response. In order to explore this, a case study is done together with the Netherlands Red Cross data team, also known as 510. 510 works together with a core team of around 15 staff members and a large number of volunteers to develop data and digital products for disaster response. The team started implementing HCD into their product development process in 2018. To do so, two staff members dedicate part of their time to the development and employment of HCD methods and a number of 'HCD volunteers' have been taken on to support in these HCD activities. However, HCD has not yet been fully implemented into all of 510 projects. This research aims to understand what is needed in order to apply HCD in 510.

For this research, firstly the enablers and challenges towards implementing HCD in 510 are analyzed (chapter Discover). These insights are summarized into three lessons about the implementation of HCD. These three lessons are translated into three elements of embedded HCD (chapter Define). Next, further research is done in order to gather more detailed insights needed to develop these three elements for the 510 case (chapter Develop). Lastly, the three elements of embedded HCD are developed for 510 (chapter Deliver).

Part 1: Discover – Enablers and challenges towards implementing HCD in 510
The enablers and challenges towards implementing HCD in 510 product development are identified through an organizational analysis of 510, an analysis of the current implementation of HCD and through interviews with 510 (non-HCD) staff and HCD volunteers.

Part 2: Define – 3 lessons and 3 elements of embedded implementation of HCD
From the case study analysis, three lessons in implementing HCD for 510 become clear:

Firstly, HCD is already practiced in many ways in 510. From communicating with the client and stakeholder engagement, to implementation and support after implementation, there are many ways in which parts of an HCD approach are already utilized. Implementing HCD is therefore not starting from zero, but rather finding what is already done and what is still needed for the organization.

Next, embedded HCD is interactive with the existing workflow. Implementing HCD does not only consist of selecting suited HCD methodologies; the most important part is embedding them in the product development in such a way that they are used effectively. In order to be integral to product development, HCD needs a structured plan in which the links between HCD activities and the rest of the product developmment process are clear.

Lastly, everyone within 510 has a role in the implementation of HCD. An HCD approach can be practiced and also hampered by almost every person within the organization. This means that the HCD team is not only responsible for performing HCD activities but also for guiding the rest of the staff in implementing HCD.

These lessons can be translated into three elements of embedded implementation of HCD; (1) a clearly defined role for HCD within the organization, (2) an embedded workflow of HCD methodologies that is linked to the larger product workflow and (3) a communication plan that guides the implementation of HCD across the organization. It should be noted that the three elements are interlinked; The role and responsibilities largely determine the methodologies and workflow. Both the role and the workflow are used as means of communication in order to guide implementation. These three elements will form the structure of the final proposal for HCD.

Part 3: Develop – HCD in response technology development
In order to develop the three elements of embedded implementation of HCD, additional research is performed: Through a literature review, the current application of HCD across different domains is assessed. Through interviews with 510 staff and stakeholders from a 510 project (consisting of staff of National Societies Red Cross of project countries) three needs for the application of HCD within the 510 case are identified:

1. The first need is ensuring that the project is solving the right problem for the right person. 510 aims to improve the speed, quality and cost-effectiveness of humanitarian aid by using data- and digital products. Even scientific projects aim to solve human problems. However, the research goal might not be formulated in order to reflect that.

2. The second need for HCD of 510 is to create an understanding of the user and their context from a user perspective throughout the project. Literature research shows that in the development of response technology, often an oversimplified definition of the user and the context is used. This is reflected in 510 through their broad user-definition; the wide variety of possible users included in the broad user-definition makes it even more difficult to get a clear understanding of the user and the context in which they act.

3. The third need for HCD is the development of a suited and usable user-interface for software products. Currently, assumptions are built up throughout the interface design with limited iteration or feedback throughout development. By iteratively prototyping and gathering feedback from users, the product is more likely to suit the many contexts it will be applied in.

Part 4: Deliver – 510 HCD proposal
The three elements for embedded HCD are developed into a proposal for the case of 510 through incorporating the challenges, the insights from literature and the needs as expressed by 510.

Element 1: Role
The found needs are translated into a summarized role for HCD: (1) supporting the formulation of human-centered project goals, (2) generating an understanding of the user and their direct context and (3) the design of usable and suitable products. The HCD team will fulfill these roles by applying 3 main HCD principles: gathering **user insights** and feedback through **participatory methods** in order to continuously and **iteratively improve** on all three responsibilities.

Element 2: Embedded workflow
An embedded workflow of HCD activities is proposed. The workflow gives an overview of the selected HCD methods, in which project phase they should be applied and their output for the project. The workflow is based on current HCD activities while changes are proposed based on the defined HCD role, examples from literature and the needs for HCD as found through interviews.

Element 3: Communication
The third lesson in implementing HCD is that it should be implemented by everyone in the organization. 510 staff need to understand HCD in order to include it in their project. HCD volunteers need to understand the methodologies in order to perform HCD activities. In order to help the HCD team guide all of 510 staff towards embedded implementation of HCD, the HCD role and workflow need to be communicated in a way that is actionable for 510 staff and HCD volunteers.

First of all, communication is already taken into account in the development of the role as well as in the development of the workflow: the HCD goals are formulated in order to have clear relevance to 510 product development activities and the HCD workflow is made more transparent for 510 staff through participatory HCD activities.

In addition to this, 4 communication materials are proposed:
1. A general introduction slide-deck to be presented to 510 staff and to be viewed by all incoming 510 volunteers
2. An HCD workflow overview to generate an understanding for the HCD activities in relation to 510 projects
3. An overview explaining when HCD should be involved in 510 projects and how HCD will benefit the project
4. Modules explaining the HCD methods in order for HCD volunteers get familiar with the activities autonomously

Concluding
The case study presents several insights in the implementation of HCD for digital tools for disaster response within humanitarian organizations like the Netherlands Red Cross. Three lessons about implementing HCD are: (1) HCD is already done in many ways, (2) HCD covers all aspects of the organization and (3) should be implemented by everyone in the organization.

Three elements for successful implementation of HCD are found to include: a clearly defined role and scope for HCD activities, an embedded workflow that complements existing product development and a communication plan that guides HCD throughout the organization and promotes participation and transparency.

Identified suitable roles for HCD in the development of response technology are: (1) supporting the formulation of human-centered project goals, (2) generating an understanding of the user and their direct context and (3) the design of usable and suitable products.

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1. Introduction and problem definition

1.1 Human focus in humanitarian response

1.1.1 Disaster response innovation

The society we live in is rapidly changing due to technological advancement and digitalization. In humanitarian action, digitalization is identified as a key driver of change as well. Technological advancements provide opportunities to advance disaster response activities such as data gathering, data analysis, logistics and donation (Brophy-Williams et al., 2013). There are already many examples of the use of innovative technologies for disaster response, for example the prediction of natural disasters in order to take preventative measures, the use of unmanned aerial vehicles to provide relief aid in remote areas and the use of chatbots to monitor food-security in hard to reach areas (Melamed, 2017).

Technical advancements, while they are the basis, are only one part in the development of well-functioning response technology (Jul, 2007). The innovative products might be employed in numerous situations by a wide variety of people. In order to develop these tools, it is crucial to gain understanding of these users, their activities and the context in which the technology will be employed.

To better understand the user and their context, local communities are increasingly included in the development of disaster response (Brophy-Williams et al., 2013). The 2015 World Disasters Report (IFRC, 2015) emphasizes the crucial role of local actors in disaster response, not only because they are always the first responders in case of disaster, but also because of their broader understanding of local circumstances. At the World Humanitarian Summit in 2016 aid organizations agreed to more and more include recipients in the design of the programs. Additionally, in their humanity agenda, OCHA promotes an inclusive and bottom up approach in order to succeed in their agenda for change (UN OCHA, 2017).

> ***"Local actors are uniquely placed to find solutions that reduce underlying risks because of their understanding of local contexts – of weather patterns, of community leaders, of vulnerabilities and of sources of strength." - IFRC, (2015)***

Although there is an increased attention and an increased intent to include a local perspective, building awareness of the local context in the development of response technology remains a challenge. The context of humanitarian response is complex due to the large variety of people and organizations involved in the inherently chaotic and unstable situation of a disaster (Jul, 2007) (Brophy-Williams et al., 2013). This is very different from most design contexts, where the deployment of the technology and the requirements are relatively straightforward (Brophy-Williams et al., 2013). The complex context of disaster response often results in assumptions regarding the user, their action and the context of use, leading to less effective products (Jul, 2007).

1.1.2 A human focus in humanitarian response

One way to systematically gain understanding on the user, their activities and their context is through Human-Centered Design (HCD). HCD is an innovation approach that centers around empathy with the user. It is described by Junginger (2005) as: "the task of developing products that people find useful, usable and desirable".

In practice, HCD is a design method that is based on interaction with the people who are intended to benefit from the design. It is a participatory approach and therefor asks for a collaboration between the developer and the user. Additionally, HCD is an iterative approach that iterates between development and testing.

> ***"Embracing human-centered design means believing that all problems, even the seemingly intractable ones like poverty, gender equality, and clean water, are solvable. Moreover, it means believing that the people who face those problems every day are the ones who hold the key to their answer. Human-centered design offers problem solvers of any stripe a chance to design with communities, to deeply understand the people they're looking to serve, to dream up scores of ideas, and to create innovative new solutions rooted in people's actual needs." - IDEO.org, (2015)***

HCD is proposed as a suitable methodology for use in the development of digital tools for disaster response because of two reasons. Firstly, it deals with the complex nature of disaster response by looking from a user perspective and constantly interacting with the user in order to create a better understanding of their context (De Leoni et al., 2007). Secondly, HCD is in line with the increasing inclusion of local actors in the development of disaster response. The HCD approach recognizes the essential role of local communities in finding solutions for the problems they face.

1.2 510 case introduction

> ***Shape the future of humanitarian aid by converting data into understanding, put it in the hands of aid workers, decision-makers and people affected, so that they can better prepare for and cope with disasters and crises. – 510 mission statement***

This thesis focuses on the case of 510, who aim to implement HCD in their response technology development. 510 is a Netherlands Red Cross (NLRC) initiative that was started in 2016 and is part of the movement to develop accessible data and digital tools for humanitarian response across the world. 510 works together with a core team of around 15 staff members and a large number of volunteers to develop data and digital products for disaster response. 510 has as a goal to: "improve the speed, quality and cost-effectiveness of humanitarian aid by using and creating data and digital products." They make digital products that support numerous people involved in disaster response, from the people affected, to the national Red Cross or other emergency aid providers, to hydrometeorological centers, local governments and donors. 510 products, which can be databases, models or software tools, are developed for different types of disasters in different countries across the world.

Whereas 510 is situated in the Netherlands, their products are implemented globally, targeting a wide variety of people in a wide variety of contexts. These varying locations and the dynamic context of humanitarian action make it difficult to gain understanding for the contexts in which the product will be used (Brophy-Williams et al., 2013). In order to ensure that the products are based on user needs and in order to ensure that the products are suited for the context in which they will be employed, 510 aims to incorporate a Human-Centered Design (HCD) approach to their product development. To do so, two staff members have taken on the development and practice of HCD methods and a number of HCD volunteers have been taken on for support in these activities.

The implementation of HCD is still in process. Since the end of 2018 HCD methods have been applied on an ad-hoc basis in some of the 510 projects. However, the HCD methodologies are not yet fully developed and are currently not structurally employed across all projects. Therefore, the aim of this thesis is (1) to understand the challenges in applying a human-centered approach and (2) to translate these lessons into required elements for HCD implementation, (3) to make an analysis of the needs for a human-centered approach in the case of 510 and (4) to make a proposal for applying a human-centered product development process within 510 product development.

1.3 Research questions

How can Human-Centered Design be applied in the development of data and digital tools for humanitarian response?

This research question is explored through the following sub-research questions:

Sub-Research question Discover:
What are challenges towards applying HCD in the development of data and digital tools for humanitarian response?

Sub-Research question Define:
What are the required elements of successful implementation of HCD in the development of data and digital tools for humanitarian response?

From the required elements of HCD, new sub-research questions emerge for the development of the final proposal for 510;

Sub-Research question Develop:
What are the needs for HCD within 510 in the development of data and digital tools for humanitarian response?

Sub-Research question Deliver:
How can Human-Centered Design be applied in the development of data and digital tools for humanitarian response in the case of 510?

2. Methodology

To understand how HCD can be applied in the development of response technology, the double diamond method (Design Council, n.d.) is used. The double diamond is a design methodology developed by the British Design Council in 2005. The double diamond has four phases: Discover, Define, Develop, Deliver. The first diamond, including the Discover and Define phases, is about understanding the challenge and the underlying problems. The second diamond, including the Develop and Deliver phases, is about generating solutions to these problems. The double diamond works with a divergence-convergence method. Discover and Develop are the diverging phases in which knowledge is expanded upon by doing research or generating new ideas. Define and Deliver are converging phases in which the existing knowledge is used to formulate challenges and concepts. The method allows to iterate not only on the design outcomes, but on the problem as well. The method is chosen because of this focus on iteration in the explorative phase of the project. For the case of 510, the challenges in implementing HCD are quite unclear at the beginning of the project and understanding these challenges is equally important as the design of the solutions. The following paragraphs explain in more detail the activities done within the four double diamond phases (as is illustrated in Figure 1)

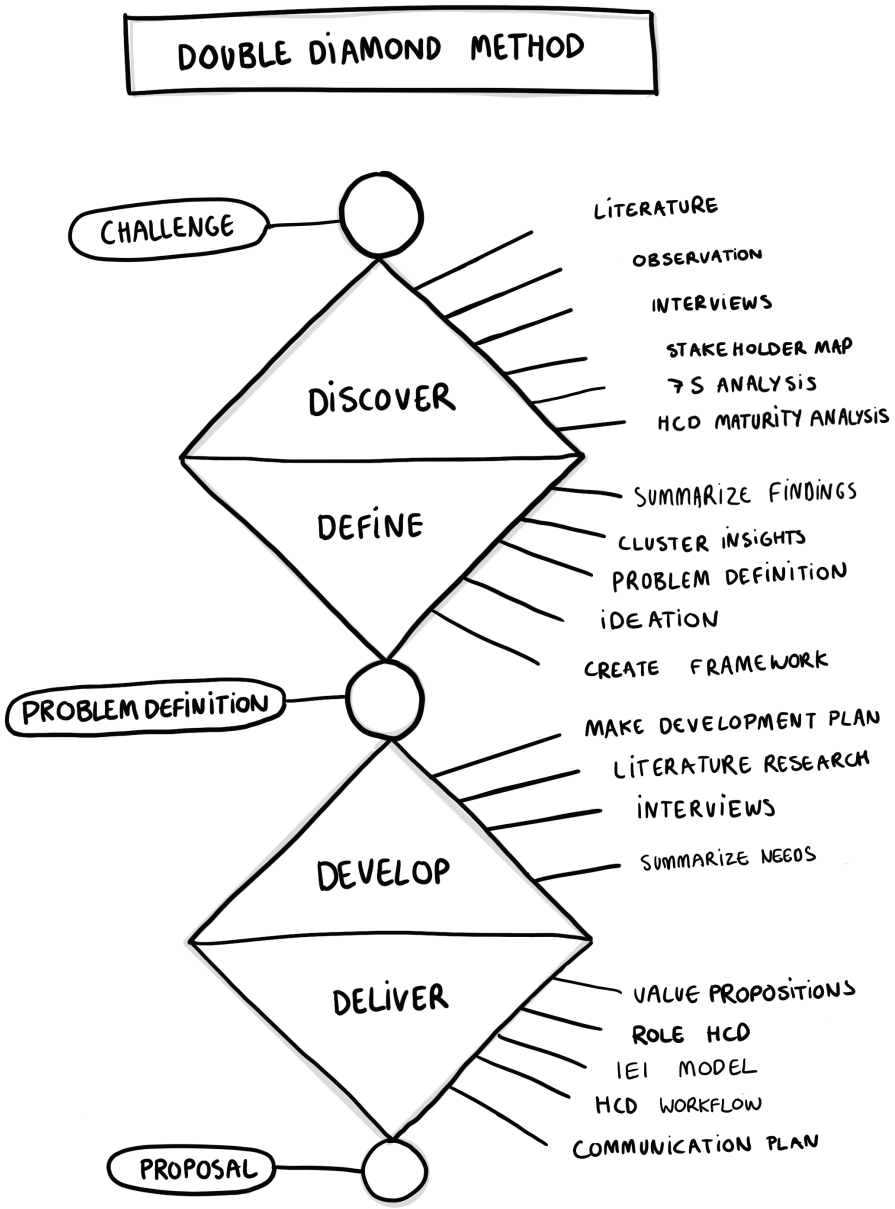


Figure 1. The double diamond (image adapted from Design Council, n.d.)

2.1 Discover - Challenges in the implementation of HCD in 510

The first diamond helps people understand, rather than simply assume, what the problem is. - Design Council (n.d.)

The first phase consists of discovering the issue through interviewing and observing those who face the problem (Design Council, n.d.). In this thesis project, the challenges towards implementing HCD in 510 are researched in this phase. Firstly, a literature research is done in order to get an understanding of HCD. Next challenges and enablers of implementation of HCD in 510 are discovered through an analysis of 510, an analysis of the current situation of HCD within 510 and through interviews with different stakeholders.

2.1.1 Literature research

An initial literature research is done in order to define the concept Human-Centered Design and review existing knowledge on the implementation of a Human-Centered Design approach in organisations.

2.1.2 510 analysis

A description of the 510 products and scope is given in order to get an initial understanding of this Netherlands Red Cross (NLRC) department. To elaborate on this initial understanding, the 7S model by McKinsey is used. This is a widely used model, developed in the 70s, in order to analyze companies based on 7 consistent factors. The model combines more evident values such as organisational hierarchy and structure with more ambiguous values, such as shared values and style. 510 has both a quite unusual organisational structure as well as distinct organisational values. Therefor the 7S model is considered suitable to analayze the department. The analysis is done only for 510 because the department works quite separately from the rest of the NLRC. Information is gathered from observation in meetings and discussions, from immersion, from the internal documentation of 510 and from collaboration with the 510 supervisor for this project.

2.1.3 HCD maturity analysis

An analysis of the HCD activities and team is made in order to understand its current maturity and possibilities for improvement. Little is written about the application of Human-Centered Design in organizations and during the writing of this thesis, no assessment method for HCD within organizations is known. For similar approaches such as service design and user experience design however, several assessment models are developed by design agencies. Examples of such maturity models are the Service-design maturity model by Koos Service Design (Corsten, 2019) or the maturity levels by NNGroup (J. Nielsen, 2006a), (J. Nielsen, 2006b). Whereas User Experience (UX), Service Design and Human-Centered Design differ in focus, the approaches also overlap in many ways. Because of this overlap and the lack of an HCD assessment model, the Service Design Maturity Model by Koos is seen as relevant for the case of 510 and used in order to assess 510 HCD maturity.

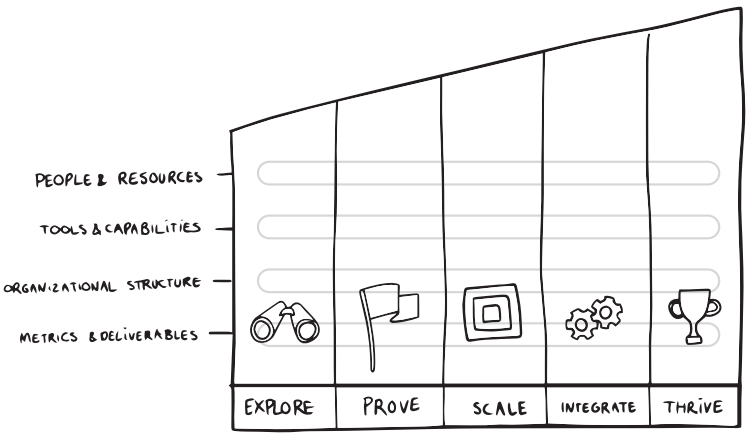


Figure 2. The stages of Service Design Maturity (adapted from Corsten, 2019)

The maturity model by Koos assesses an organization based on 4 indicators (as seen in Figure 2): 'people and resources', 'tools and capabilities', 'organizational structure' and 'metrics and deliverables'. These different indicators are categorized according to 5 possible stages: Explore, Prove, Scale, Integrate and Thrive. The classification helps identify possibilities for improvement for HCD in the organisation.

Information is gathered through observation, immersion (by participating in HCD activities), from internal documentation of 510 and through collaboration with the 510 supervisor from this project.

2.1.4 Interviews

Five 510 staff members are interviewed in order to understand the current application of HCD in 510, in order to find enablers and challenges to implementing HCD. HCD volunteers are the biggest workforce of the HCD team in 510. Two HCD volunteers are interviewed in order to understand their work for 510 and their view on HCD work at 510. The interview guides can be found in Appendix A. Both interviews are semi-structured in order to give participants the opportunity to guide the conversation to the topics they find important.

2.2 Define - Lessons and 3 elements of embedded implementation of HCD

In the Define phase, the findings from the discover phase are turned into a problem definition. - Design Council (n.d.)

2.2.1 Clustering insights

The insights from interviews are analyzed and clustered in order to form groups of insights that belong to a similar theme (Figure 3). This is done partly individually and partly in a group. The group analysis is done with the HCD team (volunteers and staff). In the group analysis, every participant is given a number of transcripts to go through in order to highlight any relevant insights. Afterwards, the insights are discussed together and grouped into larger themes.

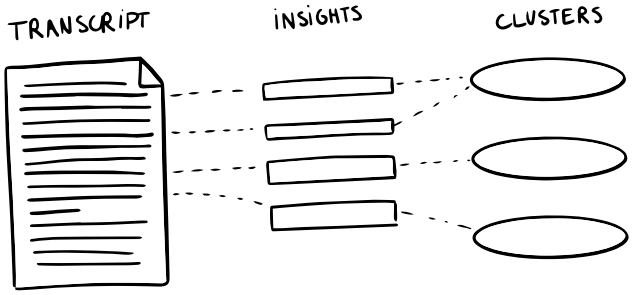


Figure 3. Combining transcripts or other analysis into insights and insights into clusters

Because of the number of interviews done with 510 staff and HCD volunteers, part of the interviews were clustered individually. This consisted of going through the transcripts and recordings multiple times, "immersing" into the topic and highlighting insightful quotes. The insights were clustered multiple times according to several themes in order to find the final overarching lessons. Additionally, the organizational and maturity analysis were done individually and therefor also translated into insights and clusters individually.

The clusters form the basis of the lessons in implementing HCD. These three lessons for implementing HCD are translated into three elements for embedded HCD.

2.3 Develop - Insights in the needs for HCD in 510 and the application of HCD across fields

In the second diamond, a design is made to help solve the problem defined in the first diamond. - Design Council (n.d.)

The application of HCD in several fields is researched through a literature review. Additionally, 510 staff members and 510 project stakeholders are interviewed in order to understand the needs for HCD. Based on these insights and the insights from the interviews, ideation is done for solutions.

2.3.1 Literature review

In order to understand the need for HCD in the development of response technology, examples of the use of HCD in this field are researched through a literature review. The role of HCD, the used methodologies and the challenges with the use of the methodologies are discussed. Because the limited available research on the use of HCD in the development of response technology, similar uses for HCD are used for as example as well:

1. HCD in software development
2. HCD in humanitarian aid
3. HCD in the development of digital tools for disaster response

2.3.2 Interviews

In order to understand the need for HCD and the niche it could fulfill within 510, 510 staff and 510 projects stakeholders are interviewed.

Nine 510 project stakeholders, consisting of Red Cross-National Society employees from project countries, who are involved in a project with 510, are interviewed to understand their perspective on the project. The interview focuses on the goals they have within the project and the challenges they come across during the project.

Five 510 staff members are interviewed in order to understand their perception of need for HCD activities, their current use of information on the user and context and their expressed needs for information on the user and the context.
The interview guides can be found in Appendix A.

Similar to the interviews in the exploration phase, the interviews are semi-structured with a small number of open-ended questions in order to give the participant freedom to discuss the topics they found most important. However, in this case the questions were focused on the information need during 510 projects instead of on the current experience with HCD.

Deliver - Proposal for embedded HCD in 510

The Deliver phase consists of iterative development towards a final design. - Design Council (n.d.)

In the Deliver phase in this report, the final proposal is explained as well as the iteration cycles.

2.3.3 Role

Based on the expressed needs, a role and scope for the HCD department is proposed. In order to formulate the added value of HCD for 510 the value proposition sheets (Strategyzer, 2020) are used (Figure 4). These sheets help determine the added value of the product or service (in this case, Human-Centered Design) for the user (in this case the user is 510) by breaking them both down into 3 parts; The first part is a general description of the product and the responsibilities of the organization. The second part is the goals of the user and how the product/service helps to achieve these goals. The third part is the challenges the user faces and how the product/service helps mitigate these challenges.

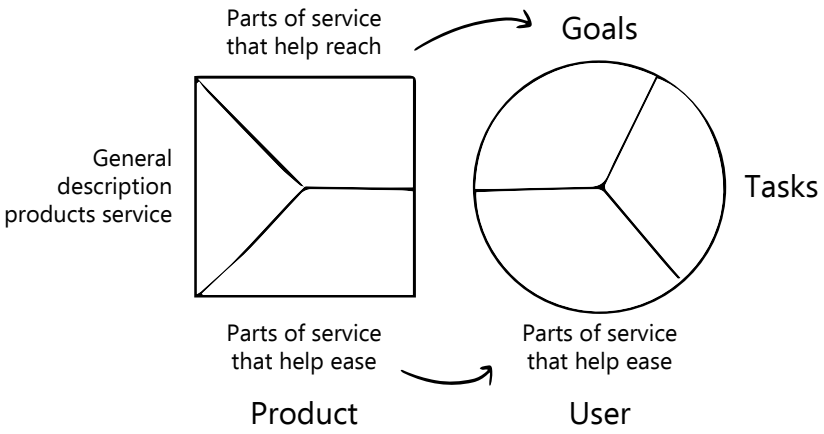


Figure 4. Value proposition (adapted from Strategyzer, 2020)

2.3.4 Embedded workflow

Methodologies are chosen and an embedded activity workflow is proposed based on insights from the Discover phase, the Develop phase and the defined role for HCD. To do so the Introduction-Establishment-Improvement (IEI) Model by Metzker and Offergeld (2001) is used which is further explained in sub-chapter 3.2. The lessons from literature are taken into account in the adaptation of the methodologies and the workflow. Appendix C shows the insights from literature divided per HCD role and Appendix B shows a wordcloud that was made in order to consider the link between HCD and 510.

2.3.5 Communication plan

One of the elements of embedded HCD is found to be communication from the HCD team in order to help the HCD team guide 510 staff and volunteers in the use of an HCD approach. To facilitate this a communication plan is made. First an overview is made of the HCD responsibilities per staff member per project phase. Using this as a guide for the needed knowledge, four communication materials are designed for four different user groups.

Part 1: Discover

The following chapters describe the exploration of the problem:

Chapter 3. Literature review on HCD (page 16)
The literature research consists of a research into the concept of HCD and research into the implementation of HCD in organizations.

Chapter 4. Organizational analysis 510 (page 19)
The organizational analysis is done to further understand the context in which HCD is implemented. It consists of an analysis of 510 and an analysis of the HCD team within 510.

Chapter 5. Maturity analysis HCD in 510 (page 23)
A maturity analysis on the 510 HCD team is performed in order to understand the current practices of the HCD team and the possibilities for improvement.

Chapter 6. Interviews on HCD in 510 (page 28)
Interviews with 510 staff and 510 HCD volunteers are conducted in order to understand their experience with implementation of HCD in 510.

The insights are further analyzed in the Define chapter

3. Literature review on HCD

This chapter discusses the basic principles of Human-Centered Design, the roles of HCD in organizations and the implementation of HCD as discussed in literature.

3.1 An introduction to the HCD approach

In order to discuss the application of HCD in 510, an understanding of the current HCD approach is needed. This sub-chapter provides a description of the concept of Human-Centered Design as found in literature.

3.1.1 The term Human-Centered Design

Currently 510 uses the description of HCD as described by the design organization IDEO. IDEO has made a handbook (IDEO.org, 2015) and tools on HCD that are widely used, mostly in social organizations (IDEO.org, 2015). However, the definition and practices of Human-Centered Design can vary greatly across organizations (Gordon, Kramer, Moore, Yeung, & Agogino, 2017). Additionally, the terms 'user-centered design', 'design thinking', 'empathic design' and 'people centered design' are used for similar practices.

3.1.2 History of Human-Centered Design

The term HCD was first used to describe the design of technology in a way that incorporates human capacity and this approach was applied mostly in the development of software (Walters, 2005). Wallach & Scholz (2012) describe User-Centered Design as a successful and practical approach to the design of software user-interfaces. In software design, Human- or User-Centered Design are closely linked to the usability of the designs interface. Gould and Lewis' (1985) describe Designing for Usability according to three principles: (1) early focus on users, (2) empirical measurement using prototypes and (3) iterative design (through Wallach & Scholz, 2012). These principles are almost identical to the IDEO principles for Human-Centered Design, even though the HCD method is applied to a much larger variety of products and services.

After usability design, Human-Centered Design became more and more known for its use in social design (Nemeth, 2019). Because of its focus on human insights and participatory approach it is considered to be a design method that enables a dignified relationship with the user (Buchanan, 2001).

> ***"It is true that usability plays an important role in human-centered design, but the principles that guide our work are not exhausted when we have finished our ergonomic, psychological, sociological and anthropological studies of what fits the human body and mind. Human-centered design is fundamentally an affirmation of human dignity. It is an ongoing search for what can be done to support and strengthen the dignity of human beings as they act out their lives in varied social, economic, political, and cultural circumstances." - Buchanan (2001)***

This social aspect of HCD was reinforced when in 2008 The Bill and Melinda Gates foundation asked design organization IDEO to develop their currently widely used HCD toolkit, which was done in order to create more awareness of HCD as a design method for social impact.

3.1.3 The Human-Centered Design approach

Human-Centered Design should be seen as an approach rather than a set methodology with clearly defined steps. The ideology behind Human-Centered Design is that it starts with the human aspect of the problem. The initial focus is on understanding the user's hopes, fears, goals in order to understand what is desirable. Allthough the activities should start at the user, there should be an understanding of the larger system surrounding the user. This three-part system includes, besides desirability, business viability and the technical feasibility of the project (Figure 5).

Every publication, video or journal provides slightly different principles for HCD. Although the main principle is in every case to 'focus on the people'. Beyond this main principle, the other principles of HCD vary. Additionally to the core "focus on the people", Don Norman (2018) states, HCD is "finding the right problem to solve" and "thinking of everything as a system". Other principles mentioned include 'building in multi-disciplinary teams' (IBM, 2020) and 'considering the overall consumer-experience' (Elmansy, 2017).

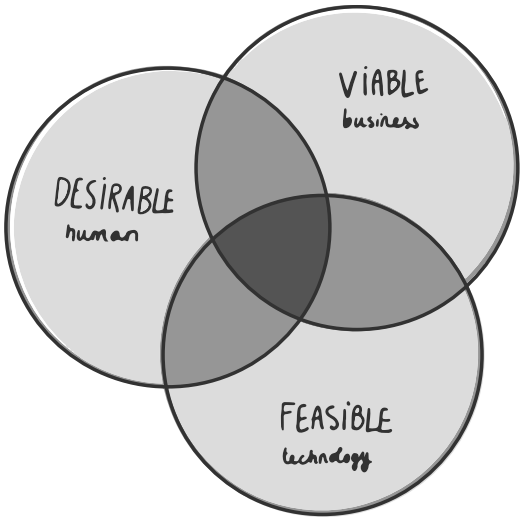


Figure 5. HCD starts at Desirability, but includes Viability, Feasibility (adapted from IDEO.org, 2015)

Based on the literature review and IDEO's Field guide to HCD (2015), HCD has three main principles:

1. HCD is, as the name suggests, human-centered. In HCD, the initial focus is on empathy with the user and understanding the needs of the intended users (Bourne, 2019). Only after this step, the project incorporates the viability from a business- and the feasibility from a technology perspective.
2. In HCD an iterative approach is used to get to the final result. Evaluations and iterations are made throughout the development process by prototyping and user-testing.
3. The approach is participatory. It engages the user in the design process, from ideation to implementation.

Although there is no predefined methodology for Human-Centered Design, in the Field Guide to Human-Centered Design (IDEO.org, 2015), the HCD approach consists of 3 phases: inspiration, ideation and implementation. In the inspiration phase the goal is to understand the user. In the ideation phase the earlier observations are analyzed and ideas are generated. Additionally, prototyping and testing are done in this phase. In the implementation phase, the practical embedding of the ideas is developed and executed.

3.2 A review of the implementation of HCD in organizations

Little is written on approaches and challenges to implementing HCD in organizations, whereas more commercially used forms of design, such as user experience design or service design, are more extensively discussed by design agencies. The different design methodologies can be expected to have similar challenges in an organizational context and benefit from similar approaches in implementation. Therefore, the implementation of a wide variety of design practices is taken as an example for the implementation of Human-Centered Design in organizations that develop data-and digital tools for humanitarian response.

One relevant example for 510 is given by NN group (2020). NN group discusses several approaches to convince companies of the value of service blueprinting, a design methodology in service design. The strategy has three steps: include stakeholders early and often, track success and use it as evidence and translate user needs into business impact (NNGroup, 2020).

Metzker and Offergeld (2001) have developed a detailed method to implement Human-Centered Design in industrial software development organizations. In this paper, the term HCD applies to usability design. The method for implementation consists of two models: the HCD Reference Model and the Introduction-Establishment-Improvement (IEI) Model (Figure 6). The HCD reference model is developed in order to create a collection of established HCD activities from different HCD approaches.

The Introduction-Establishment-Improvement model provides a stepwise methodology to implement HCD activities within software development. The methodology includes mapping out the existing software development process and selecting HCD methodologies fitting to that current process. Step 4 and 5 are the implementation of the HCD methods, the development of reusable artifacts, best practices and tools and the iterative improvement of these documentation materials.

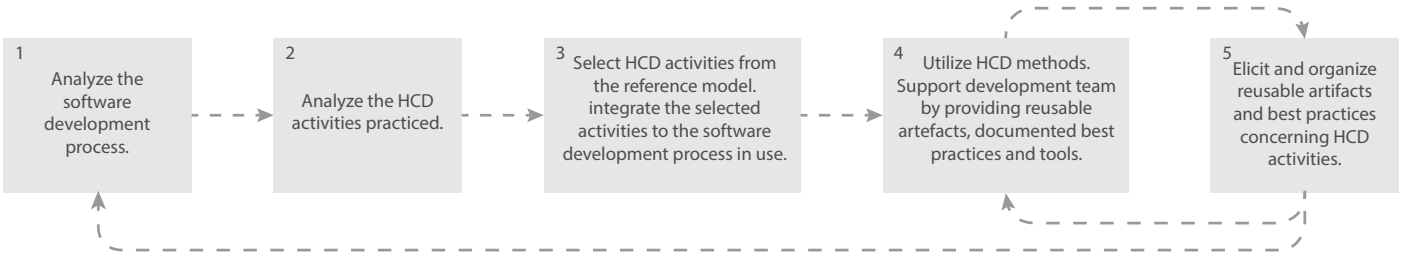


Figure 6. The Introduction-Establishment-Improvement model (adapted from Metzker & Offergeld, 2001)

The methodologies used by Metzker and Offergeld (2001) in the HCD reference model are much more limited than the possible HCD methodologies from the IDEO toolkit (IDEO.org, 2015) and uses a much more limited definition of HCD than IDEO. However, the implementation steps from the IEI model can be used in the case of 510.

3.2.1 Challenges in implementing HCD in organizations

Several challenges in implementing design thinking in organizations are found.

Firstly, in a review on the implementation of design thinking across several organizations it became clear that the design team needs to find a niche that is not covered in existing programs (Dunne, 2018). As a design team, naming the team the "customer experience" team can undermine current customer experience activities. Additionally, Dunne describes how organizations can have difficulty with the explorative and iterative nature of design practices.

> ***"The freewheeling nature of design, with its emphasis on qualitative research, storytelling, and iteration, can be a difficult fit in cultures that prioritize certainty, quantification, and efficiency." – Dunne (2018)***

Another common misconception about interface design is that it is an activity that can be applied to an otherwise finished product. However, in order to have a significant and sustainable impact with interface design, design activities need to be embedded throughout the entire development workflow (Wallach & Scholz, 2012).

A difficulty that is often mentioned in literature is the structure of teams. The design team is often a separate entity, which causes high autonomy but also makes it more difficult to implement ideas. Dunne (2018) describes a consideration in the structure of teams when implementing design thinking in organizations: By integrating design methods in cross-functional project teams and making designers part of the project team, design thinking might be applied more uniformly throughout the project. However, designers are also more easily caught in day-to-day operating procedures and are discouraged to think outside incremental improvements. Interesting is the clear preference in two maturity assessments: both in the Koos Maturity model for service design (Corsten & Prick, 2019) and the NNGroup service design maturity model (J. Nielsen, 2006b), integrated cross functional teams are one of the last steps towards reaching design maturity in an organization.

Another challenge that is mentioned is that design teams have a tendency towards developing incremental changes in design, such as usability, in order to generate easy wins that increase their credibility (Dunne, 2018). This incremental tendency decreases the chance of generating disruptive innovation.

4. Organizational analysis 510

4.1 Understanding the 510 team

510 is the data team of the Netherlands Red Cross (NLRC) and supports NLRC in emergency support. However, in its management, projects and product development, 510 works mostly independently. For its projects 510 raises funding from external partners like the IKEA foundation. Additionally 510 has a different workflow and management style from the rest of the NLRC. 510 can be considered a sub-organization rather than a team within the NLRC. In order to understand 510, an organizational analysis is done.

4.1.1 Description 510 products, services, customers and locations

In order to get a general understanding of 510, first a description of the products and services, the projects, the stakeholders and the geographical scope is given.

4.1.1.1 Products and services

510 makes data and digital products that enable aid workers, decision makers and people affected to better prepare for and cope with disasters and crises by improving the speed, quality and cost-effectiveness of humanitarian aid (taken from the 510 purpose and mission which is further discussed in paragraph 4.1.2.2). The data- and digital products consist of databases, models and software tools.

It should be noted that 510 has a wider range of activities next to the development of products. 510 provides services such as building data capacity within a Red Cross-National Society and providing assistance in disaster response. This thesis focuses on the data- and digital products that 510 develops.

Disaster aid can be divided into several phases. The phases that 510 uses are: (1) community preparedness for disasters in disaster-prone areas, (2) early warning activities once a disaster is expected, (3) disaster response once the disaster has happened and (4) recovery after the immediate response. The phases flow into each-other and act as a cycle where the last phase (recovery) is continued again by the first phase (preparedness). The products of 510 are made for different phases across the disaster cycle. Table 1 shows the products that 510 makes and their placement along the disaster phases and the product abbreviations.

Table 1. Overview of products of 510 within the different disaster phases

Digital risk assessment		**Predicitve impact analytics**			**Emergency data support**			**Direct digital aid**	
Community Risk Assessment (CRA)	Reforestation	Impact Assessment (IA)	Epidemic Risk Assessment (ERA)	Impact Based Forecast (IBF)	Surge Information Management (SIMS)	Automated Damage Assessment (ADA)	Population movement (PM)	121 (CBA)	Wegwijzer

4.1.1.2 Projects

510 works on a project-basis for most of its activities. For their projects, 510 works with funding from numerous partners in order to finance the activities. A project can be either the development of a new product or the employment of an existing product in a new country. Often projects take multiple years to complete.

In Table 2, the columns with country names represent the projects per product. For every project, agreements with the donor are made that determine the project. Projects can have a time-span from months to years. From Table 2 it is clear that especially the Community Risk Assessment and Impact Based Forecast product have resulted in multiple projects.

Table 2. 510 funded projects within the 510 products

Digital risk assessment		**Predicitve impact analytics**			**Emergency data support**			**Direct digital aid**	
CRA	Reforestation	IA	ERA	IBF	SIMS	ADA	PM	CBA	Wegwijzer
Philippines, Ecuador, Mali, Malawi, Peru, Uganda, Zambia, Burundi, Ethiopia, Haiti, Kenya, Mozambique, Nepal, Benin, Sri Lanka, Vietnam			Philippines, Mali	IARP (Kenya, Ethiopia, Uganda) Peru, Zambia, Ecuador, Mali, Zimbabwe				Malawi, Kenya, Ethiopia, Ukraine, Sint Maarten	Netherlands

4.1.1.3 Stakeholders

Most projects involve a large number of stakeholders, i.e. donors, partners that collaborate in the project, data providers, local weather stations and universities, the Red Cross Climate Center, Red Cross-National Societies and the end-user of the product (Figure 7). The exact stakeholders, the extent to which they are involved in the project and their responsibilities within the project differs per project.

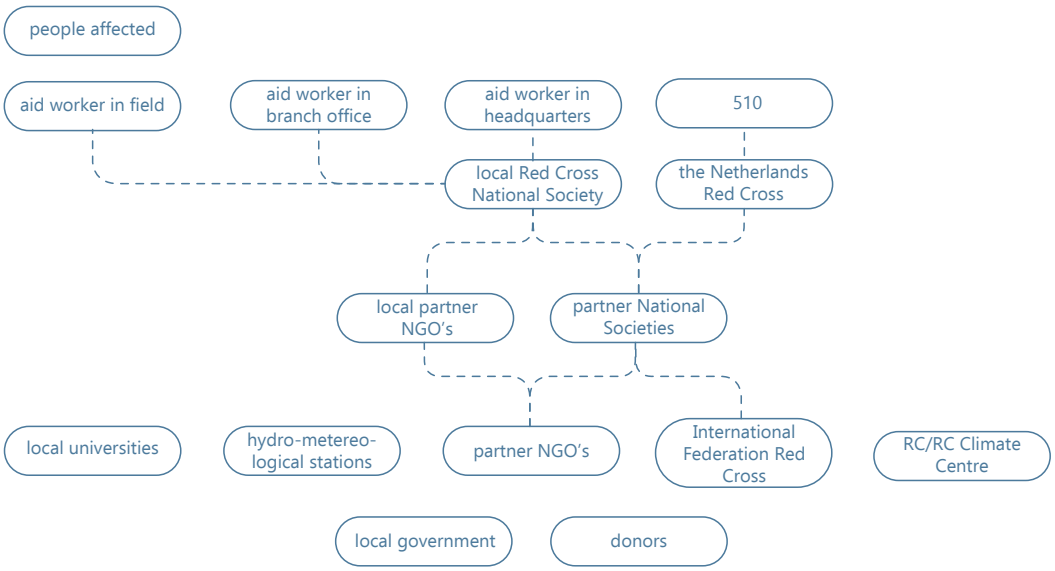


Figure 7. Stakeholder overview

4.1.1.4 Geographical scope

The products of 510 are implemented all over the world in low- and middle-income countries. Most projects are in Africa and Asia, but there are projects in Europe and South-America as well. The market of 510 consists of Red Cross National Societies and their local partners. Within the 4 years that the team has been setup, 510 has worked in over 30 different countries.

4.1.2 McKinsey 7S

In order to achieve a comprehensive and structured analysis of the organization, the 7S model by McKinsey is applied.

4.1.2.1 Shared values

The shared values of 510 are stated in their core values. All activities done within 510 should take these core values into account.

The core values of 510 are:

We prioritise disasters
We engage local and scale global
We design products and services based on needs
We embrace volunteerism
We build evidence
We use data responsibly
We connect digitally for sustainability

Three core values, highlighted in dark grey, can be directly linked to Human-Centered Design. 'We engage local and scale global' shows that products designed for a certain context are then adapted and applied across the globe. 'We design products and services based on needs' is the main value that can be linked to HCD. It means that all products should be built from a user need rather than only from technological exploration. 'We build evidence' shows that assumptions need to be tested throughout the process.

4.1.2.2 Strategy

The strategy can be found through the purpose statement and the mission statement of 510.
The purpose of 510 is:

> ***Improve the speed, quality and cost-effectiveness of humanitarian aid by using data & digital products.***

The mission statement of 510 is:

> ***Shape the future of humanitarian aid by converting data into understanding, put it in the hands of aid workers, decision-makers and people affected, so that they can better prepare for and cope with disasters and crises.***

The purpose of 510 shows the goal (improving humanitarian aid) and the way this is done, using data and digital products. The mission shows how 510 will fulfill their purpose. The mission statement is human-focused and explains the human benefit aimed for by the team.

4.1.2.3 Structure

Hussey (1984) describes a number of organization structures. 510 has a combination between a project-based structure and a team-based structure. Whereas several teams of volunteers are formed around certain activities, such as geospatial data analysis or Human-Centered Design, interdisciplinary project teams are formed as well.

Figure 8 shows a visual overview of the organisational structure. As described in paragraph 4.1.1.2., a project is either the development of a new product for a country, or it is the application of an existing product to a new country. Projects are initiated by the strategic lead, who writes a proposal. Once the funding is approved, a project manager is assigned. For products with multiple projects, a product manager is assigned. Product- and project managers get support from the product staff in the development of the product for the specific country. Not every product has a product manager that oversees the projects in which the product is applied. This means that projects for one product might have completely different teams per project.

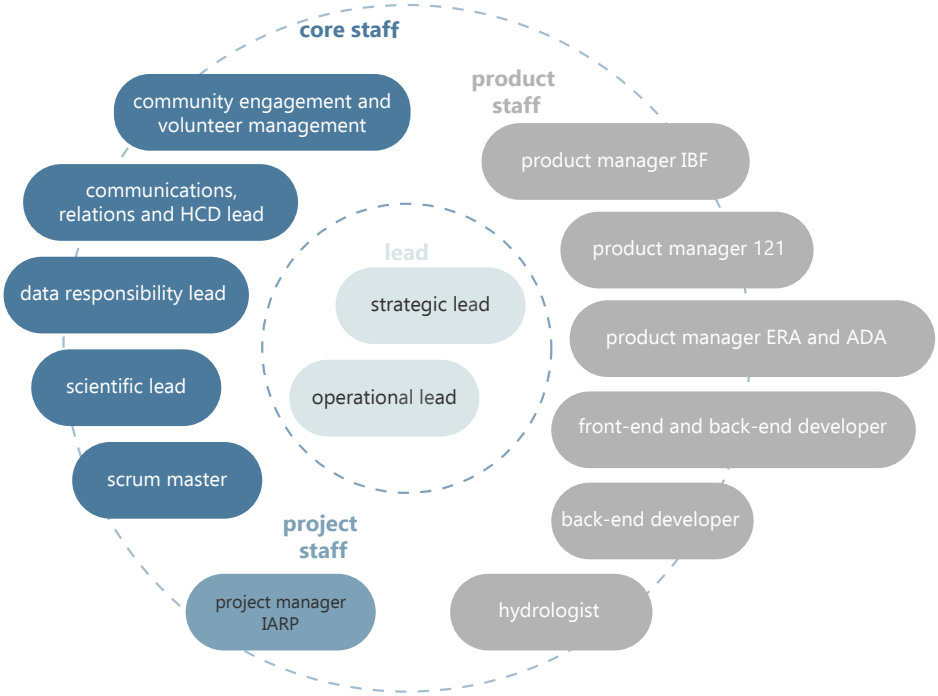


Figure 8. 510 organizational structure

4.1.2.4 Skills

For an innovative data-driven initiative, 510 is in a unique situation as it is part of the Netherlands Red Cross (NLRC). NLRC is part of the global Red Cross Red Crescent Movement and led by the International Federation Red Cross, which is the largest humanitarian organization in the world. This provides 510 two main advantages: (1) Firstly, it means 510 is part of an international movement with 192 Red Cross and Red Crescent National Societies (NS) across the world. 510 collaborates with these NS in order to develop, test and implement their products. (2) Additionally, 510 has both the reputation of a fast-moving technical startup and the trustworthy reputation of a large partner like NLRC. This combination gives competitive advantage over other companies developing response technology and help engage both partner organizations and volunteers.

4.1.2.5 Staff

510 has a highly motivated staff. Most of the staff base works on several projects and have many different responsibilities. Between the projects, the role of certain functions such as 'project manager' can vary. The responsibilities might depend on the interpretation of the people involved, the project setup and the partners involved. This diversity can create unclarity in responsibilities.

510 works with many volunteers and has a 1:5 staff-volunteer ratio. This is similar to the way of working in the entire Red Cross movement, as the movement works with a large number of volunteers across all their National Societies. However, because 510 is the data department of NLRC, staff and volunteers often have a background in data analysis (including GIS analysis), hydrology and software development.

6.1.2.6 Management Style

There is very little hierarchy in 510. In the beginning of each day, all volunteers and staff members do a standup to discuss what they are going to work on that day. Every volunteer has direct contact possibilities with every staff member and activities like drinks are inclusive to all volunteers.

A great example of the open management style are the ideation requests for new product possibilities, posted in the general communication channel. Everyone involved in the team has access to it and everyone is requested to post any ideas they have for new products.

6.1.2.7 System

Many internal processes within 510 are not predefined or not strict. Between two projects for the same type of products in two different countries, the approach, goals and documentation might be different depending on e.g. different donor's preferences. The team has hired a scrum-master to create more consistency in the product development. The limited existing structure and the shift to a different product development method means that activities and responsibilities are subjective to change.

The most important software used for communication is Microsoft teams, which holds all documentation for the different projects and serves as a collaboration and communication tool.

4.2 Conclusion 510 organizational analysis

From the points discussed in the organizational analysis, several points can be considered to have an influence on the implementation of an HCD approach in 510.

From the 7S analysis it is clear that enablers of HCD (factors that facilitate the use of HCD) within 510 are the organizational values, the company strategy, the open management style and the highly flexible staff and volunteers. Understanding the user and their context can indeed be challenging for an organization as 510: Whereas the projects are done all over the world, the 510 staff mostly work from the Netherlands. Additionally, the projects and products cover a very wide variety of disasters, countries, contexts, stakeholders and users. These varying topics makes it even more difficult to get familiar with the user and the context. Perhaps because of these difficulties, 510 supports a human-centered approach in the sense that their organizational values and company strategy underpin human-centered values. This shows openness and provides support in the implementation of HCD. Additionally, the company culture with a very open management style and the highly flexible staff and volunteers are likely to be open to embed HCD approaches in their product development.

Despite the open management and staff, the organizational analysis also shows possible challenges. Most of the staff, including project leads, have a technical background and a technical focus in their job and might therefor prioritize technical aspects. Next, the funded project structure with predefined goals and deliverables makes it difficult to pivot within projects or to change a project to have a Human-Centered Design approach. Additionally, because of the varying projects setups, the project workflow differs per project. On top of that, currently scrum methodology is being setup within 510. These differences between projects make it difficult to link HCD practices to the existing workflow. However, it also provides more possibilities in implementing HCD as there is no strict workflow in place.

5. Maturity analysis HCD in 510

In order to understand the current practices of HCD at 510 an analysis of the HCD team is made. The HCD team and methodologies of 510 are assessed using service design maturity model by Koos Service Design (Corsten, 2019). The factors assessed are: 'people and resources', 'tools and capabilities', 'organizational structure and roles' and 'metrics and deliverables'. Although the model is about service design, for 510 we will discuss the Human-Centered Design activities.

5.1 People and resources

The extent to which people, budget, time and facilities are available and dedicated to service design activities. - Corsten (2019)

Within 510, there are no full-time staff members for HCD. Instead, there are two 510 staff members who use part of their time to do HCD activities next to their main responsibilities. This is not an anomaly: within 510, almost every staff member is responsible for multiple projects or tasks (as described in paragraph 4.1.2.5).

Additional to the HCD staff members, there is a varying number of HCD volunteers available for a varying number of days per week. An overview of HCD volunteers is shown in Table 3. These volunteers might be thesis students, intern students or volunteering students, just-graduated students or working designers. On average volunteers are available 1 day a week and stay for around 4 months.

Table 3. 510 Human-Centered Design volunteers overview

Name	Type of volunteer	Start	End	Days per week	Background	Main activities
Vinay	Student	July '18	Jan '19	1	Industrial Design Engineering	XD Design
Pauline	Job-searching	July '19	Oct '20	1	Industrial Design Work	Methodology development
Rosa	Thesis	July '19	n.a.	2,5	Strategic Product Design	COD, Methodology development
Hardik	Job-searching/ working	Oct '19	Jan '20	1	Strategic Product Design	Persona journey, PESTEL
Ruth	Job-searching/ working	Oct '19	June '20	1	Human-technology interaction	Persona journey, COD
Shweta	Job-searching	Nov '19	Jan '20	0 - 1		everything
Priyanka	Student	Jan '20	n.a.	1	Strategic Product Design	Wireframing
Miranda	Working	n.a.	n.a.	Freelance	UX copywriter	UX copywriting

Because of their limited number of available hours per week and the limited timespan of involvement with 510, volunteers do not have a lot of time to be trained in HCD activities. NNgroup describe having a capable UX team as at least adequate coverage on interaction design, visual design, content strategy, writing, information architecture and research within the team. Within the small team of 510 staff and the ever-changing volunteers, building up the human capabilities described by the NNgroup is difficult. The volunteers who come in are mostly students with a relevant design background but limited work experience and no expertise.

The budget for HCD per project is growing but still limited. For multiple year projects there might be a number of days available for HCD activities. Because of this, the two staff members who are trying to implement HCD in 510 often work extra hours in order to do so. This lack of hours can be partly explained by the delay of budgeted projects. A proposal for the financial plan of a project is made before the project has received funding. During the timespan of a multiple-year project, new activities for HCD are difficult to implement later in the financial plan. A project might be started before HCD was started. This makes it difficult to implement HCD methods in the budget of the project and it makes it difficult to implement the HCD methods in the suitable timing. Partly because of this, the hours that are budgeted for HCD are sometimes planned in a way that undermines HCD methods, which will be further explained in sub-chapter 5.3.

5.2 Tools and capabilities

The extent to which service design methodologies and tools are applied within the organization and the level of required skills and capabilities that are needed to apply service design. - Corsten (2019)

There are 6 HCD methodologies that are being developed and used in 510. An overview of the methodologies and the underlying activities is provided in Table 4.

Table 4. HCD methodologies and their steps

	Method	Step 1	Step 2	Step 3	Step 4	Step 5
	**PESTEL analysis**	Find data and fill in	Iterate			
	**Strategy sheets**	Goal sheets	Value proposition	Ad libs	Business model canvas	Environment map
	**Codesign**	Codesign interview	Transcribing	Clustering insights		
	**Persona journey**	Establishing timeline	Establishing persona types	Fill in with quotes	Fill in topline	
	**Prototyping**	Paper prototyping	XD prototyping	XD wireframe	MVP	
	**User testing**	Paper prototype testing	XD prototype testing	XD wireframe testing	MVP testing	

The PESTEL analysis is a widely adopted methodology, used to understand the broader (in this case, country-wide) context, considering Political, Economic, Social, Technological, Environmental and Legal aspects.

The strategy sheets are adapted from the tools by the company Strategyzer, who make materials that help organizations understand the goal, value and the context of their product or service.

The codesigns are part interview and part ideation session. They are done with numerous people involved in 510 projects but all have the same setup: The first part is an ice breaker and gives an understanding of the participants digital literacy. The second part asks for a experience in disaster response (if possible, relevant to the product that is being developed) and asks the participant to explain this experience. In the third part the participant is asked to imagine, explain and draw out a digital tool that could help them in the disaster experience they described earlier.

The Persona journey is a combination of the Persona method and the Customer Journey method, combining the user characteristics and their journey across time into one analysis.

Prototyping and user testing are done iteratively. The prototype starts with simple drawings and notes, then moves into an XD prototype and later moves into a XD wireframe and finally into a Minimal Viable Product (MVP). The goal of all these prototypes is to be used for user-testing in order to gather feedback before moving into the next step.

As is clear from Figure 9, some of the tools are quite mature and have already been used in multiple projects. These methods include the strategy sheets and the codesign methodology. Other methodologies are still being set up and have only been used in one or two projects, such as the Persona Journey and the user testing methodologies.

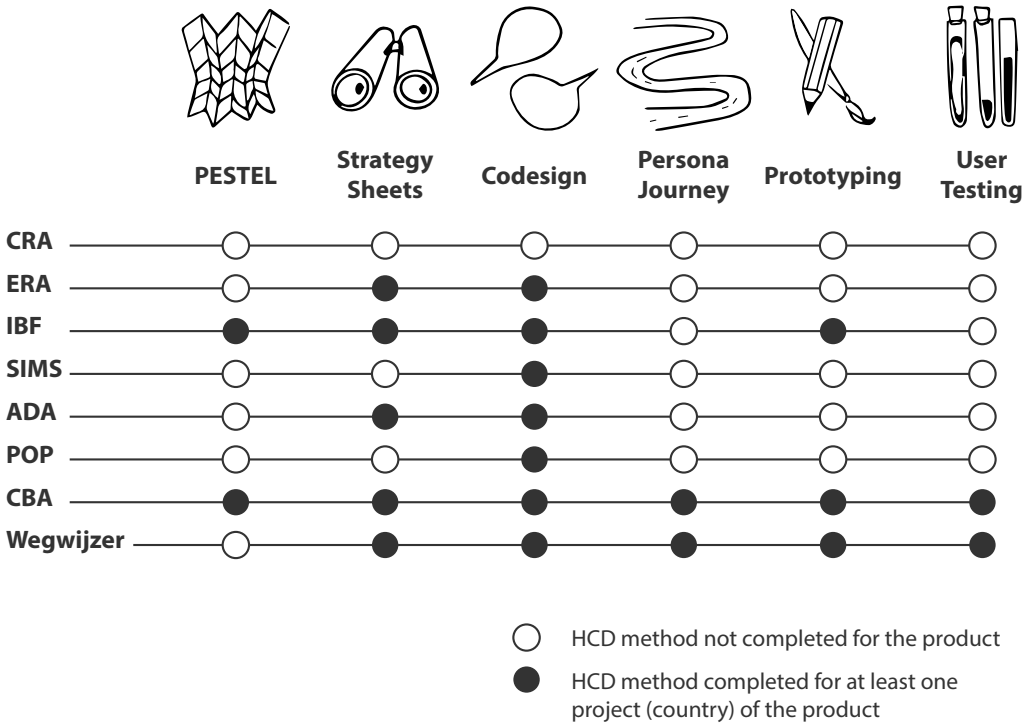


Figure 9. Overview products (as described in paragraph Table 1) and HCD activities performed

5.3 Organizational structure and systems

The extent to which the organizational structure allows and facilitates multidisciplinary service design work and the assigned roles that are needed to do so. - Corsten (2019)

As described in paragraph 4.1.2.3, 510 has a combination of project based and a team-based structure. The HCD volunteers work in a team-based structure. The most important touchpoint between the HCD team and activities and the rest of 510 is one of the HCD staff members, who divides tasks among HCD volunteers and communicates findings to the rest of 510.

The project-based structure of work of 510 generates some difficulties for HCD. Whereas there is a number of methodologies defined, how these methodologies are applied still varies across projects. Because of the long timespan of certain projects and the very young HCD team, HCD methodologies were applied after projects were already running for years. This has resulted in several difficulties in the application of HCD methodologies:

Timing of strategy sheets
In many older projects the strategy sheets are being used relatively late in the project. This means that a large part of the project might have already occurred without clear human-centered project goals.

Timing of codesigns
Codesigns were first only done once the product was already quite far in development. In a number of projects, the front- and back-end designs had already started before codesigns were conducted and a prototype was created or tested.

Iterative workflow
User testing is starting to be implemented in the workflow. Currently, it is not clear to everyone in 510 that user tests are supposed to be part of an iterative process. Because of this, user tests are budgeted to gather feedback when there are no hours left for development in order to incorporate the feedback.

Documentation
The limited number of hours available for HCD activities means that the documentation is often less important than performing the activity. For example, the HCD team might choose to do 2 extra interviews rather than transcribe one if there are 2 days to work on HCD activities for a project. This need for prioritization of activities means that the availability of documentation of previous work varies. Additionally, depending on the donor preferences documentation will vary based on what is needed for communication to donors.

5.4 Metrics and deliverables

The extent to which metrics and KPIs are in place and being pushed to stimulate and facilitate service design, next to the shape and form that deliverables of service design initiatives have.
- Corsten (2019)

The metrics vary per projects based on donor requests, and therefore do not necessarily include human-centered metrics. Deliverables of HCD are already seen across a wide variety of projects including: codesign transcripts, persona journeys and user-interface designs.

5.5 Maturity scores

The Koos service design maturity analysis helps classify the maturity into one of 5 stages: explore, prove, scale, integrate or thrive. Based on the description per stage of the four maturity dimensions (Table 5 and the corresponding Figure 10), it can be concluded that HCD within 510 is on average in between the prove and scale stages of design maturity;

- **People and Resources:** Two staff members are able to write some hours in order to do design as well as take on a number of volunteers in order to support in design activities. In the flexible workspaces, rooms are booked for some days to work with the entire HCD team. However, the HCD activities are mostly limited to the HCD team. Therefore, people and resources can be said to be in the scale phase.
- **Tools and capabilities:** The tools and capabilities are somewhere in between the prove and the scale phase. As the staff within the organization is only around 15 people, a large design department would not be feasible. Instead, some sort of design team is formed with the 2 part-time staff members and the volunteers. However, the capabilities are not spreading outside this initial team and the tools are not yet fully developed.
- **Organizational structure:** Although the organization does not have a strict hierarchy and everyone staff member or volunteer is in direct contact with the rest of the organization, at the moment the HCD team is operating very separately from the other departments. Additionally, there are no clear designated responsibilities for the design department. However, as is clear from Figure 9 a lot of HCD initiatives are already taking place. Therefor, the organizational structure is assessed to the "prove" fase.
- **Metrics and deliverables:** The metrics and deliverables within 510 score in between the prove and the scale phase. Whereas quite a lot of results are already produced, the same outputs are not created for every project and there are no predefined deliverables or human-centric KPI's formulated for the design department.

Table 5. Elaborated Service-design maturity ranking with the maturity of HCD for 510 in yellow (Adapted from Corsten & Prick, 2019)

	People and resources	Tools and Capabilities	Organizational Structure	Metrics and Deliverables
Explore	Individual service design enthusiasts are scattered across the organization in which no budget, time and facilities are dedicated to service design.	Service design knowledge and expertise is self-retreived (through books / articles / trainings), but scattered across the organization.	Traditional siloed structure, with no assigned responsibilities on service design or customer experience.	Customer centric metrics and deliverables are non-existent.
Prove	First project team is formed by enthusiasts and / or design agency. There is missing budget and management buy-in for service design initiatives.	Existing (adjacent) capabilities are brought together from different people. Organizations tend to buy capabilities through hiring a design agency.	The first multidisciplinary team is being formed and the first service design initiatives are taking place regardless of structure.	Deliverables of first project being created, like a customer journey map. First measurable results are often lacking.
Scale	More people get involved and incidental budgets are created for service design projects. Rooms and facilities are getting hijacked for service design.	Capabilities are spreading outside of the initial team. First employees start to specialise and CX / SD departments are being formed.	Interference with the existing way of working is felt. Silos start to suffer under the demands of multidisciplinary teams.	Project results are becoming increasingly apparent. First customer-centric KPIs are set specifically for the CX department.
Integrate	The majority of people is engaged with service design. Dedicated service design budgets are now in place.	Unified capabilities, methodology and language around service design, as capabilities are being decentralised within each team.	The siloed structure is broken down and design-led foundation is being laid. New roles emerge and are being assigned in each team.	C-suite is committed to CX and SD and may even assign a Chief Design Officer. Customer-centric KPI's go company wide.
Thrive	The entire organization is involved ins ervice design. Everyone is aware that all decisions may impact customer experience.	Strict methodology is set loose and experimentation is stimulated, as the design mindset is ingrained in the company culture.	Organizational structure allows for close c-creation of service experience in multidisciplinary teams.	Each initiative is tied to customer-centric metrics and deliverables. Customer centricity has become an important KPI for the entire C-suite.

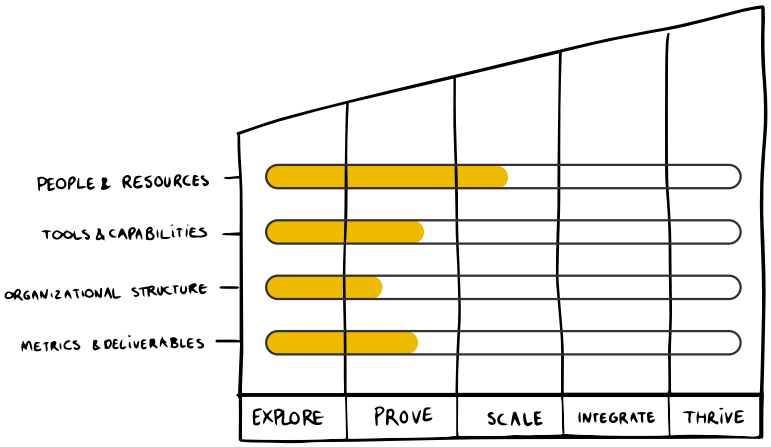


Figure 10. Maturity analysis of 510 adapted from Koos Service Design (Corsten & Prick, 2019) further explained in Table 5

5.6 Conclusion maturity analysis of HCD

From the analysis, it is clear that a lot has already been done for the implementation of HCD methods in a short time and with limited budget. Several methods have been developed and applied across projects and almost every project that was started recently has some HCD activities. However, it is also clear there still is development work to be done for HCD for 510.

Firstly, there is a very motivated HCD staff workforce with a lot of relevant experience but very little time to spend on HCD activities. Then there is a group of volunteers with little experience that varies in size and is inconsistent in availability. With the varying human-resources, capabilities that can be built up are not human-resources but rather structured methodologies that can be applied both by design volunteers and non-design staff. However, the HCD tools are not yet fully developed. There is very limited time available outside project budget in order to develop structured HCD methods. Instead, the hours available are taken to execute and employ the available methods. The lack of time also limits extensive documentation, which could be used to communicate methods and results and prove the effectiveness of the tools. Additionally, HCD methods are implemented varyingly across projects. There are no set responsibilities or deliverables for the HCD team within a project. The varying project deliverables and deliverable formats make it difficult to structurally document HCD activities.

From the maturity dimensions, the next steps for the 510 HCD team are to involve more people in HCD activities, further develop the HCD methodologies and structurally apply the methodologies to 510 projects while ensuring suitable budgets are in place. However, the size of the organization and the use of a changing volunteer base makes it difficult to build up human resources for HCD specifically as is described in the maturity analysis table.

6. Interviews on HCD in 510

6.1 510 staff interviews

From the staff interviews, both enablers and challenges to implementing a Human-Centered Design approach in 510 are found, which are described in the following paragraphs. In the quotes from the interviews, names of people, countries or organisations are replaced by a description such as - name - or - country -.

6.1.1 Interview insights

6.1.1.1 Unclear distinction between scientific or practical project

> *We have a small number of projects which are the research funds, and then the question can be more research based. That it is just a research question, that that's why we want to work with, for example, a PhD student. So then there is still consultation with the National Society, but less thorough than with an operational project. – 510_Staff_P3*
>
> *(so that is a research question based on the data available?) Yes, that's right. But it also comes from the end-user. The end-user always prefers to have the most detailed data or at the level at which they need to do an intervention. So, it also comes from the end-user. – 510_Staff_P3*

510 has a distinction between scientific (research) and product development (operational) projects. Within scientific projects the aim is to generate knowledge regarding new data or technology. In projects with a scientific scope, there is less contact with the users. However, the research question is often based on a need that is known from experience.

> *The problem that we are solving was given at the beginning, it was a very broad question: can we forecast epidemics? – 510_Staff_P2*

The participants example of a project goal is: can we forecast epidemics? This kind of research question allows to explore data analysis and model building without an already pinned down user or application. The question is aimed at exploration of the possibilities of technological innovation and not directly at development of a product.

> *We are starting HCD this week... So far, the project was more focused on the scientific part; can we forecast epidemics, can we understand the risk of epidemics? Now we want to start to turn it into a product. Timewise we are halfway in the project. – 510_Staff_P2*

In the same project example as the previous quote, the project is later turned into a product development project. HCD is entered into the project halfway through the project, when this change is made.

> *And then it is also the question – when do you call something research and when is it just a project. – 510_Staff_P3*
>
> *(talking about a scientific project that has moved into a practical project :) So far, there was a total disregard for the user perspective. So far it was very much top down (from 510). We are going to forecast epidemic; we are going to do it in this way. – 510_Staff_P2*

There is no clear distinction between a scientific and a product development project. Instead, scientific projects can later turn into practical projects. HCD is introduced once an initial model has been developed and is being turned into a product. This means that the objectives set at the start of the project focus on scientific exploration ("can we forecast epidemics?"). Because the objectives at the start of a project are scientific, there is a focus on the technical possibilities rather than the human-need within the development of the technology. However, the technology is intended to serve as the basis for a product which does intend to fulfill a human need.

6.1.1.2 Aim to sell the current products

> *If they (the National Society) indicate that they want- or don't want a dashboard. If they don't want a dashboard then we take it out of the proposition. – 510_Staff_P3*
>
> *I think the project was initially more we are going to do what we want and then we are going to sell it. We are going to see who is interested. 510_Staff_P2*
>
> *That is what we already have to offer and so we start with that. – 510_Staff_P3*

510 has products that are developed for certain countries from which the basis is a suitable product for other countries as well. Developing these existing products for new countries is desirable from an organizational perspective as this will take less time and effort to develop and has lower risk.

> *But we are not going to, like in – Country Y -, make a dashboard for -Country X- . There was no budget for that at the moment. And that is not a request from – Country X – Red Cross. Of course, in a while I might try to show them the dashboard, and ask if it would be useful for them. But that is also a bit of a technology-push, of course.*
> *– 510-Staff_P3*

The participant has described understanding and discussing with users before writing the proposal, and iteratively collaborating with National Societies. However, in practice often the communication methods can hinder a human-centered approach. The above described method of presenting a possible technology to the end-user without a need for it being expressed might, as the participant mentions himself, create a bias towards this technology. This can make it more difficult to find out the real needs of the users.

6.1.1.3 Time and budget contraint

> *But at the same time, because of the time limit right before tenders, sometimes only a short week, you can't ask questions in a scientific way about their decision-making processes. So you need to do it more quickly. – 510_Staff_P3*
>
> *Because we of course also have, the fourth option, is more the codesign sessions. But that is often if we already have a project running and then we build it into the budget to do the codesign sessions. So, then you actually postpone it a bit, so to say. Or we do some assumptions, and based on that we write the project-proposal. And then if we are doing the project, we are going to start with a codesign session to really elaborate on things, so that is also possible. – 510_Staff_P3*

One of the most common challenges to implementing additional research methodologies are time and budget constraints. In the beginning of a project, there is limited time and budget so there is no possibility to do extensive interviews or codesigns. Therefore, these are only applied after the project proposal is already made and serves as a contract between the donors and 510 that determines objectives and deliverables.

> *I think, for example, with – hydrometeorological center X- I'd rather they started collaborating with them in a very early stadium so they could have seen from the beginning how we built our model and then perhaps they had shared more with us as well. But that is also a budget question, because it also includes having a budget for such a stakeholder. Because a stakeholder is not going to say: 'O, yes I'll work together with you'. If we don't have a budget they won't, so in the begin phase if there are limited budgets then we have to give up some budget, as well as – partner National Society Red Cross- in order to include such a stakeholder. So, then you can't only say: 'let's do codesigns', if there isn't a budget for such stakeholders. – 510_Staff_P3*

Budget constraints do not only influence the internal development, but additionally can limit collaboration options. Some partners have such high interest in the project that they want to be involved without monetary compensation, for example because they are interested in the model, or because they are willing to share data if they get other data in return. However, for most partners a monetary contribution is needed in order to engage them in the project. This means that including additional partners requires cutting parts of the budget of the current project partners.

6.1.1.4 Broad definition of the user

> *(who is the end-user?) One is just the donor, the one who pays us. We need to justify what we are doing to them. Next to that end-user for us is, depending a bit on the project, most of the time the National Society Red Cross of a country. They then serve beneficiaries, or the people who are affected by disaster. But the most direct end-user is a Red Cross-National Society. Because we hope that they will use our tools and methods. – 510_Staff_P3*

There are very wide descriptions of user groups, such as 'aid workers in field' or 'aid worker in headquarters'. Many of the products made by 510 could be potentially be used by a very wide variety of people involved in humanitarian action. The products are often made for the potential use of many of these user groups. Because of this, most of the product development process is done with very broad user definitions.

> *(when in the project do you want this information?) For the adoption of the tool we noticed that, yes, we try to have the end-user there from an as early as possible stadium. Still, we also noticed that sometimes we get resistance from, in this case, our – National Society Red Cross – contact person who is in-country. Because they say that if we involve the end-user too early, then you need to think about people in an operational center who are the ones behind big screens and see typhoons coming in, they are deep in operation. So, if we come too early with our innovation then it can also give resistance, or they might not have any time. Or it could be that they want to start using it right away, even though it is not ready yet. So, we need to find some kind of middle ground in that, at which moment do we involve them. – 510_Staff_P3*

The above quote shows a more detailed description of the user (the people working in the operational center) which could be an example of a more suitable user definition for an HCD approach. However, even if the end-user is determined, they

might not be included in development from the start. Whereas it can be positive for adoption of the tool, it would also be a large request to make as it will take a lot of time, which might result in negative opinion. Additionally, the proposed end-user might get high-expectations regarding functionalities and when the product might be available for use.

6.1.1.5 Many (indirect) sources of human-centered information

> *There is also indirect feedback, from partners who have experience with humanitarian action in the field and have things to say. – 510_Staff_P1*
>
> *You also get this information from the stakeholders that you collaborate with - National Society Red Cross X - and - National Society Red Cross Y – 510_Staff_P4*
>
> *For these kinds of problems, the external NGO's are very useful – they already have the local people. In that sense there are partners of ours who research for us what we want to know when we make such products. – 510_Staff_P1*
>
> *(participant with years of experience): In that sense I also have some feeling of what might be useful to people. So that is another way to understand the context. – 510_Staff_P3*

From these quotes it is clear that there already are many sources used to gather information about the user, stakeholders, needs, tasks and the context. These include partner NGO's, local NGO's, collaborative NS, the local NS, local NLRC delegates or partner NS delegates and personal experience in disaster response.

> *I hear about this in meetings, discussions. I took notes but we don't really have a document. Also, because -country- is a sensitive political landscape, so you get lots of information over the phone and very little in formal documents. – 510_Staff_P2*

The above quote shows that the indirect sources of information do not always provide information in a document format that can be used and further communicated. The information might not be documented or there might be other reasons why the information is not shared. Political sensitivity can for example hinder the documentation of accurate disaster response activities, if these differ from the official protocol.

> *I am thinking if we ever got a real sort of surprise out of an HCD session in the sense of: 'ooh yeah we did not think that at all'. I can't remember it that extreme. But perhaps with 121 it was like that. Because it is more of a real product. – 510_Staff_P3*
>
> *It already happens a lot, so it thinks we need to assess for ourselves what exactly we mean with Human-Centered Design. Because for example, the climate center organizes stakeholder groups and brings many parties together. So, a part of the HCD is already done by other stakeholders outside of 510 so we don't have to do that ourselves. So, I think we need to find the right moment in which we can do our part HCD that aligns with, mostly, what the climate center already did, or another partner National Society. – 510_Staff_P3*

It is not yet clear what the exact contribution of HCD is within this large number of information sources. In order to allocate resources effectively, the role of HCD should be complementary to the current information sources.

6.1.1.6 The start of an iterative approach

> *-National Society Red Cross- also has a delegate there who is forecast-based financing advisor. He has been working on 3 years to get FbF starting there, so he has been doing some kind of ongoing codesign every day for 3 years. – 510_Staff_P3*
>
> *In addition, we have continuous discussion. So, in the project we are doing in – Country -, we discuss with the people in – Country – every two weeks to discuss what we did. They also often get new insights. So, then we change our deliverable a bit. So, that is really a very iterative process. – 510_Staff_P3*
>
> *(talking about what type of information he gets from project partners): That is basically a continual codesign session. They say, we need a list to go to communities with that can be printed. (...) The communities just work like that. That is information that could come from a codesign but in this case it comes from there. – 510_Staff_P5*

Practical projects mostly have a close collaboration with the local National Society that is intended to implement the developed product. In some cases, even delegates are located in project countries in order to facilitate the process. So, an collaborative approach between the different project partners (those who contribute to the project) is an embedded part of the process.

6.1.1.7 Unclarity regarding HCD

> *At the moment I still feel that one on hand, I say and -staff member- says we should really put HCD systematically, but then it is still run a bit as an experiment. A yeah, we can do ... Yeah it would be cool to do it there. But that is not... You know what I mean? – 510_Staff_P2*

The participant above expresses an understanding of the need for HCD. The participant is positive about embedding HCD into 510 projects. However, the participant does not have a clear overview of the HCD activities, their goals, or their outputs. From the analysis in sub-chapter 5.2 it is clear that this is partly true: HCD does not have a completely developed workflow. However, what is already developed is not completely clear to 510 staff. This can make HCD feel as an experiment rather than one of the building blocks of successful design.

> *I do believe that HCD should be an important ingredient in every project that we do. But we have many projects. (…) So, if you really put HCD in each project, those are many hours of volunteer time or student time or -staff member-s time or -staff member-s time, or whoever does it (…) but this is time. So, we need more structure we need to allocate this time more systematically. – 510_Staff_P2*

Additionally, there is no clear hour allocation for HCD activities which again hinders the incorporation of HCD in 510 product development. It also currently means that there is a lot of time not accounted for in project planning that does go into HCD activities.

> *I think the HCD part should be more structured. So, at the moment the dynamics is: all the project managers drop a message to -staff member-. (…) -staff member- talks to all of you guys and volunteers and organizes things. – 510_Staff_P2*
>
> *Often it comes more from the initiative of -staff member-. – 510_Staff_P2*

Currently, one staff member acts as the connection between project staff and the HCD volunteers. This one person often initiates HCD activities into projects, communicates the tasks to the HCD volunteers and presents all findings from HCD activities to the project staff. This shows that the HCD approach is not yet truly embedded.'

6.1.1.8 HCD for intangible products

> *What perhaps is an important difference- I can imagine – you are really from design. Some of the projects we do don't deliver physical products, such as a dashboard or a tool. A product could also just be a model. Or an analysis of a dataset. That is ofcourse less... You would still need some user requirements, but not user requirements of how it should look. – 510_Staff_P3*

It needs to be clear that Human-Centered Design, although it is called design, can cover a range of different products and services. Products do not have to be visual in order to benefit from design activities. Examples need to be given in order to understand what kind of user requirements can be made for a model.

6.1.2 Conclusion 510 staff interviews

The interviews show that the 510 staff supports the implementation of HCD; they are open to bringing in new approaches and see the importance of incorporating human insights into the projects. However, not every aspect of design, such as that it is not limited to tangible products, is understood as the participants do not have a design background.

In 510 projects, a lot of HCD activities are already done by non-HCD project staff or stakeholders; stakeholders are engaged in the project through meetings and calls, information on the user, stakeholders and context is received through several sources and work is reviewed continuously.

However, a human-centered approach is not implemented consistently because it is not always instinctively the most sensible choice for 510 staff. For example, when a product is already produced for one country, it is a logical idea to apply it in a new country as well and therefor show an example product during a visit. Additionally, when a product can potentially be used by many stakeholders, it seems sensible not to choose a specific user. However, in practice, these logical decisions counteract an HCD approach.

Additionally, the human-centered activities done by the project staff might not always feed into the HCD methods of the HCD team. The information that is already gathered on users, stakeholders and context (e.g. through meetings and calls with stakeholders or partners) is not always documented in a structured way, or documented at all. This makes it difficult for HCD to be applied in an effective way as there is no clarity on the information that is already available.

Additionally, the setup of 510 projects can prevent a structural implementation of HCD. The scientific focus at the start of some projects can result in a late involvement of HCD. Because of this, a lot of work is done before HCD research is done in order to understand human-needs. Because of the funding method there is limited budget available for the exploration of human needs at the initial phase of a project and many agreements are made in this phase, e.g. on the goals of the project.

Whereas the HCD analysis found that the HCD maturity is in between the prove and scale phase, to 510 staff it can seem as if HCD is still in exploration phase. To 510 staff, it is not completely clear what the exact goal is of HCD, what HCD methods are applied, how they should be implemented and how the outcome can be used.

6.2 510 HCD volunteer interviews

From the HCD volunteer interviews, several enablers and challenges are defined to the execution of HCD activities.

6.2.1 Interview insights

6.2.1.1 Project and HCD addition to project unclear

> *I couldn't understand some of the things because it was... Forecast based .... How do you say. A lot of the lingo and terminologies was really new for me, but I had an assumption – HCD_Volunteer_P1*
>
> *I did not really understand what -Project Z- was and what – Project Y- was. In the beginning it would have been nice to sit for a bit and just discuss that very broadly. We are HCD, these are the projects that we do, we are going to set you in this project, and you are going to work on this part. – HCD_Volunteer_P2*

For a volunteer coming into 510, there is a lot of new information to take in. The projects are quite complex for someone without a background in disaster response.

> *the COD questions where very specific. So that is why we thought all the insights are directing to creating a digital interaction. – HCD_Volunteer_P1*
>
> *It was still a bit difficult because they did not know yet how I worked and get to know each other. There wasn't a program of how they are going to get me familiar with the work. And I noticed that. You could do this, and at the end of the day we have this. That was fine, but you did not really understand the overall picture and then you don't know what you are doing it for. I missed that a bit in the beginning. – HCD_Volunteer_P2*

The goal of the activity that the volunteer is working on is not always completely clear. In the first example, the volunteer thinks they understand the goal of the activity, but that is not the case.

What is not clear in the second example is the link of the performed HCD activity and the project. There is no structured way for new volunteers to get informed on the HCD methods and the projects, so there is no clear overview on how the output of the volunteers' work will be used.

7.2.1.2 Help from other volunteers

> *When I came here it was nice that I had – Volunteer X – and - Volunteer Y -. So that you have people who are also volunteers and can explain things to you. They also did not know everything but then you figure it out together. – HCD_Volunteer_P2*

Although HCD staff is available for questions and discussion, they are also often in meetings. For a volunteer it is nice to work together with other volunteers, especially in the beginning of volunteering at 510. Other volunteers are available all day in order to discuss questions and work together on tasks when you first come into 510.

7.2.1.3 Clarity and motivation from talking to users

> *Because we were in -City X-, for -Project Y-, you really get a feel, because you are talking to the people. Then you know, we do the user tests, from there comes the persona journey and from that we can improve the – Product X -, for these people. That really gives an idea of what you are working on and it gives motivation. (18:50) – HCD_Volunteer_P2*

When being involved in multiple steps of a process and talking to the users, this enables the volunteer to get an understanding of both the HCD steps and the project aim. Additionally, being involved in user-research helps create motivation for a project as it is clear who you are helping with your work.

6.2.1.2 Choosing roles

> *There are multiple things of which I think:" Oh that seems interesting, that seems interesting". -HCD staff- tries to give me one role, with maybe one additional role, but not that I have 3 several projects and if I stop 3 people need to take over from me. – HCD_Volunteer_P2*

Volunteers are able to express what they want to work on; however, they are not asked to do many tasks at once as they don't have much time in the week and they might stop volunteering as it is often done temporarily but without a clear end-date.

6.2.2 Conclusion HCD volunteer interviews

For an HCD volunteer coming into 510 there is a lot of information to take in in a very short period of time. This includes information on the HCD methods employed as well as understanding the larger 510 projects for which they are working. HCD volunteers get this information through explanation by HCD staff, which is challenging for the staff members with the already limited time available. Volunteers are given specific roles (for example one HCD task for one project) in order for them to limit the amount of learning they need to do at each moment. Additionally, working together with other volunteers can help in the overwhelming initial days. However, not only for 510 staff, as described in paragraph 6.1.1.7, but also for the HCD volunteers, the structure of HCD and the goal of the activities is unclear at times. The volunteer interviews show that being involved in several steps of a project and being present during user-research helps understand the project, the challenges the users are facing and the HCD activities.

Part 2: Define

The following chapter analyzes the insights from the previous Discover chapters and summarizes them into 3 main lessons in the implementation of HCD in disaster response technology development. From these main lessons, three elements of embedded HCD are determined.

Chapter 7. Define (page 36)

7. Define

In this chapter, the challenges found in the previous chapter are clustered into three main lessons in the implementation of HCD (Figure 11). These three lesson clusters are translated into the three elements for embedded HCD, which are used to develop the final proposal for 510.

7.1 Clustering insights on the implementation of HCD

In order to examine the insights, an overview of all factors in the implementation of HCD for 510 was made (Appendix D). In order to create an understanding of the connections between the insights described in the previous chapters, clusters were made of the insights of which the final product can be seen in Figure 11. These clusters are considered the lessons in the implementation of HCD. They are translated the three elements of embedded HCD.

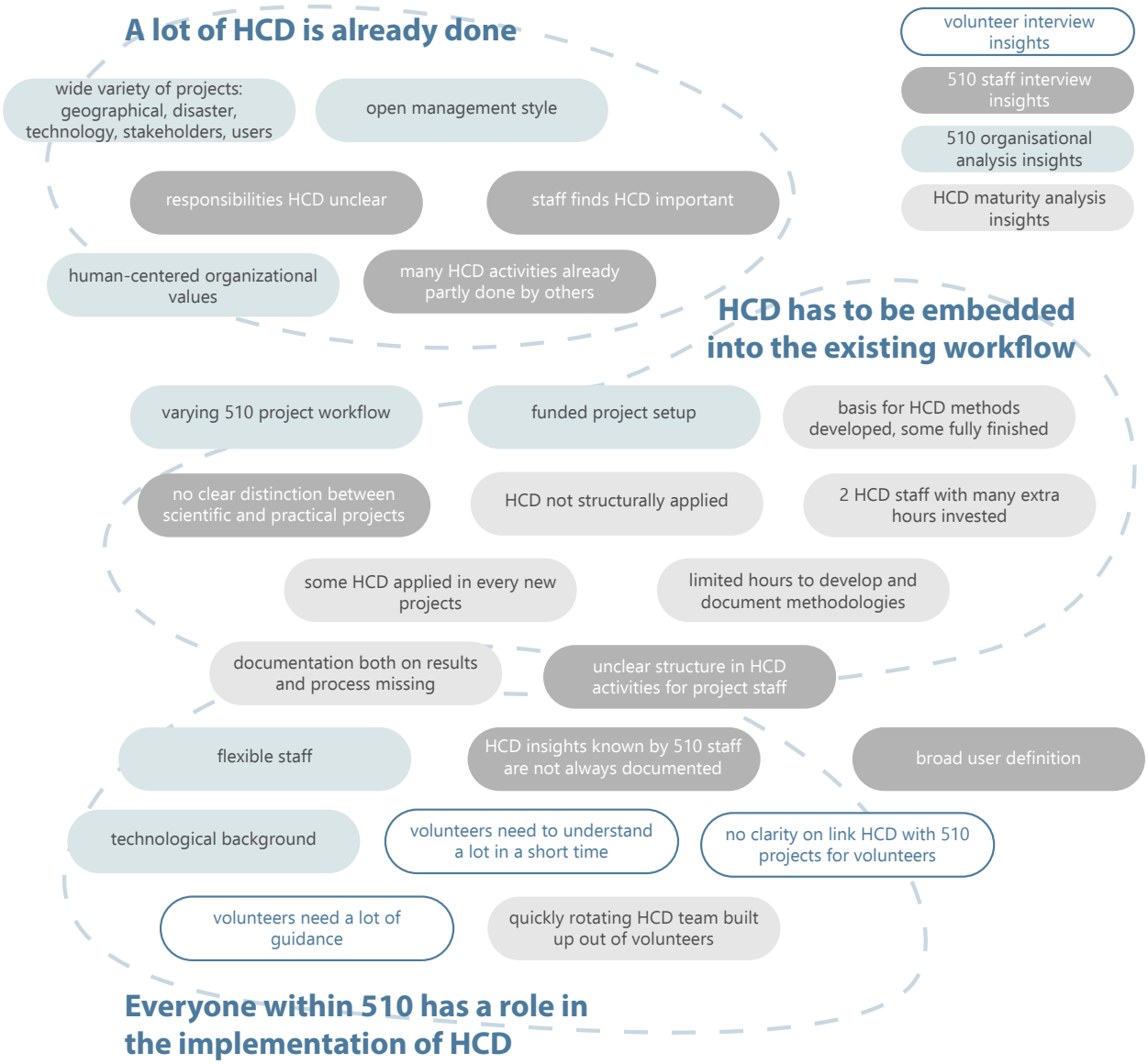


Figure 11. Overview of insights from Discover phase case study research and their connections

7.2 Element 1: A clear role for the HCD team

Lesson 1: A lot of HCD is already done
Contrary to challenges discussed in literature, HCD is supported by 510 management: The 510 organizational analysis shows that the organization has human-centered organizational values and a human-centered strategy. Additionally, the 510 staff expresses an understanding of the need for a human-centered approach.

Taking the description of HCD as an approach that is based on human-insights, participatory and iterative, indeed a lot of HCD activities are already done within 510:

- Information is gathered on the user and their context
- Many people are involved in stakeholder engagement
- There is continuous interaction with the National Society Red Cross of the project country
- Implementation plans are already developed even though this might not be done deliberately

Whereas these activities show that it there already is a lot of consideration for the user within 510, they also make that the role of the HCD team within 510 less apparent. As is seen in literature, it is important to find a niche within the organization. However, from the 510 staff interviews it is clear that the staff is not exactly sure what the role of HCD within 510 is.

The varying human resources in the HCD team and the limited budget in 510 make for an additional urgency in finding a niche in order to work efficiently.

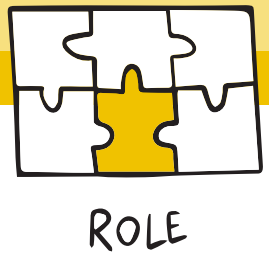
Element 1: A clear role for the HCD team
From the first lesson, it is clear that implementing HCD is not starting from scratch but rather finding what is already done and what is still needed for the organization. This is why the first element of embedded HCD is defining a clear role for the HCD team.

Defining a clear role for the HCD team can help in several ways: it helps 510 staff understand the use of HCD and engage HCD in their projects, it helps limit overlap in activities and it can help HCD limit their activities to be manageable with the resources available.

In order to develop a role of HCD within 510, the needs for HCD in 510 are analyzed.

To do so, firstly interviews are performed in order to understand the current information available on the user, stakeholders and context and what information is still needed.

Next, value propositions are filled in to link the HCD approach to the found needs. These value propositions are translated into a role for the HCD team that can be communicated to the rest of 510.



7.3 Element 2: An embedded HCD workflow

Lesson 2: Embedded HCD is interactive with the existing development
As found in literature, HCD can often be seen an addition to complement an otherwise already finished product. However, HCD activities should be done all throughout the project.

This challenge is partly reflected in 510; HCD is implemented variably across 510 projects. Additionally, from the HCD analysis it is clear that sometimes HCD methods are applied in a way that does not support the aim of method.

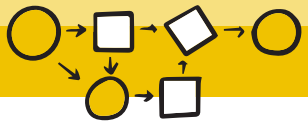
An explanation for the inconsistent involvement of HCD can be explained through several causes:
- The HCD tools have to be developed with a lot of thought and consideration for the difficult context. However, the young HCD team has had limited hours available to develop and document the methods. Therefore, the methods are not all finished and what is done already is not all documented.
- There is no clear link between the methods and the project. There is unclarity on the activities performed, the hours needed, the output from design activities and how they could be used. This is further emphasized in interviews with HCD volunteers, who do not have a clear overview of how their activities will be used in the project.
- Because of the variety of projects and the funded project setup within 510, the workflow and the available budget for HCD activities varies per project.

Element 2: An embedded HCD workflow
In order to integrate the HCD activities within the 510 development process, an embedded HCD workflow is made. This workflow can help in structurally incorporating HCD and creating overview.

A clear workflow is made with an overview of the HCD methods, the outputs of the methods and how the outputs contribute to the rest of the project. It can help 510 staff understand when to engage the HCD team and what they can expect from the HCD activities. It will also help HCD volunteers to get an understanding of how their work links to the larger project.

In order to develop the embedded HCD workflow for 510, the first 3 steps of the IEI model (Metzker & Offergeld, 2001) can be used in an adapted manner:
1. First, the workflow of 510 is analyzed.
2. Next, the possible HCD activities are retrieved from literature (instead of the predefined usability methodologies used by Metzker and Offergeld).
3. Next, the HCD methodologies are chosen and an integrated workflow is developed.

In order to choose the HCD methodologies, the role of HCD as defined in the previous 'element of embedded HCD' is used. Because of this, the activities in the workflow do not overlap with activities already done by 510 staff or project stakeholders.



7.4 Element 3: A communication plan that guides 510 in implementing HCD

Lesson 3: Everyone within 510 has a role in the implementation of HCD
From the analysis it is clear that the HCD team is not the single actor in the implementation of HCD. Instead, the entire 510 department needs to be activated in order to achieve a human-centered approach to product development.

As discussed in the first lesson of implementation of HCD, it is clear that the application of a human-insights based, participatory and iterative development process is not limited to the HCD methodologies but instead can be applied across many activities in the organization.

This shows that people outside the HCD team are responsible for a human-centered approach in different parts of the project. During contact with stakeholders, project exploration in country and the definition of the project goals, there are many considerations regarding the HCD approach to take into account. Additionally the responsibilities of project staff include engaging the HCD team in the project at the right moment and creating budget for HCD activities.

However, it is not obvious to apply an HCD approach in every activity. This can be caused by a conflict in interest (selling current products against understanding the user needs) or activities not being adapted yet to the integration of an HCD team (gathering information on users in a way that is later not available for HCD activities or a very broad user definition that makes it difficult to understand the user) or just a different focus (the 510 staff members mostly have a technical background and their main activities and considerations regard technical aspects of the product). Furthermore, as is discussed in the second lesson, the lack of documented and communicated structure makes it difficult for 510 staff to engage HCD correctly.

Additionally, the HCD team is not necessarily shifted toward an HCD approach internally. Because of the quick rotation of human resources within the volunteer-based HCD team, there are constantly people within the HCD team who are not aligned with the HCD values and who are not familiar with the HCD methods even though they are responsible for many HCD activities.

Element 3: A communication plan that guides 510 in implementing HCD
In order to ensure implementation of HCD across an organization with a technical focus, the HCD team has to guide the organization. As responsibilities in applying an HCD approach are dispersed across all activities in a project, HCD implementation cannot be dependent on the HCD team alone. Instead, the HCD team needs to communicate why and how everyone in 510 can use an HCD approach.

In order to do so, communication materials are developed that help HCD guide the organization in implementing an HCD approach where needed.

Additionally, the HCD staff is in the unique situation of working with volunteers to perform HCD methodologies. Therefore, the HCD staff has the responsibility to guide the HCD volunteers in performing HCD activities.

The communication is developed by first making an overview of the HCD responsibilities of the different staff members and volunteers. From this overview, communication materials are developed or proposed that help 510 staff and volunteers implement an HCD approach and the HCD methods.

Part 3: Develop

The following Develop chapters describe the further research needed in order to develop the three elements of embedded HCD which were defined in the previous chapter.

Chapter 8. Literature review on applications of an HCD approach (page 42)
Literature research is done in order to understand current applications of HCD in software development, disaster response design and response technology development.

Chapter 9. Interviews on needs for HCD in 510 (page 46)
Interviews with 510 project stakeholders and 510 staff are conducted in order to gain insights into the human-centered information needs in 510 projects.

The insights are used in the Deliver chapter in order to propose a role, workflow and communication plan for 510.

8. Literature review on applications of an HCD approach

IDEO explains a large number of methodologies in their HCD toolkit (IDEO.org, 2015). However, HCD is considered an approach or a philosophy rather than as a strict methodology. Therefore, the range of methods IDEO provides is diverse. The toolkit includes 'building your team', 'doing secondary research', 'expert interviews', 'collaging', 'role-playing', 'the business model canvas', 'building partnerships', 'creating a pitch' and 'making a funding strategy'. It is clear that not all methodologies from this toolkit are necessarily suited for every application of HCD, and some of the methodologies might not be appropriate for use in response technology development.

In order to find the best application of HCD in the case of 510 a more in-depth research is done regarding the current use of HCD within the field of data and digital tools for disaster response. This chapter will therefore describe the application of the HCD approach in humanitarian software development. As literature on the use of design methods in response technology development is limited, the research includes the use of HCD in adjacent fields. The research discusses the use of HCD methods in the field of software development, in the area of humanitarian action and development aid and finally in response technology development.

8.1 HCD applied in software development

Within software development, an HCD approach often focuses on interface design and usability design. These are two accomplished design domains with wide research coverage that has expanded over a long time period; Methods for achieving high usability of interactive devices were already discussed by Gould and Lewis in 1985 (through Wallach & Scholz, 2012). Wallach & Scholz, (2012) describe user-centered design (UCD) as "a successful and practical approach to the design of software user interfaces" and provide an overview of activities done in a UCD methodology.

Usability design in software development is said to have a number of advantages. Maguire (2001) defined the three most common usability requirements that are improved through usability design:

- Effectiveness: the degree of success with which users achieve their task goals
- Efficiency: the time it takes to complete tasks
- Satisfaction: user comfort and acceptability

Other requirements include understandability, learnability, operability, flexibility and attractiveness.

A common misconception of user-interface design is that it is an individual activity in which designers generate visions and ideas and develop these into an interface (Wallach & Scholz, 2012). This suggests that interface design is a very subjective activity in which one person's view determines the outcome. However, in practice, well-performed user-interface design is a series of processes that produces suitable outcome while leaving limited possibility for personal creativity (Wallach & Scholz, 2012).

Wallach & Scholz (2012) and Maguire (2001) both describe an overview of design activities for use in software development. Figure 12 shows an overview of activities mentioned in both papers and the 510 HCD methodologies as described in sub-chapter 5.2. The division of activities into categories (evaluation, planning, etc.) is taken from Maguire (2001).

Possible design activities as mentioned by Wallach & Scholz (2012) include: goal and scope setting, analysis without the end-user, analysis with the end-user (including job shadowing and contextual interviews), synthesis (including affinity diagrams, personas, mental models, scenarios), conceptual design (including scribbles, wireframes and prototypes) visual design, usability testing and usability goals. These activities are very similar to many of the 510 HCD methods.

Methods for HCD as summarized by Maguire (2001) are also shown in Figure 12. This range of activities is broader than the one mentioned by Wallach & Scholz (2012), although many activities overlap. One of the HCD principles mentioned by Maguire which is less apparent from the 510 HCD methodologies (as described in sub-chapter 5.2) is the appropriate allocation of function between the user and the system which is explained by the following quote:

> ***"It is important to determine which aspects of a job or task should be handled by people and which can be handled by software and hardware. This division of labor should be based on an appreciation of human capabilities, their limitations and a thorough grasp of the particular demands of the task." - Maguire, (2001)***

The allocation of function between user and systems consists of understanding the user tasks and understanding which of these tasks are going to be taken over by the system. An HCD approach can help in determining this allocation of function.

In a study by Kifle, Dittrich, & Teka (2017), adaptations to UCD methods are proposed in order to deal with culturally diverse settings of users. Firstly, they suggest the use of different users' personas in order to get a better understanding, as well as to update those personas based on user tests. Secondly, they propose to do user testing in pairs as in some cultures it might be inappropriate to express critique. Pairing up the participants could help in easing them to give critique on the prototype or product.

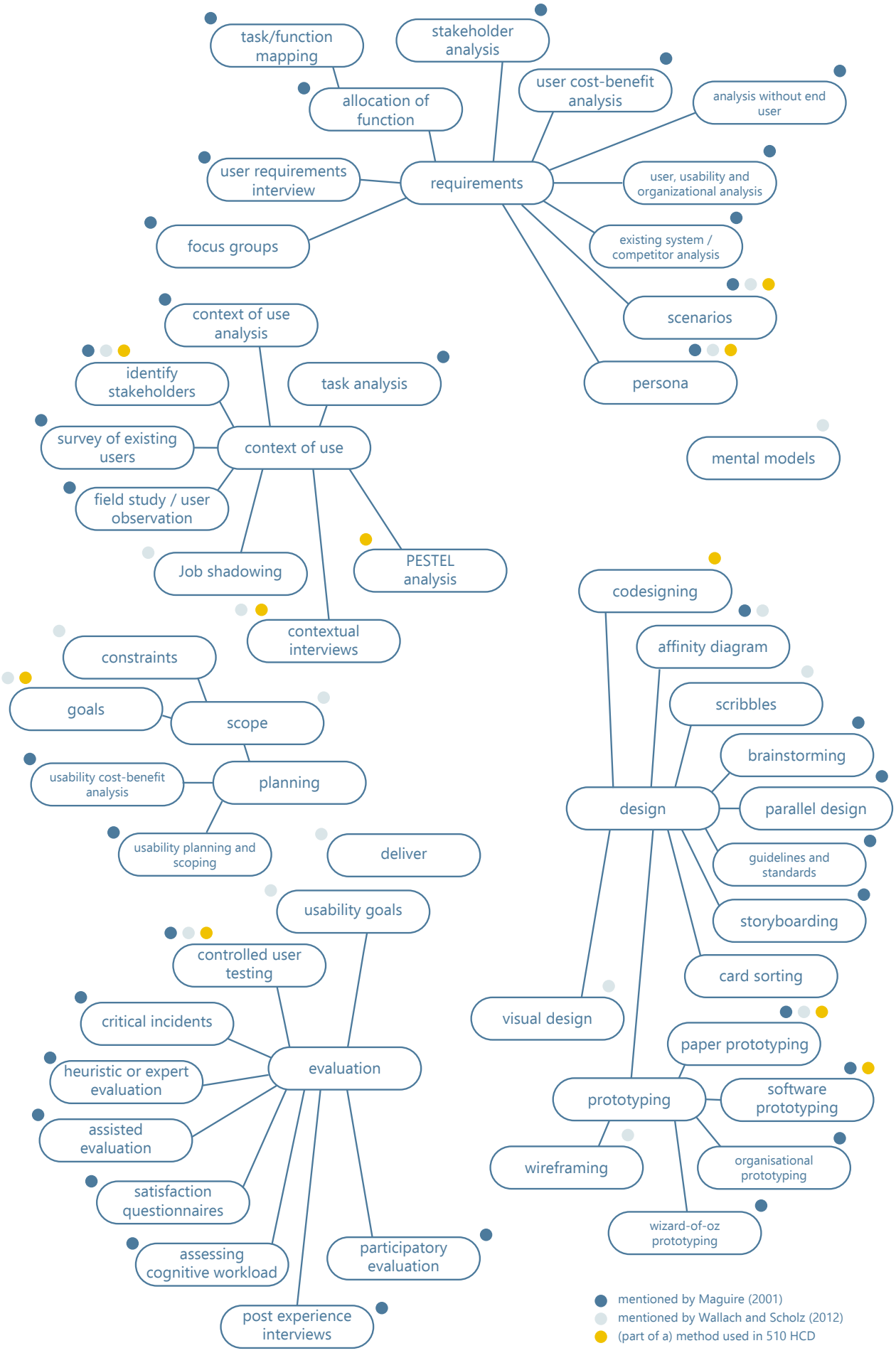


Figure 12. HCD methods mentioned in literature and done in 510

8.2 HCD applied in humanitarian action

From the early 1990's, a human-centered approach to humanitarian response has been promoted (Konyndyk & Worden, 2019). Research on design methods for human-centered development started as early as 2004, but has gained interest in current years (Gordon et al., 2017). The Bill and Melinda Gates Foundation gave IDEO the task to develop the HCD Toolkit in 2008, creating more attention for HCD as a design method for social impact (Gordon et al., 2017).

An example of the use of HCD in humanitarian action design is the study by B. F. Nielsen (2017). In the study, design thinking is used in order to overcome challenges in the design for humanitarian emergencies. B. F. Nielsen (2017) uses human-centered approaches for several parts of the project; to determine the problem, for project goal and scope setting and for combining donor and beneficiary views. Collaborative sessions are done using methods such as storytelling, in which participants can explain their experience, and back casting, in which groups of participants analyze the goals expressed in the stories and the steps to get there.

However, applying HCD in this context demands an understanding of the differences between design in the humanitarian field and design for commercial goods. Most design methods need to be adapted in order to be suitable for use in humanitarian response (Gordon et al., 2017). For example, disaster response activities do not always follow the designed processes (Fahland & Woith, 2009). Instead, designed protocols might change in a disaster event depending on the situation. Therefore, design practices such as scenario formulation applied for disaster response activities should take into account this changing context. Similarly, the final products or systems designed for the disaster response context have to take into account this variability.

An overview of critiques on the use of HCD for development mentioned by Gordon et al. (2017) is; (1) research on the context of the problem is under-emphasized and oversimplified; (2) prior to implementation, there is little to no emphasis on ensuring that solutions are appropriate or contextualized and (3) the designer and the designer's freedom of creativity are prioritized over the end-users empowerment. The research concludes that further research is necessary on the effect of remote design and the level of inclusion of the designer in the target community. The third critique is similar to the misconception about user-interface design and seems to be based on a notion that design activities are subjective activities based on designers' vision rather than predefined processes.

8.3 HCD applied in humanitarian software development

> ***"The most effective way to design a system matching users' needs is to perform a User-Centered Design; it relies on continuous interactions with end-users in order to understand better and better how organizations are arranged during emergencies, which data are exchanged and which steps are performed by organizations to face disastrous events."***
> ***- De Leoni et al. (2007)***

Coletti, Mays, & Widera (2018) describe HCD as an approach that can be used in order to include humanitarian values into the design of response-technologies. However, data- and digital tool development for humanitarian aid is a niche field and the development of such tools through an HCD approach is not elaborately covered in literature. Nonetheless, a number of examples in which HCD is applied in humanitarian software development are found.

One example is the practice described by De Leoni et al. (2007). In their study, HCD methods are used in order to understand software system requirements for disaster response and short-term recovery. De Leoni et al. (2007) describe their way to collect user insights in order to develop user-interface designs, as is illustrated in Figure 13.

Firstly, interviews are done with potential users in order to understand the tasks they perform. This phase results in a clear definition of the user groups and an overview of the current working situation, responsibilities and tasks of the potential users. Next, scenario's are built using a storytelling technique that allows the users to share their workflow without much guiding structure. This is done in order to better identify the various user groups and to understand the differences in workflow between the different

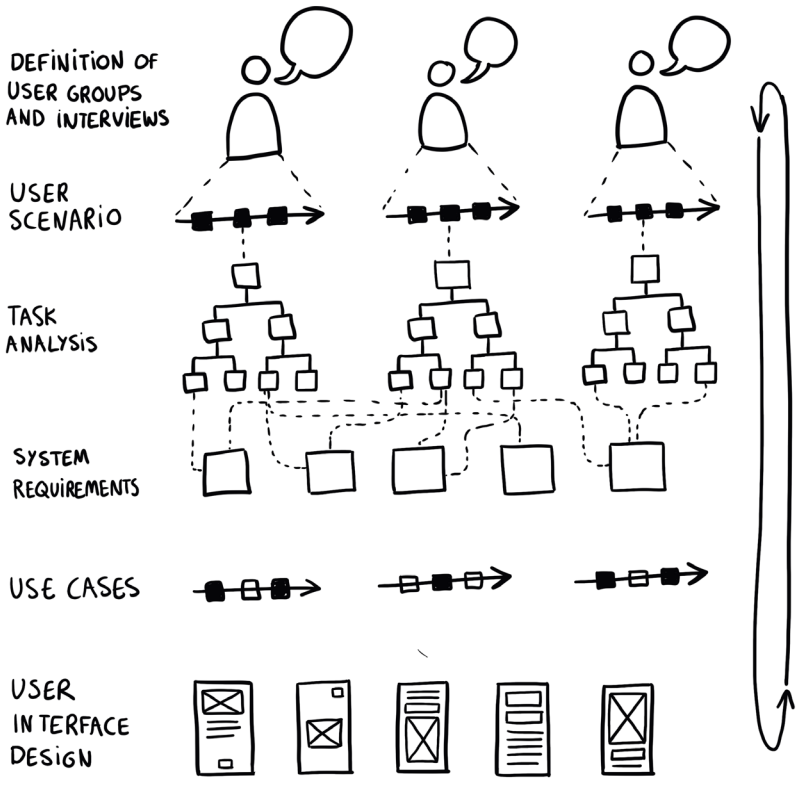


Figure 13. The WORKPAD methodology adapted from De Leoni et al. (2007)

user groups. Then, a hierarchical task analysis is done, which separates high-level tasks and identifies the sub-tasks that belong to those high-level tasks. These sub-tasks are then again divided until the required level of detail is achieved. In the following step, user requirements are analyzed by dividing them into (1) challenges for the user, (2) proposed solutions and (3) user needs. User requirements can then be divided into functional and non-functional system requirements. Functional requirements are those that need to function within the designed system, such as the ability to download the data used. Non-functional system requirements are context constraints that the software design needs to account to, such as limited access to the internet. Functional requirements are made using use-cases. Non-functional requirements are added to the use cases. These insights are the basis for the user-interface design.

The method described by (De Leoni et al., 2007) is similar to HCD methods used by 510 as discussed in sub-chapter 5.2. In particular, the codesign setup shows many similarities to the storytelling technique and the user scenarios. The 510 HCD Persona Journey method is still in development but is similar to the user scenario, the task analysis and the use cases although the Persona Journey steps are less defined.

Next, in a study examining characteristics of disaster response and their impacts on design practices for response technology, several challenges to applying HCD in disaster response were found (Jul, 2007).

> ***"In the area of user interface research and design, the lack of theory is evident in widely disparate conceptions of who "the users" are, what they are doing, and where they are working. Many research and design efforts are based on idiosyncratic conceptions of "user," "task," and "context," that are often hypothetic, and sometimes, myopic. Such efforts fail to consider the fluid ambiguous nature of disaster, and the diversity of individuals who participate in disaster management. The resulting technologies may appear promising, but limitations imposed by underlying assumptions will ultimately hamper their usability and utility." - Jul (2007)***

The simplification of the definition of user, tasks and context is found to be a recurring problem in design for response technologies (Jul, 2007). The three disaster response characteristics - scale, kind and predictability – had several implications to the characterization of user, task and context. For example, the scale of the disaster might affect the expertise of responders, as the relative number of untrained responders increases as the scale of the disaster increases.

8.4 Literature review conclusion

It is clear that most of the methods described in literature are in part included in the 510 HCD activities. For software development and usability design, much research has been done and a lot of information on methodologies is available. However, less knowledge is available for HCD methods for application in the field of humanitarian response and response technology development and not all tools developed for other context might be suitable for use in humanitarian response. Therefore, the HCD team needs to take into account that methods might need to be adapted for application in the humanitarian field.

From the literature review a number of important topics for HCD are clear. Firstly, the lack of a defined user in interface design, as described by Jul (2007), is in line with the findings from the initial problem exploration of 510. Additionally, within humanitarian response it is quite difficult to get a good understanding of the tasks or activities and the context in case of disaster. In addition to the topic 'tasks', another focus of HCD methodologies for software development is the allocation of function as described by Maguire (2001). Whereas currently allocation of function is an implicit process in the 510 HCD prototyping method, making this process more explicit can help evaluate the appropriate allocation of tasks between user and system. Lastly, Gordon et al., (2017) describe as one of the problems of design for humanitarian response the lack of understanding of suitability of the solution before implementation. According to the IDEO description of HCD, the iterative and engaging nature of HCD is in fact a suitable approach to test the appropriateness of the solution before implementation.

Some challenges in the implementation HCD in response technology development become clear. Firstly, the complex and adaptive nature of disaster response should be taken into account in both the design methods and the design results. Next, HCD can be seen as a proposed solution to the oversimplification of the user, task and context. However, if not performed correctly, HCD methods could in fact contribute to this simplification of the user, task and context. Additionally, if HCD is practiced without structured methodologies, individual creativity of the designer could be leading rather than the user needs.

Concluding, HCD can benefit from including user, task, context and allocation of function in their focus topics. Additionally, HCD can help understand suitability of the proposed solution before implementation. However, it is clear a structured methodology is needed in order to ensure that human insights are guiding and not individual visions of the designer. Additionally, it is clear that the HCD team needs to adapt methodologies in order to apply them in a humanitarian context.

9. Interviews on needs for HCD in 510

9.1 Project stakeholder interviews

9.1.1 Stakeholder interview insights

Interviews are done with local project partners from Red Cross National Societies involved in a project with 510. The projects were all part of the IARP project which is an Impact Based Forecasting (IBF), also called a Forecast-Based Financing (FBF) project for Uganda, Kenya and Ethiopia. From the interviews, several needs for a human-centered approach are found:

9.1.1.1 User definition

> *I do not know at what point these people come on board, the people who are at branch level or district level. I don't know whether the system will really be used by them, or if it is at a national level. The lower levels, the district information management officers in charge of disaster management, I don't know whether this system will be accessed by them. And if it is accessed by them. I am still not clear whether this information is useful for them. – Project_Stakeholder_P5*

After a year of the project, it is not yet clear who the final user of the digital tool will be. There are many possible users; the government disaster response unit, the NS data team, the NS disaster response department, forecast providers. Additionally, these descriptions of possible users are very broad. Every group mentioned consists of a large number of people doing very different tasks and needing very different information.

9.1.1.2 Stakeholder engagement

> *I am not sure if we have the right person from the right level engaged. – Project_Stakeholder_P1*
>
> *Still the challenging part continues to be having the critical stakeholders on board. We have some, but the ones that we have I think are not enough to take action. It would take action but I think the demand would outweigh the supply. So, I think getting more partners on board. I also think, so getting more partners on board would still be a challenge. – Project_Stakeholder_P2*

Within the Red Cross project team, multiple people are in charge of stakeholder involvement in several ways. Some are focused on the government agencies involved, others are focused on the forecast providers, others are more closely connected to the people in universities.

Stakeholder engagement is initiated from the beginning of the project. Stakeholders might be involved because they are partly responsible for disaster response and thus influence product implementation, or because they can provide models or data that are needed for the project. However, it remains difficult to know if all necessary stakeholders are involved in order to ensure successful implementation.

9.1.1.3 Stakeholder understanding

> *The number one challenge from my side is building a system that is understood by the national stakeholders. Because up to this point, we are trying to bring home this idea of FBF firstly and the idea of using the FBF system. Getting these National stakeholders to appreciate what is being built and also to understand and appreciate that this system is not a magical system, it is a system that is very good being built. But it is also a system that has its limitations that can be worked upon to improve it. It is something that is a great challenge we are facing and we will definitely face it in the future. - Project_Stakeholder_P5*
>
> *They are the very people who were not understanding what we are doing. They had misunderstood us that we are creating a parallel system to the government system. – Project_Stakeholder_P5*

Ensuring that all stakeholders understand the product across the disaster response system in a country is challenging. On the one hand, the stakeholders need to understand the value of the project in order to cooperate and successfully implement the product. On the other hand, the stakeholders should understand the limitations of the system.

For most participants, the goal of this particular project is to make a product that is implemented in disaster response nation-wide. So, the end product should not become a Red Cross product, but a product that is owned by the country and everyone involved in disaster risk. However, from the interviews it is clear that engaging the right stakeholders at the right time in order to ensure successful implementation is the most challenging part of the project.

9.1.1.4 Stakeholder data sharing

> *The other issue is with regards to data sharing, information sharing. You find that there is a lot of information that you need to develop these approaches and that information is not readily available. There are so many issues to do with data, you find you don't have access to certain data sets. Policy issues. You find it information you need to develop the methodologies for your approach.*
> *- Project_Stakeholder_P7*

Even when the right stakeholders are found and they are introduced to the project in a way they understand, there is no certainty that they are willing to share the data they have. The projects do not always have funding available to pay for this information, so mostly other data and models are offered in return.

9.1.1.5 Multiple project goals

> *I believe it can act as a benchmark for many other initiatives that will come up in the country. To improve the system of how things are done." … "Already, as we speak now there are many projects that are coming up that are looking at the IARP project and trying to improve what they do. So, I am looking at the IARP project, achieving its goal and also setting a benchmark for many other initiatives that are coming. – Project_Stakeholder_P2*

Whereas the official project goal is building and implementing an Early Warning Early Action protocol, the Forecast-based-Financing work also serves a goal that goes beyond the project. The underlying goal for the FbF project was getting decision-makers to act based upon forecast models and to set a standard for future data-driven decision-making tools for humanitarian aid.

9.1.2 Conclusion

A clear finding is that not only the 510 staff members, but even project partners within the National Society Red Cross for which the product is made, are unsure of who the user should be. A very wide range of possible users is discussed without a definite conclusion.

Additionally, even though a lot is done already, engaging external stakeholder seems to be the most significant challenge. This task includes knowing who the right stakeholders are to have on board, knowing how to communicate the project to them in a way that they understand its importance and engaging them in such a way that they want to communicate to the project.

9.2 510 staff interviews

9.2.1 510 Staff interview insights

From interviews with 510 Staff, several needs for of HCD were identified:

9.2.1.1 Understanding what problem is solved for whom

> *What problem am I really solving for most people? With that I can make an as effective/nice/useful as possible product for most people. - 510_Staff_P1*
>
> *Somehow it would help to only focus on 3 problems and to solve those as well as possible and leave the rest for what it is. But we can never definitely say that, that these are the 3 most important problems. (…) We can't say that so we need to focus on many things at the same time because we are trying to make three products that solve everything for everyone. - 510_Staff_P1*

In the example, there is unclarity on the problem the project is intended to solve for most people. Because of a large number of stakeholders, there is a corresponding large number of project goals without clear priorities. The participant expresses a need for a clear practical goal that is limited in such a way that it eases decision making.

9.2.1.2 Clear user definition

> *One is just the donor, the one who pays us. We need to justify to them what we do. Next to that the end-user is a bit dependent on the project. Most of the time for a National Society Red Cross in a country. They serve the beneficiaries, or the people affected by disaster. But the most direct end-user is such a Red Cross National Society. Because we hope that they will use our tools and methods. - 510_Staff_P3*

One of the users identified is the donor, the one who funds the project. Then, the people who are intended to gain from the product in the end, are the people affected by disaster. However, the most direct user is the Red Cross-National Society, in most projects they are the end-user of the product developed by 510.

As mentioned in the problem analysis in paragraph 6.1.1.4 and in the 510 project stakeholder interviews in 9.1.1.1, the user definition is very broad. This broad-user definition makes it difficult to get a better understanding of the user and their context, as there is a wide variety of users and context within the defined user groups.

9.2.1.3 Understanding of the user and their context
(answers to the question: What information on the user would you like to have that you do not have?)

> *Focused on the aid workers; from them I would like to know what they do in daily life and how such a project looks like for them and what problems do they encounter? – 510_Staff_P1*

> *what does the end-user base their decision on? – 510_Staff_P4*

> *who has the skills that are needed? - 510_Staff_P4*

> *Eventually the best thing is if we can find out how they do – as they call that in scientific terms – sense-making and decision making. How are decision made. How do they take information in. If you know that, you can add innovation and ideas of value. - 510_Staff_P3*

One of the most mentioned information needs is a general understanding of the workflow of the end-user. Several mentioned aspects are: How do they make decisions? What information do they have? What information do they need? What challenges do they run into?

> *I am pushing towards narrowing down the scope to a very specific context. I see less as a priority to understand the whole context of the -Country- - what is the micro context of this specific thing that we are working towards. – 510_Staff_P2*

In this quote, the participant describes the wish for a very specific context description of the product rather than a nation-wide context description. In the HCD methods described in the literature research in chapter 8, user scenarios are used to understand the use-context.

9.2.1.4 Usable product-user interface design

> *(What information on the user do you use?) What I use comes from, if you see HCD as UX user research, then codesign is the execution of it and it informs the wireframe or in information that the designer translates into product design. We use that, or I try to steer towards that. - 510_Staff_P1*

Currently, the most important responsibility of the HCD staff is the development of wireframes and a user-interface for the product.

> *WhatsApp is very common, but Facebook is less used. The last 20 years they have a huge advancement with mobile phone usage without ever having had a landline phone. Nobody has a computer but they do have a smartphone available. That affects what people expect from technology - 510_Staff_P1*

The participant describes the need for country-specific usability design. Different user groups from different countries have very different experience using digital tools. Whereas some user groups might have experience with landline phones and computers, others might have skipped both those steps and have first used internet using their smartphones. Different user groups have experience with very different applications and programs on their digital devices.

9.2.1.5 Implementation plan

> *No, it is not yet a real dashboard. It is an email and then they get in -country- a kind of map. (…) This is, I must say, a bit of a make-do implementation. It is not completely – it does not get used yet by the operational center of the Red Cross, only by the -NS- Forecast based Financing advisor, they use this. (…) The next step would be that it is integrated in the operational center and their dashboards. But before that it needs to be a few times …. It is now first used for -disaster-, of which we have a blog on the website. Now, it first needs to be used another 2, 3, times, lessons learned, evaluate, improve, etc. And then, perhaps in a few years, we can truly integrate it in their tool suite. That would be an example of an ideal form of adoption. – 510_Staff_P3*

The above example describes an ad-hoc implementation design. Whereas in project plans implementation is often seen as training sessions, from this actual implementation it is clear that in order to gain trust, a multiple year implementation plan that starts very basic through an email is set up.

9.2.1.6 Iteration
(answer on the question: What do you see to be the most important role of HCD?)

> *That you build something that people want to use. That it helps people. Testing as much as possible and getting feedback from users. You never know for sure of course, (...) but in any case, to get a feeling that we are in the right direction. - 510_Staff_P1*

From this description it is clear that in order to gain familiarity with the product, a multiple year implementation trajectory is carried out. The implementation starts with a non-committal email to an external advisor, in order to be able to provide a proof of concept. Later however, the product is intended to be embedded into the existing procedure used by the National Society and integrated into the disaster response system including the operational center.

9.2.2 Conclusion

Most needs expressed by 510 staff correspond with the design of the HCD methods as described in the HCD maturity analysis in paragraph 5.2. Stakeholder engagement is partly done through codesigns with the stakeholders. Project goal setting is done through strategy sheets. Generating understanding of the user and their context is achieved through codesigns and persona journeys. Iterative testing is done through user testing.

A number of needs for information on the user and their context that are mentioned are still missing from the current HCD methodologies: The strategy sheets and persona journeys do not require a clear definition of the user. Next, HCD is not involved in the development of an implementation plan. Additionally, the codesign questions and the structure of the persona journey do not explicitly include information requested by 510 staff such as on the end-user's decision making.

Part 4: Deliver

The following chapters describe the proposal for the three elements of embedded HCD for 510.

Chapter 10. Element 1: Role (page 52)
The chapter on the role of HCD describes how the insights from the previous chapter are combined and selected in order to find the information niche that HCD fulfills within 510.

Chapter 11. Element 2: Workflow (page 55)
In the chapter on the workflow for HCD, the suitable HCD methodologies for HCD are selected based on the role of HCD as determined in the previous chapter. Additionally, these HCD activities are placed within the 510 product development workflow.

Chapter 12. Element 3: Communication (page 59)
The communication plan highlights which part of the developed role, scope and workflow are important to communicate to whom.

In addition to the explanation in the Deliver chapters, an overview of the insights contributing to the development of the proposal elements is provided in Appendix D.

10. Element 1: Role

This chapter will discuss the proposed role and scope of the HCD team. This role and scope will help focus the HCD activities to where they are most needed in the development of the second element of the embedded HCD; the workflow (chapter 11). Additionally, it wil help in communicating the value of HCD for 510 in the third element of embedded HCD; the communication plan (chapter 12).

10.1 Clustered needs from needs analysis interview

To find the role and scope for the HCD team of 510, the insights from the Develop phase are analyzed. In order to understand the value of the different responsibilities of HCD within 510, value propositions are made (which can be found in Appendix E) based on the needs expressed in the interviews. Through iteratively filling in the value proposition after different 510 staff interviews, three different roles for HCD are defined that are catered to three different groups within 510. In the overview in Table 5 an additional group is added based on the expressed user needs in the stakeholder interviews.

Information need	Quote	Value to:
User activities (decision making, sense making, tasks)	"What does the end-user base their decision on?" - 510_Staff_P4	510 General
Context of use	"I see less as a priority to understand the whole context of the -Country- but more what is the micro context of this specific thing that we are working towards. " - 510_Staff_P2	
Digital literacy/technical capacity	"Who has the skills that are needed?" - 510_Staff_P4	
Who the user is	"I do not know at what point these people come on board, the people who are at branch level or district level. I don't know whether the system will really be used by them, or if it is at a national level. The lower levels, the district information management officers in charge of disaster management, I don't know whether this system will be accessed by them. And if it is accessed by them. I am still not clear whether this information is useful for them." – Project_Stakeholder_P5	Project management
What problem is solved for the user	"what problem am I actually solving for most people?" – 510_Staff_P1	
Usable user-interface	"to make sure that our products are used and useful" – 510_Staff_P3	Product staff
Implementation plan	No, it is not yet a real dashboard. It is an email and then they get in -country- a kind of map. (…) This is, I must say, a bit of a make-do implementation. – 510_Staff_P2	
Stakeholders selection	"I am not sure if we have the right person from the right level engaged." – Project_Stakeholder_P1	Engage
Stakeholder engaging	"Still the challenging part continues to be having the critical stakeholders on board. We have some, but the ones that we have are not I think are not enough to take action." – Project_Stakeholder_P2	
Stakeholder understanding	"The number one challenge from my side is building a system that is understood by the national stakeholders" – Project_Stakeholder_P2	

Table 6. Overview of information needs with corresponding quotes and 510 group

The first need for HCD of 510 is to create an understanding of the user and their context. Literature research shows that in the development of response technology, often an oversimplified definition of the user and the context is used. This difficulty can be seen in 510 projects. Although a lot of information on stakeholders and context is available through a variety of sources, there is a clear need for a better understanding of the user, how they make decisions and what challenges they face. This difficulty in user understanding can be partly linked to the broad user-definition; the wide variety of possible users included in the broad user-definition makes it difficult to get a clear understanding of the user and the context in which they act.

The second need is to ensure that the project is solving the right problem for the right person by deciding on project goals. 510 aims to improve the speed, quality and cost-effectiveness of humanitarian aid by using data- and digital products. The practical projects aim to solve human problems. However, the research goal is not always formulated in order to reflect that, for example because it is a research-goal inherited from the underlying scientific project. The problem definition might also become unclear because additional project goals are added by project stakeholders. Additionally, an abstract problem definition makes it more difficult to find the right end-user for the product. As mentioned in the previous paragraph it is difficult to understand the problems the end-user is facing with a non-specific user definition such as a department or an organization.

The third need for HCD is to translate this understanding and these project goals into the design of a suited and usable user-interface for software products and an implementation plan. The user-interface is currently the largest output and responsibility of the HCD team and also the most important use of the other HCD activities (codesigns and analysis are fed into interface-design). Additionally, the need for a well thought out implementation plan becomes clear from the make-do implementation described in the interviews.

The last need is stakeholder engagement. As the context of disaster response is very complex, gaining an understanding of the system is quite difficult. Many people are involved in stakeholder engagement; however, it is not always clear if all necessary stakeholders are involved. Additionally, making sure all stakeholders understand the project and want to participate is an even bigger challenge.

10.2 Scope

Because of the limited resources for HCD and the need for a clearly defined niche for HCD activities in projects, an HCD scope has been developed for 510. The HCD scope includes a focus on the end-user and excludes scientific projects, stakeholder engagement and implementation. The following paragraphs further describe the choice for this scope.

10.2.1 Focus on the user rather than the stakeholders

Whereas currently codesigns are done with many types of stakeholders involved in the project, the proposed niche of HCD consists only of data gathering from (possible) end-users. There is a very large number of stakeholders with potentially relevant information. However, there is also already a very large number of people working on stakeholder engagement who gather relevant data from different stakeholders. It is proposed the HCD team focuses on the end-user rather than on all stakeholders in the project. This is also in line with the HCD philosophy as described in sub-chapter 3.1, which states that the ones facing the problem are the ones holding the key to the solution. As there currently is no one focusing on the end-user, this creates a clear niche for the HCD team.

10.2.2 Practical projects, not scientific projects

The focus on the end-user means that HCD is mostly involved with practical projects, rather than scientific projects. HCD activities are better suited for projects that aim to solve a human problem rather than projects that focus on scientific exploration.

10.2.3 Implementation not included

It is proposed that, although identified as a need, the HCD team is not yet involved in the development of an implementation plan. As implementation for disaster response systems is very complex and involves many stakeholders, the small HCD team with a limited budget is proposed to focus on activities regarding the user and the product development within 510. Additionally, the current HCD methodologies developed do not yet cover implementation and so this would require development of a new methodology. However, the user understanding generated by the HCD activities can inform the implementation plan. Additionally, as it is seen as a clear need and as it is largely concerned with the end-user, implementation is a topic that could be included in HCD once the team is more established.

10.3 Role of HCD in 510 product development

The main needs for HCD within 510 product development are: (1) generating user understanding through a user, task and use-context analysis, and through this user understanding (2) formulating clear human-centered project goals and user definition, and (3) designing a suited user-interface. As can be seen from Table 5, these are the HCD needs separated by activity type (understand, decide or design) excluding the activities that are proposed to be out of the scope of HCD for 510. These 3 points are considered the responsibilities of HCD in 510 product development.

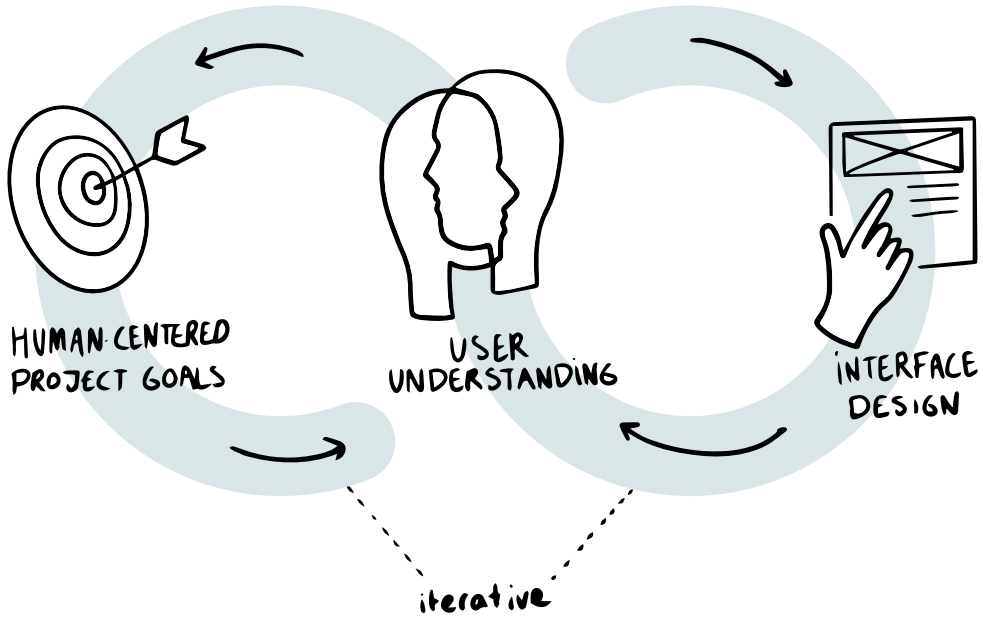


Figure 14. 510 needs for HCD, HCD responsibilities and HCD approach

10.3.1 Generate understanding of user and context

From the interviews it is clear that there is a wish to better understand the user and their context, including their activities, how they make decisions and what challenges they face. These information needs fit within the persona journey method that is being developed within HCD. The literature research provides several examples of a task and context analysis which can be used in order to help develop the persona journey. The following chapter discusses proposed methodologies for the HCD workflow.

10.3.2 Support in defining problem definition and user

Based on the interviews a need for a clearly defined problem and user is determined. Therefore, it is proposed that the HCD team assists both in the formulation of human-centered project goals as well as in the definition of a specific user.

10.3.3 Iterative and participatory design of product interfaces

User-interface design is already the most important output of the HCD team. Literature shows that a lot of response technology design does not sufficiently take into account the user, their tasks and the context. In order to make sure that the user-interface is designed to be suitable for its application, the HCD team designs the product user-interface for 510 in an iterative manner. This is done by first making rough prototypes and slowly developing these towards detailed designs.

11. Element 2: Workflow

For this step the Introduction-Establishment-Improvement model (Metzker & Offergeld, 2001) is used. First, the general steps in 510 product development are mapped. Next, the HCD activities are chosen, using the current HCD portfolio (as described in 5.2), the expressed HCD needs (from chapter 9) and the defined role (from chapter 10) as a guide. The mapped 510 workflow and the selected HCD methods are used to develop an embedded HCD workflow for 510.

11.1 Step 1. Mapping the 510 workflow

Figure 15 shows a simplification of the project phases of a 510 product development project. As mentioned in 4.1.1.2, 510 works on many diverse projects, with Red Cross-National Societies of varying data maturity, different project partners and with a focus on different aspects of response. Because of this diversity, the steps differ depending on project.

Following is an elaboration of the project phases identified;

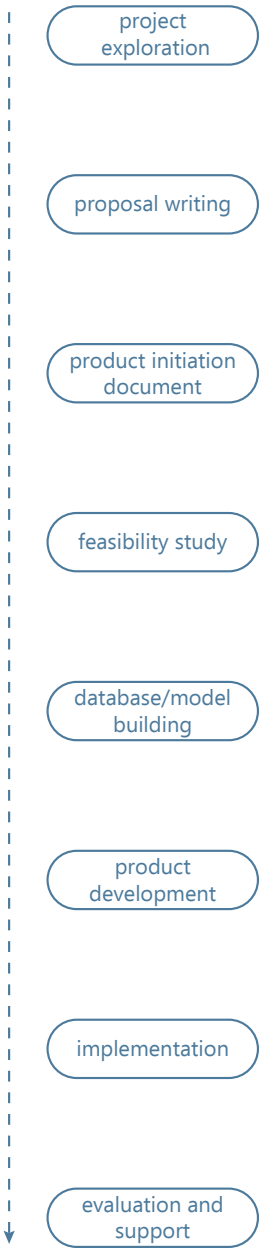


Figure 15. 510 workflow

11.1.1 Phase 1. Project exploration

The low level of hierarchy becomes really clear when the new project opportunities are discussed. A message in teams (the documentation and communication tool of 510), available to see and respond to for every staff member and volunteer, is posted by the strategic lead. To determine the best directions, voting is done (although this is not a definite result). The strategic lead of 510 then turns the most promising ideas into proposals.

11.1.2 Phase 2. Proposal writing

The best ideas are turned into a project proposal based on the required format for the donors. After this, a team is formed to work on the project.

11.1.3 Phase 3. Product Initiation Document

The Project Initiation document (PID) is a long document in word format (15 pages A4) which serves to explain the goals and project overview to anyone who joins the project. This can either be part of the proposal writing or the start of the project.

11.1.4 Phase 4. Feasibility study for project

The first phase of a project is a research and in-depth feasibility study. This includes mapping and finding stakeholders, finding the available data and models and evaluating the capacity of the Red Cross National Societies.

11.1.5 Phase 5. Data gathering/analysis/model building

The main activity of 510 is transforming data into understanding, whether it is gathering data or creating predictive models using weather forecasts to predict floods, droughts or typhoons, or combining data into a community risk score. This is done by the data scientists, hydrologists, and GIS experts that are working and volunteering within 510.

11.1.6 Phase 6. Product development

Next, the data or model has to be made into a product that can be used. Depending on the type of product and the intended user, this step might be quite exstensive or very limited. A dataset made for use by data scientist does not necessarily need a lot of product development. However, if a model is made into a software tool for use by a wider audience with limited digital literacy or limited technical knowledge, the product development phase is often quite exstensive. As previously mentioned, 510 products can be databases, models or software products.

11.1.7 Phase 7. Implementation

The final goal is for the user to be able to use the product autonomously. The products are meant to be used by those who act and make decisions during disaster, such as government officials working in disaster management and aid organizations employees in office and in field. To be able to have such ownership, product implementation is extremely important.

11.1.8 Phase 8. Evaluation and support

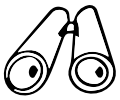
As funding is provided per project and each donor asks for a specific evaluation, evaluation is done per project and the structure is based on the requirements of the donor. This leaves little room for product evaluation.

The implementation described as the goal in phase 7, is an ideal situation. In case of disaster there is no official support embedded in the project, however it is expected that either an in-country delegate or 510 employees can remotely provide support once the product is in use.

11.2 Step 2. Selecting HCD methods

In this step, the changes to the current HCD methods (as described in sub-chapter 5.2) are proposed based on the found challenges, the literature research and the needs analysis. These adapted methods are then applied in step 3. As mentioned in the HCD analysis, the original HCD activities consist of PESTEL analysis, strategy sheets, codesign, persona journeys, prototyping and user testing. The needs and roles of HCD, as discussed in chapter 10, mostly correspond with these methods. In order to give an overview of the changes made in the HCD workflow, a comparison between the old and the new workflow is made. In Table 7, the old HCD methodologies are combined with additional or changed steps in blue. The corresponding HCD roles from the first element of embedded HCD are shown in the first column.

Table 7. Renewed HCD methods with changed steps in blue

HCD Role	Method	Step 1	Step 2	Step 3	Step 4	Step 5
	deleted: PESTEL analysis					
	 **Strategy sheets**	Goal sheets and value proposition	Define user	Other strategy sheets	Determine unknowns and codesign questions	Iterate using codesign insights
	 **Codesign**	Gather insights from previous projects	Develop interview questions	Codesign interview and transcribing	Clustering insights	Fill in into persona journey and Strategy sheets
	 **Persona journey**	Establishing timeline	Establishing persona types	Fill in topline	Determine unknowns and codesign questions	Iterate using codesign insights
	 **Iterative prototyping**	Paper prototyping	XD prototyping	XD wireframe design	MVP design	
	 **User testing**	Paper prototype user testing	XD prototype user testing	XD wireframe user testing	MVP user testing	

1. PESTEL analysis not included.

In the proposal for HCD, the PESTEL analysis is not part of HCD methodology as it is not based on user insights and therefore does not fit the scope set for the HCD team. Additionally, the nation-wide scope of the PESTEL analysis does not fall within the focus on the user. Instead, it is proposed project management or other involved stakeholders perform this analysis instead of the HCD team.

2. Define user is added as part of the strategy sheets.

A crucial step for HCD within 510 is found to be the selecting of the intended user. This is not an activity that the HCD team can do by themselves. Instead, the HCD team will, just as is currently done with the strategy sheets, guide the project management in defining a clear end-user. The HCD-team is involved in this step as an understanding of the possible users and their responsibilities is the basis of the selection of the user. Additionally, many other HCD activities are dependent on a clearly defined user. The step is facilitated by an HCD team-member through the strategy sheets while using insights from the persona journey and codesigns.

3. Partly predefined structure for persona journey.

From the interviews, several information needs that are relevant for almost all 510 staff became clear: information flow, decision making flow, responsibilities and tasks. These information needs can be used to build a basic structure for the persona journeys. Additionally, literature research shows examples in which task analysis is linked to system requirements formulation. Therefore, it is proposed that the persona journey method would not only be a combination of a persona and a user journey but also of more structured methods such as the task analysis and system requirement formulation.

4. A more specified codesign.

Whereas codesigns currently are very open and can be done with all stakeholders, once codesigns are only done with possible users the questioning can be more specific. The basic structure is proposed to stay with the three parts: digital experience – relevant disaster experience – ideation. However, as it is also one of the main principles of HCD to gather feedback iteratively based on progress in the project, the codesigns are proposed to include specific questions on information identified as unknowns and assumptions during the development of the strategy sheets and persona journeys. These more specified questions can be added at the end of the codesign in order to let the participant determine the direction of the conversation in the beginning and only later give more direction.

11.3 Step 3. Integrated development process

The last step from the IEI model that is done within this project is the development of an integrated HCD workflow. In this step, the selected HCD methodologies are linked to the development phases of 510. The changes within the HCD workflow are explained as well as their relation to the larger project.

11.3.1 Changes to HCD workflow

Two changes are proposed for the timing and use of the HCD methods;

1. Use of database of user insights in project exploration and project initiation

The HCD team is to take a proactive role in the development of new projects. Codesigns are setup in such an open manner that participants are free to express many different types of challenges and opportunities. Therefore, challenges expressed in one project might also be relevant for another. These can be used as insights for new product development by documenting them during codesign analysis.

2. First fill on both strategy sheets and persona journeys

As found in literature, HCD is initially based on human insights, participatory and iterative. Ideally, this approach should be present in all of HCD's activities. Whereas currently the strategy sheets are initially filled in based on 510 staff knowledge in order to understand what information is already available, what assumptions are present and what is unknown. When knowns, assumptions and unknowns are first filled in into the persona journeys, the focus of the codesigns can be determined based on those two initial-fills. This does three things. First, it gives the HCD interviewer an initial understanding of the user, stakeholders and the context. This can help in the preparing and executing the interview. Second, it ensures that the participant's time will be used in order to gain new information, rather than the find information that is not relevant to the project or already known within the project team. Third, it engages the 510 staff in the setup of the codesign which ensures higher visibility of HCD methods and generates trust.

11.3.2 Design: Embedded HCD workflow

The changes in methods and the changes to the HCD workflow result in the following embedded HCD workflow (Figure 16). The 510 project phases used in this overview are slightly different from the earlier defined phases; a number of phases are combined as they were closely linked and they required the same HCD activities.

In the project exploration phase, HCD documented transcripts and persona journeys from earlier projects can be used to get an initial understanding of the context and the needs of possible users.

During the writing of the proposal there is no budget for extensive HCD activities, as the project has not received funding yet. Using the user insights from previous projects and a lot of assumptions, the project team can already use strategy sheets in this phase in order to formulate human-centered project goals. Additionally, using the information from previous projects and knowledge or assumptions from 510 staff, an initial persona journey can be set up by HCD volunteers.

Once funding is raised, codesigns can be done in order to iterate on both the persona journey and the strategy sheets. However, both of these documents are "living documents" and they can continuously be iterated upon throughout the project.

The insights from the codesigns, the strategy sheets and the structured information in the persona journey form the basis of the 1st prototype. The goal of the first prototype is to test the initial ideas with the user early on. This is done continuously throughout the development. Additionally, the user test insights might lead to adaptations in the persona journey, the definition of the user and even the project goal.

Insights from the strategy sheets, the persona journey and the user test feedback can be used in the design of an implementation plan, in predicting the need for support in the use of the product and in evaluation of the product.

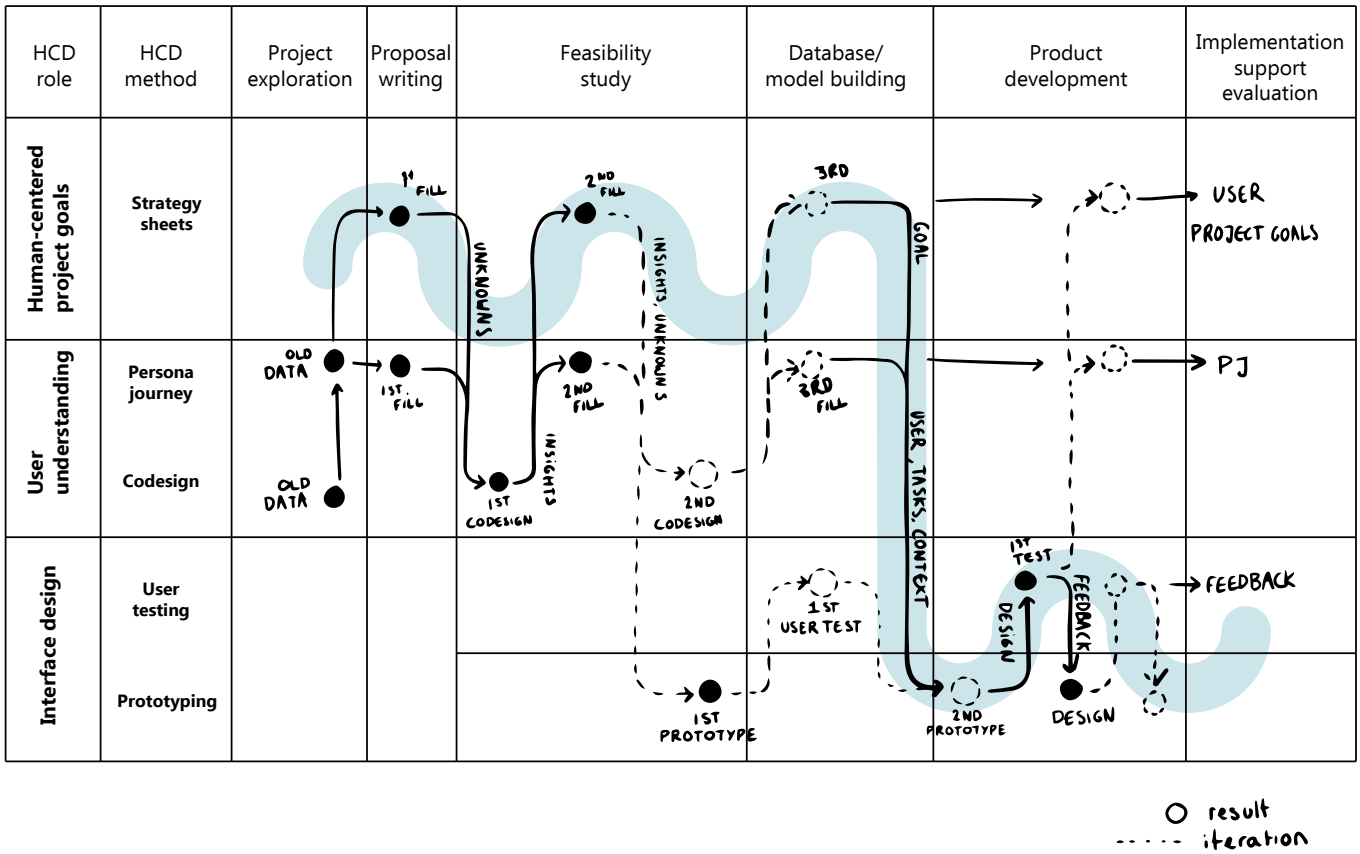


Figure 16. Overview HCD workflow integrated in 510 projects

12. Element 3: Communication

From the initial problem analysis in the Discover phase it is clear that HCD is not only done by the HCD team. Therefore, the responsibility to apply an HCD approach does not only lie with the HCD team. Because of this, the HCD staff needs to guide not only the HCD volunteers in applying an HCD approach where needed, but everyone in 510. To do so, first the HCD-responsibilities of the different staff members are identified. Next, communication materials are developed in order to guide the staff members in their responsibilities.

12.1 Responsibilities of staff members across project stages

In order to understand who in 510 needs to understand what of HCD, the responsibilities of the different staff members in applying HCD need to be analyzed. For this, the 510 staff roles (as described in paragraph 4.1.2.3) and their responsibilities in using an HCD approach (as taken from the interviews and the organizational analysis) are summarized in Table 8. The responsibilities are mapped along the different 510 project phases as defined in the previous sub-chapter.

Table 8. 510 division HCD responsibilities

Role within 510	Project phase and corresponding HCD responsibilities					
	Exploration	Proposal writing + PID	Feasibility study	Database / model building	Product development	Implementation Support Evaluation
Strategic lead **Scientific lead**	Take into account human needs in project exploration Start with the problem, not with a solution	Include human needs in proposal Start with defining a problem, not a solution				
Project manager **Product manager**		Include human needs in proposal Create budget for HCD activities	Identify and document knowns, unknowns and assumptions with HCD team in order to incorporate into codesigns	Identify and document unknowns and assumptions	Having an understanding of the user Document unknowns and assumptions	Understand barriers in implementation and use Make realistic implementation plan Use human-metrics in evaluation
Scientists **Software developers**						
HCD staff	Help formulating human-centered project goals and human metrics Help define end-users	Help formulating human-centered project goals and human metrics Help refine end-users Provide clarity on options and hours based on existing knowledge	Codesigns Transcription Analyzing results into persona journey Prototyping	Codesigns Transcription Analyzing results into persona journey Prototyping	Prototyping and user testing	
HCD volunteers	Review documentation (existing knowledge)					
Everyone always	Take into account the human needs Document assumptions and unknowns Document human insights					

12.1.1 Exploration
The strategic lead and the scientific lead need to include an HCD approach in the setup of new projects. In order to explore project opportunities in an HCD approach, they need to start from problems addressed by local stakeholders and possible end-users.

12.1.2 Proposal writing + PID
Additionally, the project goals should be formulated in a way that reflects this human-focus; explaining the human-needs that the project is solving. The HCD team can help in this phase by providing insights from previous interaction with local stakeholders. Additionally, the HCD team can help in formulating both the project goals and the proposed end-user. While doing so, unknowns and assumptions are documented for future codesigns.

In this phase, there will be communication with the National Society/Group for which the product is intended. During this contact, the strategic/scientific lead has the responsibility not to start by presenting possible solutions (existing products) as this creates a bias and makes it more difficult to understand the need.

Throughout the process of applying for funding, a budget has to be made for the project and its activities. The strategic/ scientific lead and the project/product manager are responsible for this. In order to ensure an HCD approach, budget needs to be available for participatory approaches with the user such as codesigns and user-testing. Budget and planning also needs to take into account iteration cycles based on insights from codesigns and user testing.

12.1.3 Feasibility study
Once funding is secured, the definition of the project goals and end-user is continued by the project and/or product manager. The HCD team can now help by gathering new information through codesigns. This information gathered by the HCD team is also analyzed and turned into a persona journey. These insights help sharpen the project goals and the user definition and are input for prototyping.

12.1.4 Model building
In the following phase, the product/project manager and the development team together work on developing the model. While doing so, they have to document any assumptions they use or any information they miss from the user. The HCD team can discuss these points during their ongoing codesigns.

12.1.5 Product development
The project/product manager is responsible for defining the system requirements. This is done in an HCD manner by basing the system requirements on the human-centered project goals. Additionally, the persona journey helps them understand the user activities and responsibilities, which will help in defining an allocation of function between the product and the user. Before the front- and back-end developers start working on the product, the HCD team has gone through a number of iterations of designs and user testing in order to minimize assumptions in design.

12.1.6 Implementation, support, evaluation
The product/project manager is responsible for creating an implementation and support plan for the product. They can use the codesign and persona journey insights in order to understand the need for implementation support and support during use. The strategic/scientific lead and the product/project manager is responsible for making an evaluation plan. By using the human-centered project goals they can measure the human-value of the product.

12.1.7 Throughout the project
Throughout the project, it is important that everyone involved actively documents any unknowns and assumptions used in the project. Everyone involved has to understand why they are doing their activities from a human perspective which problem is solved for whom?

12.2 Design: Communication materials
Based on the responsibilities as described four types of HCD responsibility groups can be defined that need guidance in implementing HCD.

The first group consists of everyone within 510, including both the staff members and the volunteers. Everyone in the team should have a basic understanding of an HCD approach and why it is used in 510. Additionally, everyone can help a human-centered approach by taking into accounts human needs and understanding when assumptions are made in their development in order to communciate them to the HCD team for testing.

The second group are 510 staff and HCD volunteers. This is the group that needs to have an overview of the HCD methods and their link to the project. 510 staff needs this as they will be part of project meetings in which HCD work will be discussed and because they will directly see how HCD results nfluences their work. Additionally, HCD volunteers want to understand how their work is linked to other HCD methods and how their work is being used in the larger 510 project.

The third group consists of leads and project management. They need to understand not only why HCD is important and what HCD does but also when they have to engage the HCD team within the project.

The last group are the HCD volunteers. They need to not only understand HCD in general, and how HCD is linked to the project but also how they can perform the HCD methodologies. Whereas they are currently guided in this by the HCD staff members, having communication materials on the methodologies will not only help the volunteers become more autonomous and the results become more consistent but it will also serve as documentation for the methods developed by the HCD team.

Table 9. Overview of designed communication materials and their uses

Communication material	Target audience	It will help	Why is it needed	In what situation will it help?
Why HCD? HCD introduction slides	Everyone within 510 (staff and volunteers)	Provide an understanding of the philosophy of HCD and the role of HCD within 510	In order to have a basic understanding of the goal of the HCD team, and the meaning of an HCD approach in projects – it can help everyone apply this way of thinking and it can help conversation with the HCD team	Throughout all activities
What does HCD do? HCD Workflow overview	Project staff and HCD volunteers	Provide an overview of all HCD activities within the project structure and the output of the HCD activities and how they will be used in the rest of the project	It can help gain trust in HCD methods, create overview regarding HCD activities and provide clarity when working together with the HCD team	When communicating with stakeholders and users, when working together with HCD
When to do HCD? Explanation on how to use HCD in your project	Leads, project manager and product manager	Provides an understanding of the goal of the HCD activities and how the results can benefit the project	Help understand when to involve HCD in the project	When involving HCD in a project
How to do HCD? HCD volunteer modules	HCD volunteers	Gives a detailed explanation of how to perform HCD activities	Supports the HCD staff in explaining the HCD methodologies to the HCD volunteers	When a volunteer starts at 510 or is being trained in a new methodology

Based on these groups and their HCD responsibilities, four types of communication materials are designed for 510 (Table 9 and Figure 18);

1. A slide-deck to understand HCD in 510, which is aimed at all staff and all volunteers.
2. An overview of the workflow of HCD within 510, which is aimed at all staff and HCD volunteers.
3. An explanation of how to engage HCD within a 510 project. This is catered to project leads, such as strategic and scientific leads or project and product managers.
4. A proposal for HCD methodology modules, which is meant for HCD volunteers in order to get a first understanding of an HCD methodology that they want to employ.

Figure 17 shows how the previous two elements (role and workflow) are used in the communication materials.

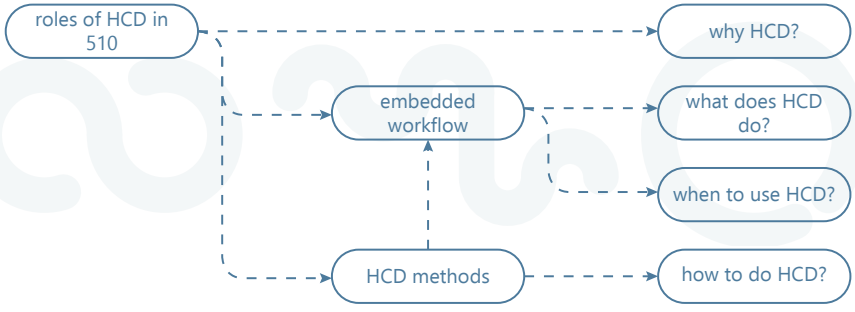


Figure 17. A visual overview of how the different elements are embedded into the communication plan for 510 HCD

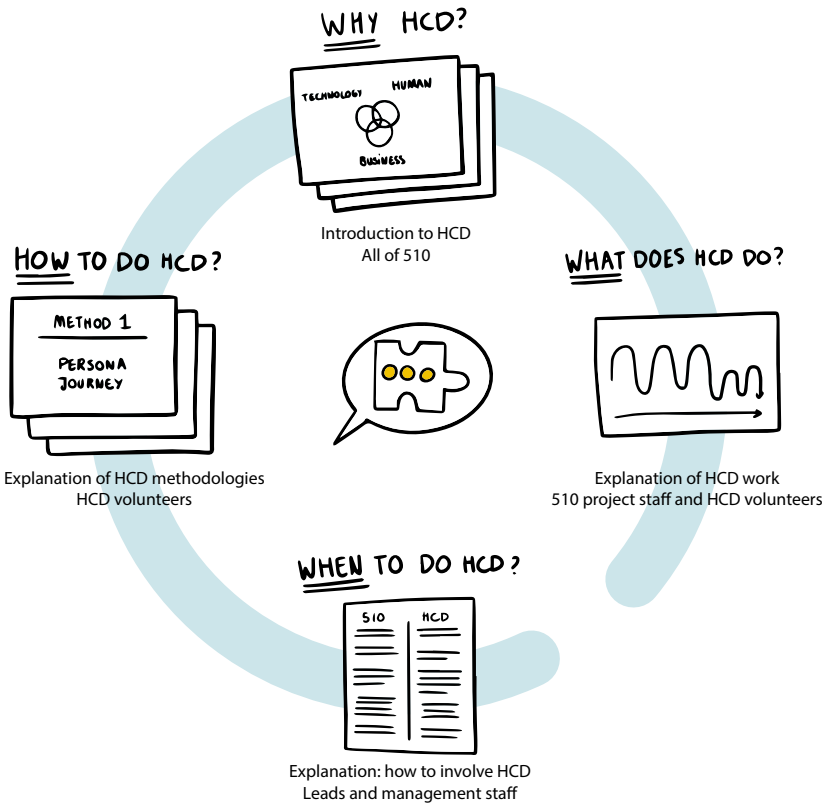


Figure 18. The 4 communication materials

12.2.1 General introduction of HCD in 510

Target audience: All 510 staff and 510 volunteers

Firstly, everyone in 510 needs to understand the HCD approach and the philosophy in order to understand the meaning of HCD and how applying an HCD approach can be of value to 510.

For volunteers starting at 510 an introduction module is already being used. This is a slideshow that can be viewed and gone through autonomously in order to get a basic understanding of 510. A similar introduction module has been developed as an introduction to HCD, which can be found in Appendix F. These same introduction slides can be used during HCD lunch presentations.

12.2.2 An overview of the HCD workflow in 510

Target audience: 510 project staff and HCD volunteers

Next, 510 staff and HCD volunteers need to gain an understanding of what activities are done by HCD and how they are integrated into the 510 projects. It should be clear what will come out of the HCD activities and how this will help the product development. In order to communicate this, the visualization of the embedded workflow design can be used (Figure 16).

12.2.3 How to use HCD in a project

Target audience: Strategic and scientific lead a project or product management

For 510 leads and project staff, it has to be clear when they need to involve the HCD team in the project. To be able to do so, they should understand which HCD activities are relevant to them and how they will benefit from the HCD method. This should be done by not only discussing in which phase the method should be employed (as is clear from the overview of HCD activities) but also how the output of the HCD activity can help them. An overview for this target audience can be seen in Figure 19. In this overview, the HCD activities are shown as linked to the 510 projects and the responsibilities of the project managers (such as setting project goals and understanding the user workflow). In order to communicate that user testing and prototyping need to be applied together, these two activities are shown as one element of HCD to involve in the project in order to ensure that budget is only released for both activities at the same time.

Additionally, during the activities, more collaboration with the 510 staff is set up (e.g. by a first fill of the persona journey and the collaborative setup of the codesign questions and information goals) in order to ensure the needed information is gathered and in order to create understanding and trust among 510 staff members. By getting an initial understanding of HCD methods and by being involved in the setup of the codesigns, it is more apparent what information is relevant for the HCD team and thus what information (e.g. gathered in calls or meetings) is important to document for use by the HCD team. This is especially important (first) for the strategic/scientific leads and (later) for project/product managers as they are most involved in the project.

Communication material: When to do HCD? How to involve HCD in your project. An overview for 510 leads, project and product managers.

	510 project activity	HCD support
Project exploration	**Exploring a new project opportunity** Would you like to know what the people you want to help are doing, what challenges they are facing and what they see as opportunities for improvement?	**Review HCD database** During codesigns for previous projects, challenges that might be insightfull for a new project might have come to light. By checking the HCD database when starting a new project, projects are Human-Centered from the beginning. Additionally, before you ask the same person again, make sure you check with HCD who they have talked to already!
Proposal writing / PID	**Do you have a clear human-centered project goal?** Who are you going to help do what? And how are you going to do that? **Have you defined the user? (A person, not a department or a National Society!)** Have you defined a user group that is specific enough so that you could implement it right now with your current contacts?	**Strategyzer sheets** Strategyzer sheets help writing a proposal by creating overview and formulating goals for the entire project in a structured manner. Additionally, they help you pinpoint the end-user you are designing for. The HCD team can help you use these strategyzer sheets. The first round of filling this in is not only to gain insights, but also to understand what is known and what is unknown. This helps in the development of the codesign interview guide.
Throughout project	**What do you know about the user's workflow you will add to?** What digital tools do your users use? What information do they have? When do they trust information? How do users make decisions?	**Codesign** Codesigns are the way in which data is gathered in a Human-Centered way. This can then be used both to refine the previous steps and to base designs on. Codesigns are done in a way to minimize bias and to get the most realistic insights. **Persona journey** A persona journey does two things. First, it maps aspects of a user- such as digital literacy and responsibilities in case of a disaster. It also gives an understanding of the workflow, for example what information is available at what time and what decisions are made.
Product development	**Are you going to develop a user-interface? (email/alarm/ dashboard)** How would the user like to get the new information presented? When? Through what platform? How should it look like?	**Iterative development and user testing** Development is an iterative process. It starts with a paper prototype in order to get feedback from users on the functionalities. Then a XD prototype is made in order to test the interface and visual elements with users. With the XD wireframe a final user test can be done and the developers can use this as a guide in their work.
Throughout project	**Have you made any assumptions you want to check?** Are there any unknowns or assumptions made in the previous steps?	**Codesigns, User-testing** Codesigns and User-testing are two ways to test assumptions about the user and their context.

Figure 19. An explanation of how to engage HCD in a project for 510 leads and management

12.2.4 HCD method modules

Target audience: HCD volunteers

In addition to the previous communication materials, a more elaborate explanation on the separate methodologies is needed in order to enable the volunteer to work autonomously on tasks. These method modules are made to limit the time spent by HCD staff explaining the methodologies to new volunteers. This more in-depth information for the HCD volunteers can be incorporated into additional introduction modules, for which a template has been developed. The module template can be found in Appendix G.

The modules are made in order for the volunteer to understand the goal of the methodology, the output of the methodology, how it will be used in the larger development process, the steps of the methodology and how to document the work.

The HCD team will develop their methods and tools further. When a new method is added, the volunteer developing the workflow of the method can document this into the module template and create a slideshow, so that future volunteers who want to use that method get an initial understanding of the method autonomously.

13. Conclusions

Several conclusions can be drawn regarding the application of HCD in response technology development from the 510 case study. They are discussed below based on the sub-research questions from the Discover, Define, Develop and Deliver phase and the main research question of the report.

> **Discover: What are challenges towards applying HCD in the development of data and digital tools for humanitarian response?**
>
> **Define: What are the required elements of successful implementation of HCD in the development of data and digital tools for humanitarian response?**

From the **Discover** analysis, a number of enablers and challenges is found in the application of HCD in humanitarian software development for the case of 510. The challenges are clustered into three main lessons in implementing HCD in humanitarian software development (a, b and c). In the **Define** chapter these lessons are translated into three required elements of embedded implementation of HCD in humanitarian software development (1,2,3);

Firstly, (a) HCD is already practiced in many ways within current projects outside of the HCD team, so there is a need for (1) a clearly defined role for HCD within the organization. Secondly, (b) an HCD approach needs to be interactive with the existing development workflow. Therefore (2) an embedded workflow of HCD methodologies that is linked to the larger product workflow is required. Thirdly, (c) the embedded application of HCD in all projects relies on the inclusion of the HCD approach and the HCD team in numerous parts of the project and by numerous people involved. Therefore (3) a communication plan is required that helps guide the 510 team in the implementation of HCD across the organization. It should be noted that the three elements are interlinked; The defined HCD role largely determines the methodologies and workflow and both the role and the workflow are used as means of communication in order to guide implementation.

> **Develop: What are the needs for HCD within 510 in the development of data and digital tools for humanitarian response?**

In order to **Develop** the three elements of embedded implementation of HCD for 510, three needs for the application of HCD in response technology development are identified. The first need is ensuring that the project is solving the right problem for the right person. The HCD team can facilitate this through the formulation of human-centered project goals. The second need for HCD of 510 is to create an understanding of the user and their context. The HCD team can facilitate this through participatory methods with the user and analyzing these human insights. The third need for HCD is iterative development of a suited and usable user-interface for software products. By iteratively prototyping and gathering feedback from users, the HCD team can help increase the suitability of the product for the context in which it will be used.

> **Deliver: How can Human-Centered Design be applied in the development of data and digital tools for humanitarian response in the case of 510?**

In the **Deliver** phase, the needs are translated into the role of HCD for 510 and an embedded workflow for HCD within the 510 product development. Finally, a communication plan is proposed based on an analysis of the 510 team and their responsibilities for the application of an HCD approach in order to guide the HCD team in embedding the HCD approach across the organisation.

> **Main Research Question: How can Human-Centered Design be applied in the development of data and digital tools for humanitarian response?**

The research confirms that HCD can support response technology development and identifies actions to take in order to implement HCD as well as the role HCD can fulfill within the development process.

The required elements of embedded HCD show the necessary components in order to implement HCD in a response technology development process (a defined role, a structured workflow and a communication plan). These elements are in line with the IEI model (Metzker & Offergeld, 2001) but elaborate on it as is further explained in sub-chapter 13.2.

The needs of HCD in response technology development identify three possible roles of HCD (project goal formulation, generating user understanding and iterative product development). Whereas the application of HCD found in literature differed per example, the described role of HCD for 510 is in line with elements of the examples.

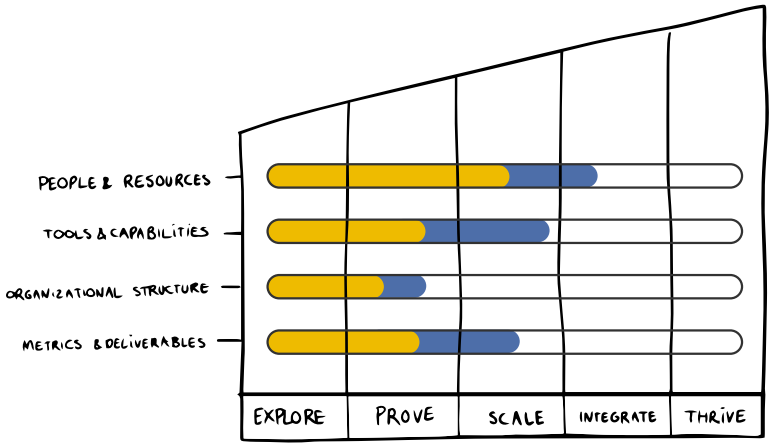


Figure 20. The updated HCD maturity assessment for the new proposal

13.1 Implementation of results in 510

13.1.1 Improvement HCD maturity

By analyzing the Koos Service design maturity score before (chapter 5) and after the possible implementation of the design interventions (Figure 20 and Table 10), an assessment of their effect can be made. In the initial analysis, the most important points of improvement were found to be to involve more people in HCD activities, further develop the HCD methodologies and consistently apply the methodologies to 510 projects. The proposal partially helps achieve this;

Table 10. Elaborated Service-design maturity ranking with yellow marking showing the original score and blue fill showing the score if all design propositions are applied (Adapted from Corsten, 2019)

	People and resources	Tools and Capabilities	Organizational Structure	Metrics and Deliverables
Explore	Individual service design enthusiasts are scattered across the organization in which no budget, time and facilities are dedicated to service design.	Service design knowledge and expertise is self-retreived (through books / articles / trainings), but scattered across the organization.	Traditional siloed structure, with no assigned responsibilities on service design or customer experience.	Customer centric metrics and deliverables are non-existent.
Prove	First project team is formed by enthusiasts and / or design agency. There is missing budget and management buy-in for service design initiatives.	Existing (adjacent) capabilities are brought together from different people. Organizations tend to buy capabilities through hiring a design agency.	The first multidisciplinary team is being formed and the first service design initiatives are taking place regardless of structure.	Deliverables of first project being created, like a customer journey map. First measurable results are often lacking.
Scale	More people get involved and incidental budgets are created for service design projects. Rooms and facilities are getting hijacked for service desgin.	Capabilities are spreading outside of the initial team. First employees start to specialise and CX / SD departments are being formed.	Interference with the existing way of working is felt. Silos start to suffer under the demands of multidisciplinary teams.	Project results are becoming increasingly apparent. First customer-centric KPIs are set specifically for the CX department.
Integrate	The majority of people is engaged with service design. Dedicated service design budgets are now in place.	Unified capabilities, methodology and language around service design, as capabilities are being decentralised within each team.	The siloed structure is broken down and design-led foundation is being laid. New roles emerge and are being assigned in each team.	C-suite is committed to CX and SD and may even assign a Chief Design Officer. Customer-centric KPI's go company wide.
Thrive	The entire organization is involved ins ervice design. Everyone is aware that all decisions may impact customer experience.	Strict methodology is set loose and experimentation is stimulated, as the design mindset is ingrained in the company culture.	Organizational structure allows for close c-creation of service experience in multidisciplinary teams.	Each initiative is tied to customer-centric metrics and deliverables. Customer centricity has become an important KPI for the entire C-suite.

- **People and Resources:** The communication materials help people outside the HCD team to engage with HCD activities. Additionally, a clear overview of activities can help determine the right hours for HCD and therefor the right budget.
- **Tools and capabilities:** The HCD methodologies are not immediately improved because of the design. However, the methodology modules are meant to help the HCD team unify, structure and communicate the HCD methodologies. Additionally, the HCD communication materials help spread HCD understanding outside the initial HCD team.
- **Organizational structure:** The organizational structure is not changed because of the design. However, engaging the non-HCD staff more with HCD activities can help in the shift towards more interdisciplinary teams.
- **Metrics and deliverables:** By involving HCD in the beginning of the project and ensuring Human-Centered project goals from the start, human-centric project KPI's are promoted. The clear role for the HCD team within 510 and the communication material on when to involve HCD in projects help HCD to be structurally embedded in projects with expected HCD deliverables.

13.1.2 Implementation

It is not clear yet what parts of the proposal might be implemented and what parts will not. Based on feedback received throughout the project, it is already clear that many of the insights are relevant to the case of 510.

> *"At the moment HCD could definitely be more R&D. We have identified many products and features that are not on any of the proposals and that also causing issues"*
>
> *"Sometimes, HCD would be better to start as part of the proposals… "we will only do this project if we know & address real needs""*

The most notable example of this is that the insights about the unclarity regarding the user of the developed products in the project stakeholder interviews have been shared when discussing the definition of users.

Some of the insights are already recognized and incorporated before the report was finished:

> *(about the missing user tests for some prototypes) "For this reason, we brought in a corporation to allow for continual user testing. Outside of the 510 project budgets"*
>
> *(about the structural documentation of user insights by staff outside the HCD team) "This is now in azure and collected and structure by product owners (its new as is the function of a product owner in scrum agile) they are starting to think on behalf of the end user and getting more interested in the facts that drive the end users)"*
>
> *(about the varying workforce of HCD volunteers) "We are getting two HCD interns that will work 3 days a week on specific tasks."*

Especially two communication materials; the general introduction to HCD in 510 and the methodology modules for incoming volunteers were seen as a suitable solution by the HCD staff. Before the Covid-19 epidemic, the methodology modules were already being developed in collaboration with one of the two HCD staff (who is also the volunteer management). This however was put on hold once the pandemic became the first priority within the NLRC.

In some situations the responsibilities for HCD within 510 as defined in this thesis should not be performed by the HCD team. As mentioned in the interviews, 510 works on a wide variety of projects with a wide variety of stakeholders and the roles of 510 and other project partners vary. If 510 has a solely technical executing role in a project, HCD activities might be done by other partners within the project consortium.

13.2 Scientific relevance

The three elements of embedded HCD can be seen as an addition to the IEI model (Metzker & Offergeld, 2001) based on the challenges found in the implementation of HCD in 510. The adaptation makes the model suited for a broader interpretation of the term HCD and a wider variety of products. In addition to the IEI model, in which an integrated workflow for HCD activities is developed, two extra steps are added.

- The first step that is added at the beginning is determining the role of HCD within the organization. When starting up HCD methodologies within an organization, it is crucial to have a clearly defined goal and scope. The roles of HCD will vary greatly across organizations because the need for HCD varies between organizations.

- After the development of an integrated workflow, as a last step, a communication plan is added. In order to integrate the HCD philosophy into an organization, not only HCD methodologies need to be added. In addition to this, the entire organization has to be guided towards implementation of an HCD appraoch. The HCD team is responsible for this and therefor a plan needs to be made to do so, the communication plan.

Additionally, the number of possible HCD activities used in the IEI method is increased by using HCD methods found in literature.

13.3 Limitations

A number of limitations regarding the research design should be noted.

For the 510 project stakeholders interviews, the participants were selected through NLRC delegates in the specific project country. The stakeholders consisted of Red Cross staff and therefor the needs of stakeholders in the project outside the local Red Cross have not been taken into account.

The analysis of clustering insights and the design was done partly in collaboration with the 510 HCD staff members and the 510 HCD volunteers and partly individually. The partial individual analysis and design and the involvement of only design staff and volunteers might have interfered with the objectivity of the design.

The organizational analysis and maturity analysis were made based on internal documentation and collaboration with the company supervisor for this thesis. Whereas there was a clear intention to describe both the organization and the HCD team in an objective way, the collaboration and sourcing from internal documentation might have hampered this.

The selection of literature for the literature research was done in an explorative way rather than a structured way. The search words were not chosen in a consistent manner and the literature was not selected according to distinct criteria. Additionally, the lack of previous research for this specific application of HCD made for a need to branch out into other fields which might have resulted in the use of less suitable papers.

Finally, as the study is done based on one case study, the findings and the proposed development process are not suggested to be suited for application in all response technology development. However, the findings can serve as an incentive for other organizations to reflect on their need for a systematic method for understanding user and context in the development of response technology. Therefore, although the research broadens the knowledge on HCD in practice within the field of humanitarian innovation, further research is needed in order to make conclusions regarding applicability across the field.

13.4 Recommendations

13.4.1 Research recommendations

Based on limitations in the research design, further research can be proposed on the implementation of HCD in response technology. First, research is needed that includes a wider range of interview participants and a larger number of organisations in order to get a better understanding of the implementation of HCD across different organisations and from the perspective from more stakeholders. Additionally, resarch is needed that is performed in a collaborative way throughout in order to minimize subjectivity in the results.

Based on the limitations in literature, more research is needed for the use of HCD methods in the field of disaster response. Many of the commercial HCD methods need adaptation before they would be suited for application in the field of humanitarian response. Whereas IDEO (2015) provides a basis for HCD methods for social purposes, it does not provide in-depth explanation of the methods and is often not suited for disaster response. This lack of knowledge can be explained because of the complexity, the number of actors and users and the political sensitivities. Examples of areas in which work could be done are methods for determining the user for response-technology as well as participatory methods for response-analysis that take into account potential political sensitivities. This can contribute to the ability of response-technology developers to understand the needs of the user and focus on the most important functionalities of their products.

13.4.2 Further recommendations for the implementation of HCD in 510

A number of findings from research were not included in the final proposal. Therefore, additional recommendations can be made for future steps in the implementation of HCD in the case of 510:

From the literature research and the maturity matrix it is clear that an HCD team can have more impact when it is not a separate entity. Instead, project teams should be multi-disciplinary and include designers. For 510, this would mean for HCD volunteers to be assigned to specific projects. However, this would require HCD volunteers to have quite a good understanding of the HCD methodologies performed by 510 as well as to be certainly available for a number of hours a week for a certain timespan. Currently, volunteers are often not familiar with all HCD activities as they start at 510 and are not certain of their availability. In the future the HCD team could take into account a minimum availability or knowledge of certain methods.

As we learn from the needs analysis, implementation is a crucial part of the project that does not yet have a systematic approach. Additionally, this is a part of the project that requires a good understanding of both the user and the context. Currently, this task is deemed too large for the very small 510 HCD team to be responsible for. However, once the HCD team is more established and HCD methods are employed across the 510 staff, an HCD approach to implementation could be developed.

Within the scope of this thesis it was not possible to develop structured methodologies and corresponding methodology modules for all HCD methods. Further research into the selection and development of HCD methodologies for the development response technology is recommended. Future HCD volunteers can develop the methodology and at the same time develop the methodology module.

Whereas the current design includes introduction modules for HCD activities, one of the mentioned challenges for HCD volunteers is gaining an understanding of the entire project they are working for. Introduction modules for 510 projects can be made in order to facilitate the understanding of volunteers in at the start of their work.

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Appendix A. Interview setup

Discover – interview questions

510 staff interview setup

Participant profile
- Could you describe shortly to me what your role is in 510 and what you are working on at the moment?
- (possible probe: When you finish your work, who do you hand it over to? Who do they hand it over to?)

End-user
- Who is the end-user of your work/the project you are working on?
- What information do you have about the end-user?
- Where do you get this information?
- When and how do you use this information?
- Is there any information that is not available but that you would like to have?

Stakeholder
- Who are the stakeholders in your work/the project you are working on?
- What information do you have about the stakeholders?
- Where do you get this information?
- When and how do you use this information?
- Is there any information that is not available but that you would like to have?

Context
- What is the context of your work/the project you are working on?
- What information do you have about the context?
- Where do you get this information?
- When and how do you use this information?
- Is there any information that is not available but that you would like to have?

510 HCD volunteer interview setup

These interviews follow the 510 HCD codesign setup, but instead used for understanding an HCD volunteers experience at 510.

Digital literacy / ice breaker

What digital devices and software do you use?

Experience

Could you explain to me how your volunteering journey at 510 has been from the moment you heard about 510?

Ideation

Do you have an idea how your journey volunteering at 510 could have been improved?

Develop - interview questions

510 project stakeholder interview setup

These interviews follow the 510 HCD codesign setup with additional questions relevant to my research added at the end.

Digital literacy / ice breaker
- What digital devices and software do you use?

Experience

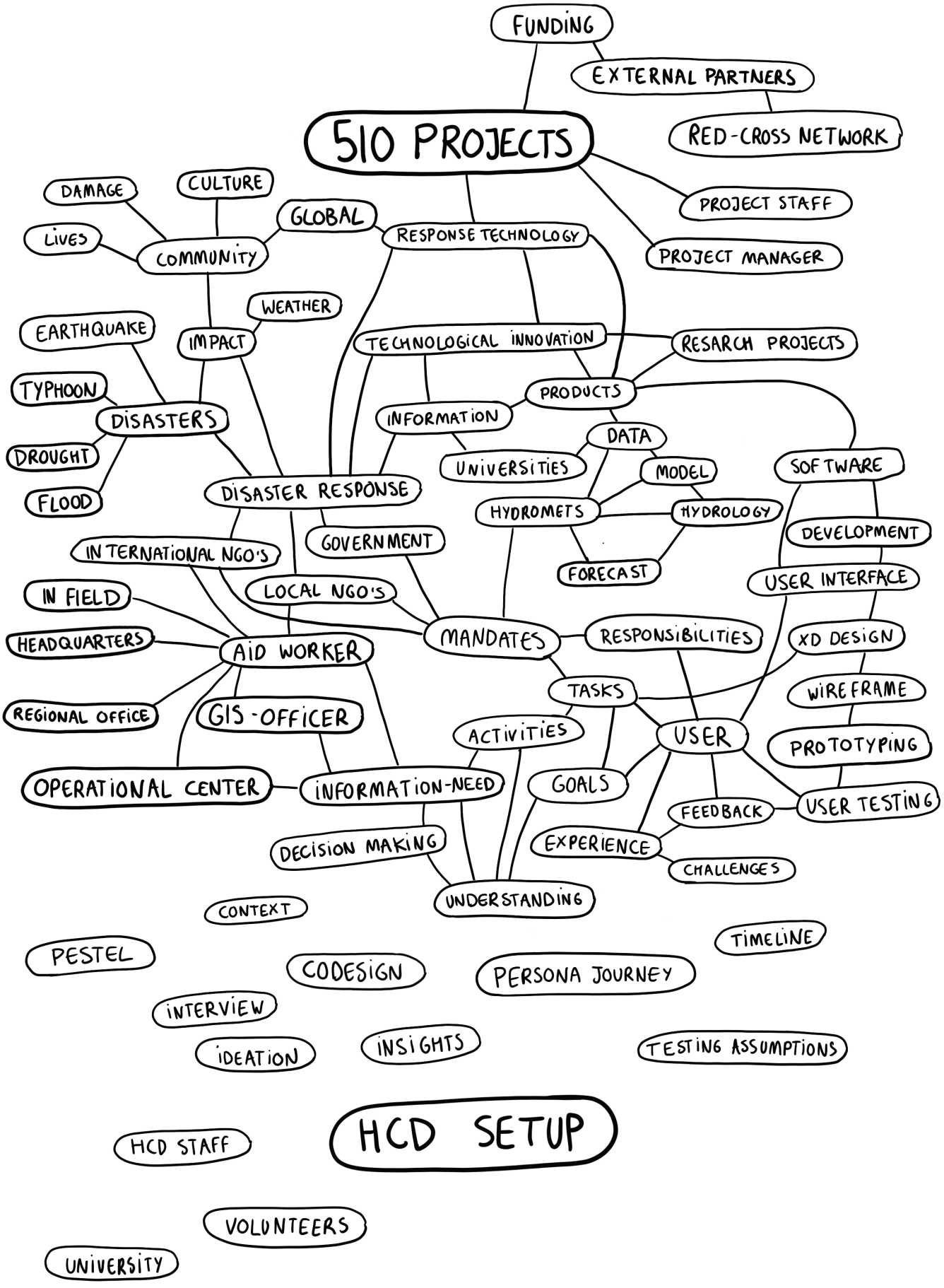
- What is your experience with disaster response? Please try to remember one event and explain what happened and what you did.

Ideation
- Now, imagining a screen in front of you, what would you want to see on this screen to help you with the experience you just described?

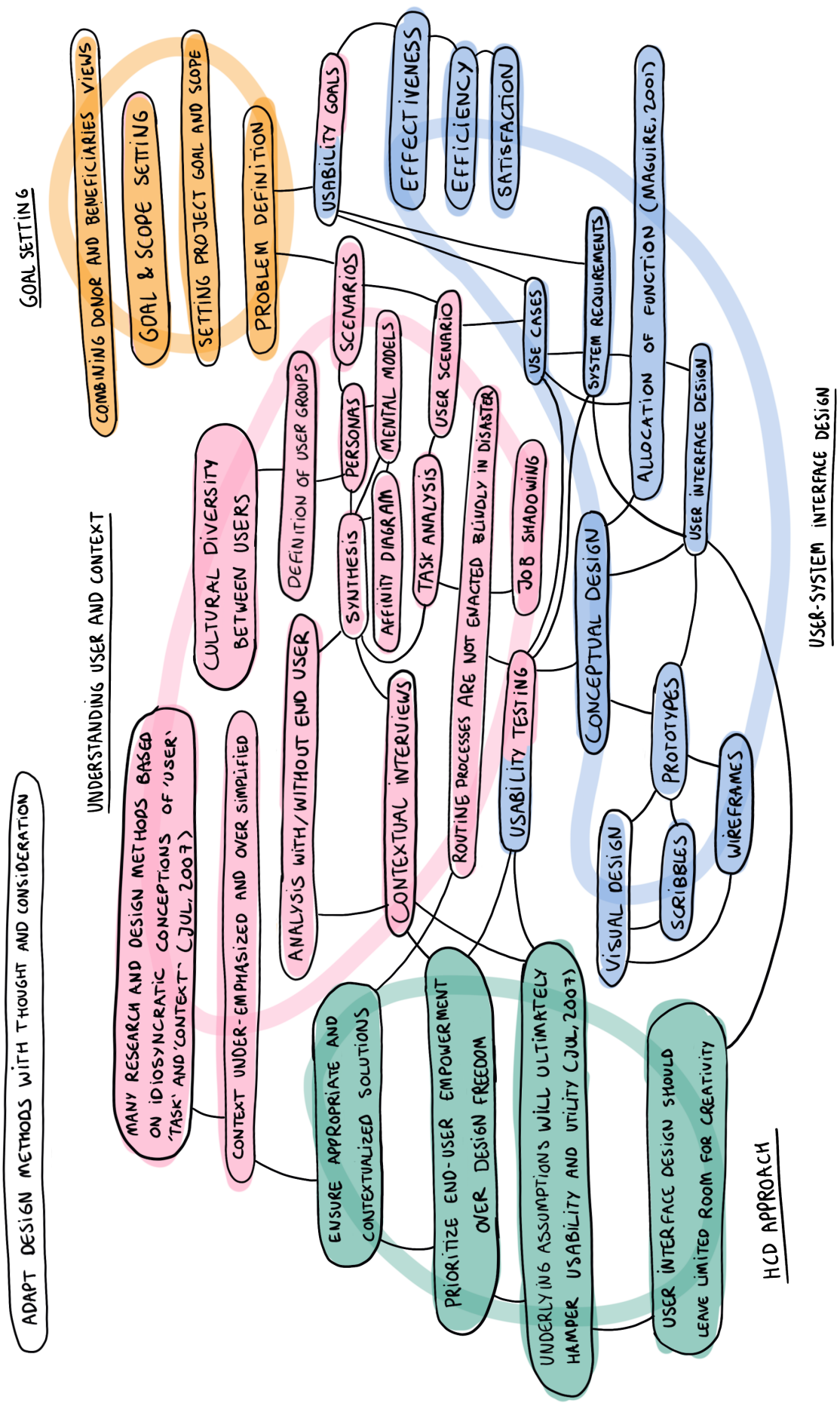
Additional questions
- When would this project be a success for you?
- What have been or do you foresee to be the biggest challenge in this project?
- Who do you see to be the user of the system? Are you one of them?

510 staff interviews - These interviews were the same as the previous 510 staff interviews.

Appendix B. Wordcloud 510 HCD



Appendix C. Worldcloud literature



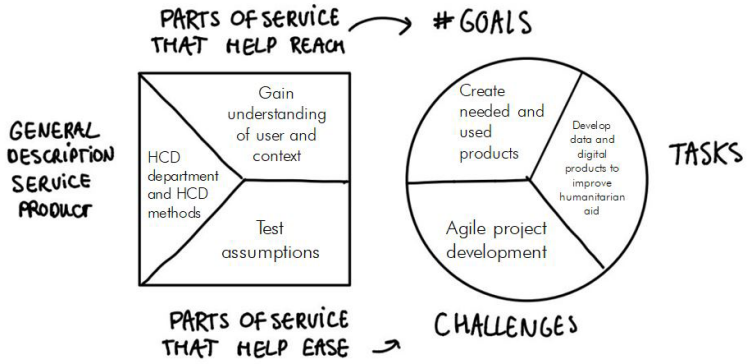
Appendix D. Complete insights overview table

Part	Source	Insight	Relevant proposal part
Explore	510 analysis	Technical focus across the organization	Role
		Human-centered organizational values	Communication
		Access to many possible participants through Red Cross network	Scope
		Very wide product scope	Role & Scope
		Flexible staff	Role & Scope Communication
		Open management	Role & Scope Communication
		Constant development	Role & Scope Workflow
		Large number of stakeholders that is different per project	Role & Scope
		Team-based and project-based structure	Recommendations
		No clear project structure yet	Workflow
		Funding approach	Role & scope Workflow
	HCD analysis	HCD methodologies not fully developed	Workflow
		HCD methodologies implemented ad hoc across projects	Role & Scope Workflow
		Documentation missing	Workflow
	510 staff interviews	No clear distinction between scientific and practical projects	Scope
		Aim to sell current products	Role
		Time constraint to HCD activities	Workflow
		No clear definition of end-users	Role
		Staff sees importance of HCD	Communication
		Many sources of information	Role
		Missing structure for HCD	Workflow
	HCD volunteer interviews	510 Project can be unclear	Recommendations
		Goal of HCD activities can be unclear	Role & Scope Communication
		Integration of volunteers work with projects unclear	Workflow Communication

Develop	Literature Review	No inherent HCD role or scope	Role & Scope
		HCD for software development is usability design: effectiveness, efficiency and satisfaction	Role & Scope
		Disasters need flexible scenario	Persona journey
		Human insight should be more important than design creativity	Role & Scope Workflow Communication
		Often user, tasks and complex are oversimplified in disaster response	Role & Scope Workflow
		Disaster systems are often not designed appropriately for context of use	Role & Scope Workflow
		More elaborate task analysis	Persona journey
		Better understanding of user, task and context	Role & Scope Workflow
		Include types of disaster: scale, type, predictability	Persona journey
		Include stakeholders in HCD activities	Workflow Communication
		Track success	Workflow Communication
		Find a niche	Role & Scope
		Integrated teams result in more HCD embeddedness	Recommendations
		Often more incremental changes than disruptive changes through HCD because of safety	Role & Scope Workflow
		Timing of HCD not always understood	Workflow Communication
		HCD reference model	Workflow
	510 staff interviews	Need for project goals and hierarchy of goals	Role Workflow
		General understanding of user	Role Workflow
		Insurance of relevance project	Role
		Understanding of workflow	Persona journey
		Understanding of decision making	Persona journey
		Implementation unstructured	Scope
	Stakeholder interviews	User unclear	Role Workflow
		Uncertainty of involvement right stakeholders	Scope
		Difficulty stakeholder engagement	Scope
		Data gathering through stakeholder engagement	Scope

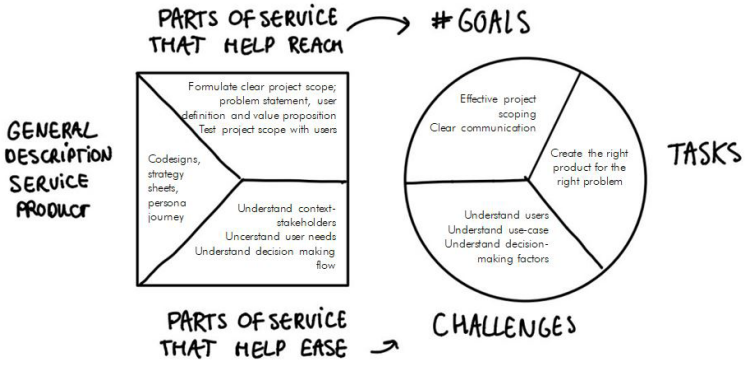
Appendix E. Value propositions for HCD in 510

Value proposition for: 510 General



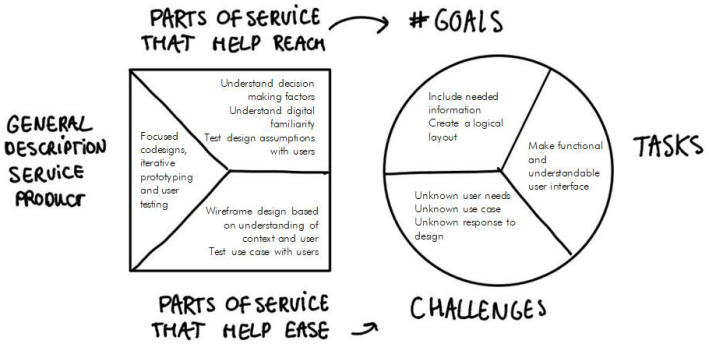
Product: HCD Department/methods User: 510 General

Value proposition for: Project management



Product: HCD Department/methods User: Project Management

Value proposition for: Developers



Product: HCD Department/methods User: Developers

Appendix F. HCD general introduction modules

General HCD introduction

An introduction to how Human Centered Design contributes to 510, what activities they do to do this and how these fit within projects of 510.

For: anyone who wants to understand how HCD contributes to 510 projects

What is Human-Centered Design?

"Human-centered design is a philosophy, not a precise set of methods, but one that assumes that innovation should start by getting close to users and observing their activities."

-Donald A. Norman, Co-founder of Nielsen Norman Group

"It is about them and for them. The closer the end-users' needs are analyzed and answered, the more successful the adoption or purchase of a solution. You iterate until you get it right from a customer perspective. This the power of HCD."

-Olivier Delarue, UNHCR

Main principles of Human-Centered Design

1. Start with the user

2. Use participatory approaches

3. Iterate

HCD to complement a data driven approach

HCD has a focus on the end-user and their needs, and from their build a larger understanding of the challenge and possible useful products. If a process was performed in a completely user-centered manner, the pink arrows as drawn in the image above would be followed.

510 is largely technology focused, however this does not mean that the HCD team is not suited for 510.

"If I had asked people what they wanted, they would have said faster horses." - Henry Ford

In other words: by only listening to the user only incremental changes would be made. In innovation more information is needed on technological capacities, context and systems in order to design smart solutions that surpass the imagination of the user.

So why Human-Centered Design?

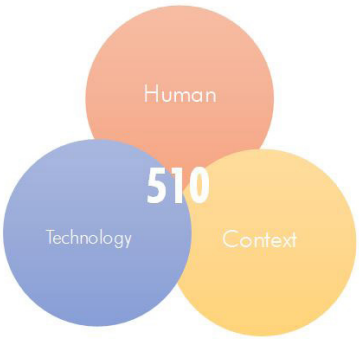
An understanding of the user and their needs is very important in order to understand what problem you are solving with your product as well as the user and the context the product will be used in. This understanding helps create suitable and usable products.

Therefor the user-centered focus of Human Centered Design is not contradicting to the technical focus also present 510. Instead, the **two approaches complement** each other.

Why the HCD department?

The goal of 510 is to "Improve the speed, quality and cost-effectiveness of humanitarian aid by using and creating data and digital products.". Therefor, the products that are developed by 510 can be seen to be an interface between **technology (technical possibilities), human (human needs)** and **context (restraints of the context).**

510 was initiated because of an identified the potential to use **nascent technologies** to increase speed and accuracy of disaster response and has a technical starting point. The Human Centered Design department was initiated to ensure that 510 makes products that fulfill a **human need** and that they are **suited for the context** in which they will be used.

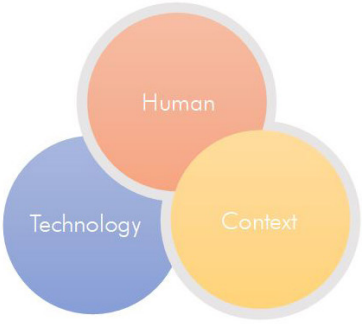


What does the HCD team do?

The Human Centered Design team was initiated to ensure that 510 makes products that fulfill a **human need** and that they are **suited for the context** in which they will be used.

They do this by:

- Creating **user and local context understanding** by mapping user information along a timeline in something called a Persona Journey And embed this in 510 projects in the following ways:
- Help **formulate clear project goal and scope** through strategy sheets
- Design **usable user-interfaces** through continuously validate design assumptions through iterative prototyping and user testing



Appendix G. HCD methodology modules

HCD modules introduction

An introduction to the HCD activity modules.

For: anyone who wants to use the HCD methodologies

Use of the modules

These modules are made for you to get a basis of the methods used by the HCD team of 510. As we work with a lot of volunteers, we try use the time to guide volunteers as useful as possible. We do not expect you to understand exactly what you need to do from these modules alone, but this module will give a basis to get you started. At the end of each module, there is a list of all HCD volunteers who have completed the module and probably applied the method in a project already as well. Feel free to ask them for help as well when you get stuck, as they have more time! Also don't forget to put your name on the list after you've finished the method!

Setup of the HCD Method Modules

1. Overview of 510 workflow and HCD method in the workflow
2. Goal of the method
3. Overview of method
4. Step by step explanation
5. Example of filled in method
6. How to document the work
7. Link to templates and filled in versions
8. Overview of volunteers who have done the method before
9. Additional resources

Index

510 HCD Module 1
Strategy sheets

Goal: Mapping project value, user and context

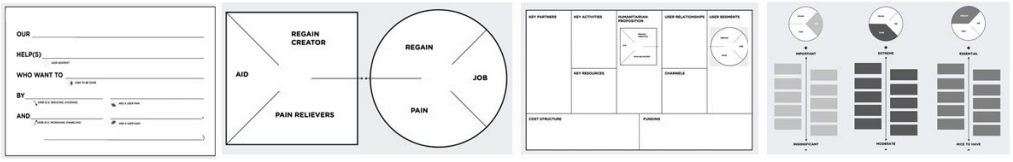
Overview of the strategyzer module

- What is strategyzer?
- When do we use strategyzer?
- What information do we need to fill in strategyzer?
- How do we fill in strategyzer?
- Who can i ask about strategyzer?

What is strategyzer?

Strategyzer tools is a series of documents that help extract and formulate a clear proposal: of the business model, to the value proposition, to the priorities. They are performed in the order of the images below (left to right).

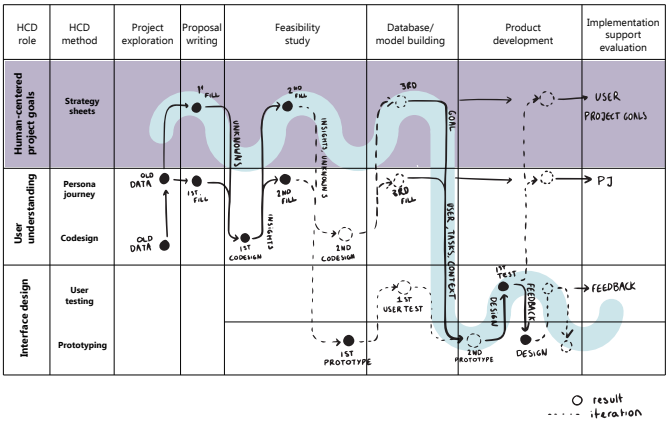
Define User



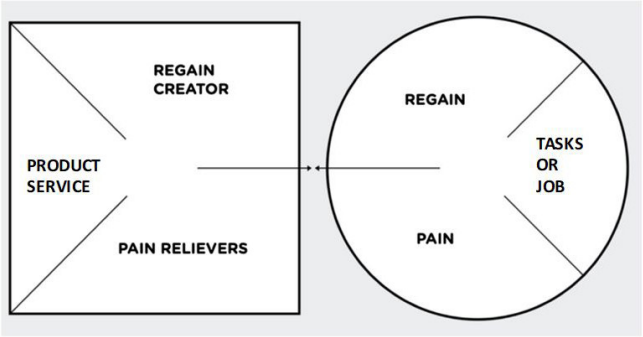
1. Goal sheet 2. Value Proposition 3. Business Model Canvas 4. Priority sheet

Strategy sheets in the HCD workflow

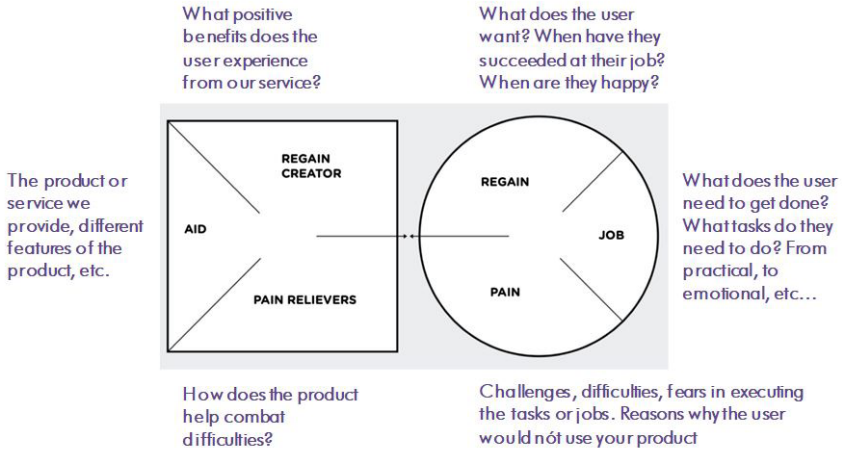
All HCD activities



Value proposition



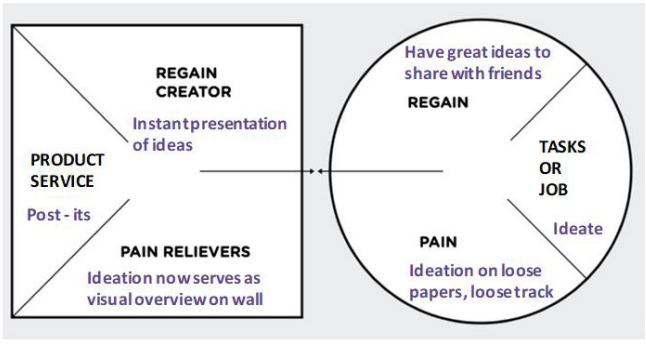
Value proposition explained



Video from strategyzer to understand the basics

https://www.youtube.com/watch?v=ReM1uqmVfP0

Example: filled in value proposition



Links to templates and finished versions

• Template link

(HCD -> General -> Methods HCD -> Humanitarian HCD Methods -> Strategyzer visuals -> Value Proposition)

• Finished version (FbF Aid Worker) link

(HCD -> General -> FbF -> Strategy Sheets -> Aid Worker ->Value Proposition)

Do you have any questions?

Do you want to discuss anything from this module with someone? Feel free to contact a volunteer who has experience with the module:

These HCD volunteers have finished this module:

Rosa Ruth