

# 'Include', a Toolbox of User Research for Inclusive Design

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## ABSTRACT

In order to empower more people to become more self-reliant in society, interactive products and services should better match the skills and values of diverse user groups. In inclusive design, relevant end-user groups are involved early on and throughout the design and development process, leading to a better user experience. However, for IT businesses not operating in the academic domain, getting access to appropriate user research methods is difficult. This paper describes the design and prototype development of the Include Toolbox, in close cooperation with practitioners of small to medium sized enterprises (SMEs) in IT. It consists of an interactive app paired with a book. The app helps to find suitable research methods for diverse user groups such as older people, people with low literacy, and children. The book offers background information on the advantages of inclusive design, information on different user groups, and best practices shared by other companies.

## Author Keywords

Inclusive design; user research methods; low literacy; elderly; children; SMEs; IT; societal participation

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

The world changes at an amazing pace, and technological innovations happen faster and faster [1]. Behaviour, needs, wants and likes of people also change, and many user groups are less homogenous than before; fewer and fewer people can be characterised by a traditional stereotype [32]. Older people: a 70-year old internet pioneer taking programming classes, and a 90-year old going shopping by bicycle. Disabled people: a 16 year old teen who battles BMX riders in the skatepark and calls himself an extreme sportsman, but also happens to be in a wheelchair [35]. Businesses cannot rely on existing knowledge alone; they need increasingly up-to-date insights into the perception and

behaviour of their diverse customers, and need inspiration on how to shape the future of their enterprise.

As public services and products become more interactive and are increasingly offered solely online, it is important to not exclude anyone from using these services. In many countries, there is already legislation to ensure access to essential online services and products for everyone [34], for example ensuring a blind person can buy a train ticket, or a low literate person can apply for benefits online. But also for less essential interactive services and products, it can be an advantage to design them in an inclusive way, taking into account the diversity of the user group.

Inclusive design can be defined as the design of mainstream products or services that are accessible to, and usable by as many people as reasonably possible [20]. In inclusive design, relevant end-user groups are involved early on [30] and throughout the design and development process [3], leading to more varied inspiration and more user-friendly solutions. Making a product more inclusive, usually means better usability for everyone [7]. It is not only a way to solve problems, but also a strategy to identify problems to solve. With the growing importance of brand image and sustainable business practice, inclusive design can be a selling point and may broaden the potential customer base.

It can seem easier and cheaper to self-reference than to involve users. But to cater an application to a 28-year-old male programmer, is actually designing for a tiny minority. It can be very costly to launch an application and only then discover it does not suit the people who were intended to use it. From our previous research, it can be concluded that awareness of inclusive design is still lacking. Unfamiliarity with its advantages and methods seems to be a barrier to practicing it.

User involvement does not need to be difficult, time-consuming or expensive. For a business seeking inspiration from customers, or wanting to get a feel of the perception of their product by users, smaller informal sessions suit an iterative design process much better and are more practical. Sometimes, even one participant can be enough to get inspiration for new business ideas [27], and a session with five participants can uncover most of the general attitudes about a subject [6]. User research methods are generally very robust and even shorter, simplified execution will give usable results.

It can be challenging to find a user involvement method suitable for the goal of a project, time frame, resources and the type of target users. Academic as well as popular literature describes hundreds of research, ethnography and usability methods [Sanders, E.B.N., personal communica-

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tion], [4]. Especially for businesses not operating in the academic domain, getting access to and finding the right research methods can be a challenging task, that is often not even started. As a result, users are often not included in the development process.

There are many websites and toolkits available that offer techniques to help getting new inspiration by thinking differently, and tools for visual design. There are only a few that offer user involvement methods, or are designed for use by practitioners in the information technology domain (IT). In this paper, we will describe the design and prototype development of a toolbox for inclusive design and end-user involvement, during which we worked closely together with practitioners of small to medium sized enterprises (SMEs) in the field of IT, that had little or no prior experience with user research.

The Include Toolbox prototype [26] that resulted from this cooperation consists of an interactive app paired with a book. The Include App (Figure 1) helps to find suitable research methods for diverse user groups such as older people, people with low literacy, and children. The Include Book offers background information on the advantages of Inclusive Design, information on different user groups, and describes best practices shared by other companies.

The Include Toolbox can help bridge the knowledge gap between academia and practice, and make Inclusive Design possible for more businesses. Ultimately, the toolbox could lead to interactive products and services that match the skills and values of diverse target groups better, in order to empower these people to become more self-reliant in society.

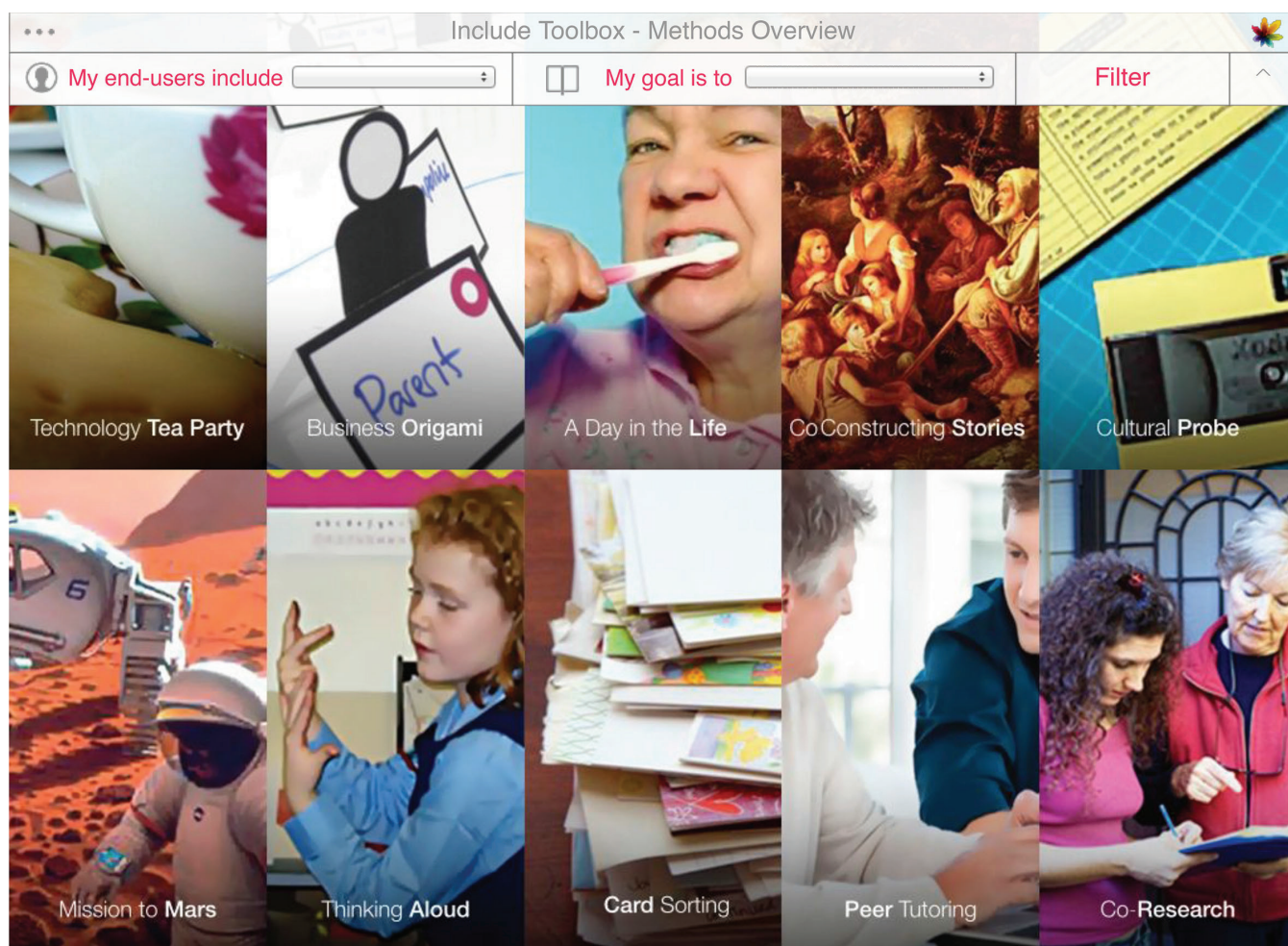


Figure 1. Home page of the Include Toolbox App (below)

## RELATED WORK

Amongst the many toolkits available for designers, most offer inspiration techniques and tools for visual or product design. There are only a few that offer user involvement methods, of which a selection is described here.

### IDEO cards [17]

The classic IDEO method cards are widely used and the methods on them became accepted practice in a lot of businesses. The deck of 51 sturdy cards, developed by the IDEO design firm, describes mostly inspirational methods and also some user involvement methods, and are specifically geared towards product designers. Already over 10 years old, it is one of the most well-known collections of methods and is often used as basis for other card sets and toolboxes, such as HCD Connect and Designing with People (see below). On the cards is a colour-coded system that helps designers to pick a suitable method. Of the toolkits described here, it is the only one that is not free.

### HCD Connect - Bill & Melinda Gates Foundation / IDEO [14]

The Human-Centered Design Toolkit was designed specifically for people, nonprofits, and social enterprises that work with low-income communities throughout the world. The HCD Toolkit walks users through a human-centred design process and offers design- as well as user involvement methods, based on the IDEO cards. It is divided in three parts: Hear, Create, Deliver; with the appropriate methods listed under pictograms.

### Designing with People - Helen Hamlyn Centre for Design, Royal College of Art [11]

Designing with people is a website with very complete information on research methods, design methods, user groups background and stories, personas, and tips on doing user research. It is set up in a clear way, so that it is easy to decide which part of the information to view. The research methods that are available in this toolbox, are based on the IDEO cards and described in a compact way but further references are also given. The Designing with People website is one of the outputs from i~design 3, the final phase of a collaborative research programme on inclusive design funded by the Engineering and Physical Sciences Research Council. It has been designed to work in conjunction with the Inclusive Design Toolkit developed by project partner, the Engineering Design Centre at Cambridge University.

### Inclusive Design Toolkit - Engineering Design Centre, Cambridge University [15]

The Inclusive Design Toolkit, next to explaining inclusive design and offering business rationale and design patterns, offers physical tools to assist inclusive design, including a Vision and Hearing Impairment Simulator, Cambridge Simulation Gloves and Glasses, and an Exclusion calculator. The design patterns mention user involvement methods but for descriptions refers to the closely linked Designing with People website. The Engineering Design Centre also offers courses on inclusive design.

### UCD Toolbox - Tristan Weevers UCD / Delft University of Technology [12]

The UCD Toolbox is a very complete resource of methods for user centred design. It contains an overview of 35 design methods, which can be filtered by criteria: type of product, design goal, resources, participants and method characteristics. Also, a pre-selection of methods can be made for various target groups: elderly, children, physically challenged, visual/hearing impaired or cognitively challenged. However, no background information on specific target groups is offered and it does not become clear why the methods are suitable for the target groups. Method descriptions contain a lot of information and it is not always clear how much time, skill and effort a method will take. Because of the extensiveness of this toolbox, it can be hard for IT practitioners to find the specific information they need.

### UX Toolbox: Better Web for Citizens - British Columbia Government [17]

A resource for government interaction and web designers, the UX Toolbox is a complete manual containing information on user experience, design research, web strategy, information architecture, content design, and web standards. The design research section describes research methods in detail, some of which involve end-users. It includes, research plans, reporting and managing tips. The methods are sorted into categories based on the type of research method, of which the terminology can be hard to understand for non-experienced researchers. The UX Toolbox also has a team that practitioners can contact for information and help.

### 55plusToolbox – Saxion [13]

The 55plusToolbox (in Dutch) focuses on topics that change the innovation process as a result of choosing the user group of people over the age of 55. Target users of the toolbox are entrepreneurs, focusing on both product development and marketing and sales. It contains information on the user group as well as case studies. Suitable tools for the particular phase and user group are suggested and illustrated in factsheets containing step by step guidance, visualisations, relevant links and references.

### Universal Methods of Design - Bruce Hanington, Bella Martin [10]

The fact that Universal Methods of Design is a physical book, allows for another kind of interaction. When flipping through the pages, one gets a clear overview but not too much information at once, even though the book describes a total of 100 methods. The book contains design-, research- and user involvement methods, ordered alphabetically and coded for each design phase. The target users of the book are designers, but it is written in a very accessible way. There is a short description given for each method, completed with references and examples.

All toolkits and related work mentioned above are in theory also usable for IT practitioners. However, because of factors such as terminology and emphasis on creative techniques, some are clearly meant to be used by designers, not programmers. The British Columbia UX Toolbox is made



for the IT-practitioner target group, but requires previous knowledge of and experience with user research. In most existing toolboxes, it can be difficult to find a suitable method, sometimes because there are so many, sometimes because it is difficult to get an overview [20]. Often exact descriptions of a method are not given, sometimes there are references to this information. But even then it is often still hard to determine the level of difficulty of the method, and the amount of time it will take. Few toolboxes offer sufficient background information on the needs and abilities of different target groups. Many of the resources mentioned above, cover some aspect of what we think an inclusive design toolbox needs to offer, but there is not yet a resource available that caters specifically to the needs and wishes of practitioners of SMEs in IT.

## REQUIREMENTS TOOLBOX

In earlier research [3], a workshop setting was used to gather preliminary requirements for an inclusive design toolbox, which formed the basis for this project.

To further define and refine the requirements, we worked together with a total of 11 practitioners from seven SMEs in IT. The project was set up in an Agile way [18] with many short iterations. In the earlier stages of the project, focused interviews were conducted about existing business processes and views on inclusive design. In later stages, two practitioners worked with the toolbox in their projects [19] (Figure 2), providing feedback on the practical applicability, while others provided feedback on design and business aspects. Throughout the project, new companies were introduced to get fresh insights from people who had never seen the toolbox before. Five companies were smaller (5-20 employees) privately owned businesses, one practitioner was a PhD. student in the field of computer science and one company was medium-sized (~200 employees), all based in the Netherlands. The business activities included designing, developing and building websites, intranets, e-learning applications and apps, and consultancy.

In the beginning of the project, a very persistent attitude we saw in the companies was that user research would be difficult, expensive and not useful. Statements such as ‘users do not know what they want’ and ‘they never say anything useful’ were heard. With further questioning, it became clear that the people we interviewed were more frustrated with the lack of success, than convinced of the uselessness of user research. For example, they hated it when their app for helping elderly using public transit came on the market but was rejected by the target group, who claimed they did not need help. The company was now wondering if working with older people in a more structured way from the beginning, could have prevented the need for an expensive redesign. Another business owner saw the business opportunities of making a clients website more inclusive for elderly, attracting more customers that way.



**Figure 2. Practitioner performing user research using the Business Origami method from the Include Toolbox**

By working closely together with practitioners and owners from these and other companies, and using the knowledge gathered in our earlier research, requirements were refined and tested through prototyping throughout the project. This process allowed for a thorough understanding of the needs and business practice of our target user group, SMEs in IT. It also made it possible to adapt and change the design and setup of the toolbox continuously, to suit the requirements more optimally.

The requirements we found for an Inclusive Design Toolbox for SMEs in IT:

### 1. Easy to find the right method

Especially because it is so difficult for most people, and therefore also end-users, to verbalise needs and imagine products or services that do not yet exist, it helps to employ a structured process for this task [25]. For academics, searching a scientific literature library is easy. Finding a specific, suitable method without knowing its name is already more difficult. For non-academics there are books and websites on user research, but because this is such a big field, the amount of information is typically very large, and the information is often geared towards experienced researchers, not IT practitioners. The practitioners from our interviews were often not aware of the existence of scientific libraries or that there are many different user research methods.

### 2. Decision aid versus freedom of choice

When looking for suitable user research methods, practitioners wanted the autonomy to explore the methods themselves first, to see what there was on offer. Only after that, they would request toolbox recommendations. It was mentioned many times that they would like to keep their options open and choose themselves, and have the freedom to deviate from recommended methods.

### 3. Methods: fast, robust and cheap

For a scientific research project, it can make perfect sense to do a three-week long experiment with 120 participants. But in the IT world, with Agile development cycles, the time or budgets for this are often simply not there. And as Nielsen [23] and Dix [6] argued, with about 3 to 5 people, you will

see most of the common behaviours from an entire group, and each extra participant gives only limited extra insights. Limiting the amount of participants limits the expense of time and money, making user research more likely to take place.

The methods should be robust so that even inexperienced researchers making mistakes, can get useful information from them. Therefore methods should be less dependent on facilitator skills, and require only limited previous knowledge of the target groups. Since sometimes the people in IT businesses who want to do user research, have to convince others, or need some convincing themselves, the methods that are offered must be well-known or validated methods, to inspire credibility.

#### **4. Background information**

Once the practitioners became more convinced of the importance of taking the needs of end-users into account in the development process, they often recommended that the toolbox would have ready-made personas and background information on user groups.

#### **5. Examples (best practices)**

Another requirement that came out of the interviews, was to supply examples or best practices, so that the practitioners could see how other businesses had approached user research. This way, it would also be possible to give examples of the type of knowledge one could expect to gain from user research, without presenting it as if this particular knowledge is generally applicable.

#### **6. Business processes**

Amongst the companies we worked with, there was a range of business processes practiced. Practitioners who were used to Agile or Lean [28] ways of working, were often looking for ways to verify early concepts with users within a short timeframe, because these methodologies require new versions or changes to a product to be validated of before the next iteration can begin. In more traditional linear (waterfall) processes, there appeared to be a bigger concern with the cost and validity of user research in general. If a project went over budget, evaluations were one of the first things to be skipped to save costs. User research was often only done when they needed specific proof to back up decisions. But even here, there was a general acceptance of the idea that it is cheaper to identify issues sooner rather than later.

#### **7. Brand image / Commercial value**

Next to the user research activities, it seemed important to companies to be able to show these activities off, and be able to use inclusive design as a sales tool. While an app or online toolbox would be practical in use, a physical component that can be shown in the office or given to clients is also important.

Being able to talk about inclusive design as a complete strategy, rather than separate user research methods, can show a brands involvement in sustainable business practices. It is important that the toolbox allows IT practitioners to

learn about inclusive design as a holistic concept, to be able to sell it convincingly.

#### **8. Terminology and tone**

Some of the practitioners we worked with, joked about the words ‘design’ and ‘research’ as concepts they were not interested in. They saw themselves first as developers, as clients often provided the visual design and not much research was done. To avoid estranging practitioners with design jargon or academic terms, it is important to use more generic language or use terms from the IT world. On the other hand, the people that we worked with were highly educated entrepreneurs and independent thinkers, who did not appreciate to be talked down to.

### **DESCRIBING THE INCLUDE TOOLBOX**

For a small to medium-sized company that works in the field of IT, ‘Include’ is a toolbox of user research methods providing an easy and efficient starting point for inclusive design. The toolbox is an interactive application accompanied by a hardcover book. The interactive part gives an overview of easy user research methods, complete with descriptions and workbooks, and helps filter them according to the company’s needs and their user groups. The book serves as a visual reminder, a reference for background information and a way to show off the use of inclusive design practice in the office.

The toolbox is currently available as a free application in Beta, that has the purpose of creating awareness about inclusive design in the IT sector. For future versions of the toolbox, different business models could be considered. The main functionalities and design elements of the toolbox are described below and structured according to the requirements listed above.

#### **1. Directly from the home screen of the app, it is easy to find the right method**

Incorporated in the interactive toolbox are currently 10 user research methods. This number of methods was arrived at by weighing different factors: there must be enough methods to suit four development phases and three specific target groups, but not so many that it would become overwhelming, especially for first-time users. Some methods are suitable for more than one phase or user group. The methods are all existing, validated methods, with references. The methods can be browsed from the main screen of the app, where after clicking a short description is offered next to a recognisable picture for each method (Figure 3). There is a filter bar, that can be hidden when not in use, that contains two drop-down menus: “My end-users include: [Older People, Children, People with Low Literacy]” and “My goal is to: [Get Inspiration, Evaluate an Idea, Review a Scenario, Test a Prototype]”. Using the filter creates a recommendation of three selected methods, that can be browsed through before making a choice.

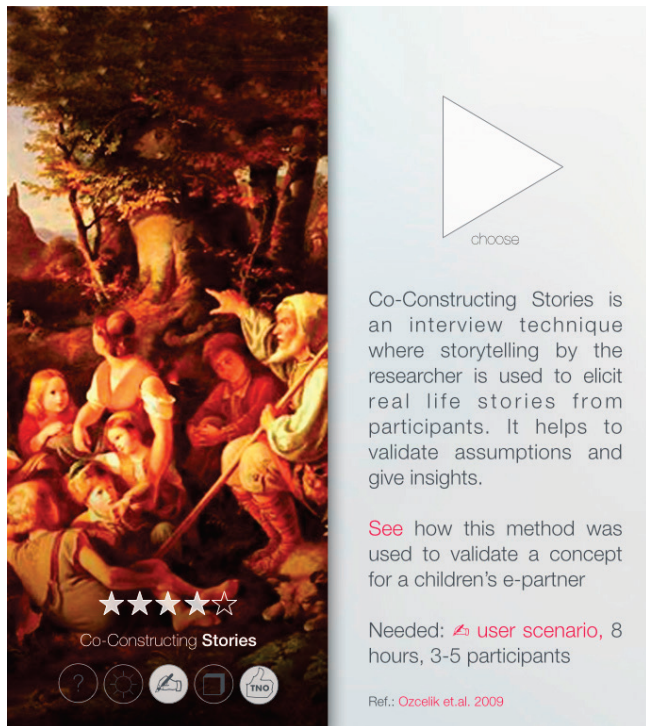


Figure 3. Example of a method description card

## 2. The toolbox can act as a decision aid but also allows for making alternative choices

Offered are two ways of looking for a method (browsing and filtering). This has the benefit of being able to give people who know what they want direct access to the methods, while users looking for guidance can get it while keeping the option to choose open.

## 3. The methods are fast, robust and cheap

From the requirements description, we distilled the following criteria for user involvement methods that could be useful to SMEs in IT:

- it must be possible to do the preparation, session and analysis in a total of 8 hours, one half day at the beginning of the week and another at the end;
- no special skills or prior experience are necessary;
- it must be a well-known or validated, existing method;
- it looks like a fun activity for both the practitioner and the participants;
- all the necessary materials can be provided in a PDF workbook in the form of tips or worksheets;
- get useful results with 3 to 5 participants.

From a literature study, the following methods were selected based on the aforementioned criteria:

A day in the life [9]	Cultural Probe [8]
Business Origami [10]	Mission from Mars [5]
Card Sorting [31]	Peer Tutoring [21]
Co-Constructing Stories [25]	Co-research [33]
Technology Tea Party [2]	Think Aloud [22]

The methods are described in the following way: first a short introduction, on the basis of which the method is chosen. Then there are seven cards used within the app:

1. overview of the method;
2. description of the preparation, step-by-step, but short (Figure 4);
3. guide for the session itself, idem;
4. tips for a quick and effective analysis, idem;
5. filling in the name of the project and a short description;
6. choosing how to use the PDF workbook: print or digital, and after the research, archiving the work;
7. rating the method on suitability for the user group and ease of use of the method itself, providing tips and comments, choosing to share or not.

## 4. and 5. Background information and best practices are available in-app and in a hardcover book

User group characteristics change, and due to market fragmentation, user groups are not as homogenous as before [32]. Providing pre-made personas (in contrast to carefully constructed personas based on relevant user research data) would mean to overly simplify and stereotype the people of a user group [24], ignoring the needs and wants of sub-groups or failing to spot underlying patterns in a user group specific to a certain project. Therefore, even though practitioners asked for ready-made personas, we decided against this.

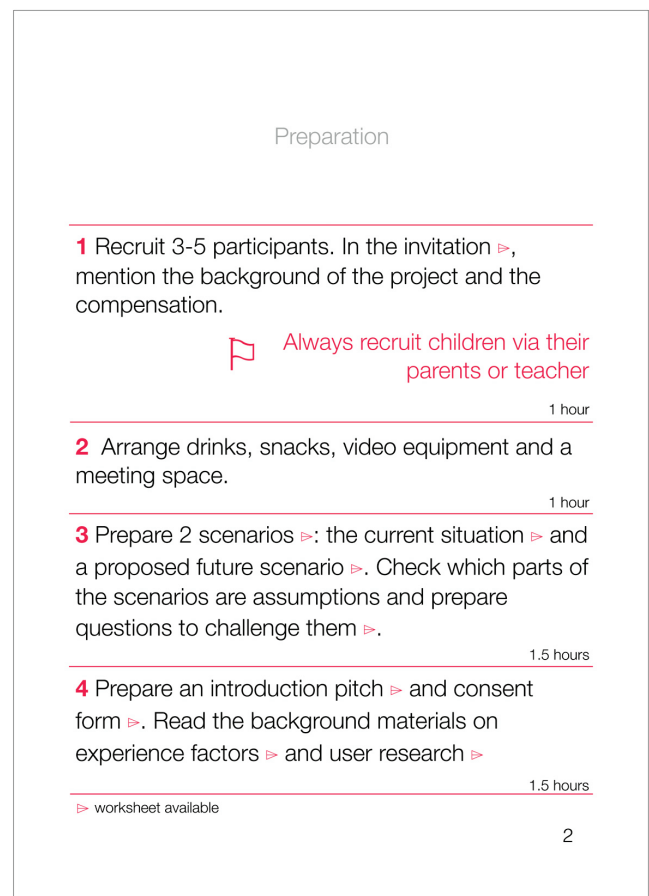


Figure 4. Example of a method workbook card



The toolbox does provide general background information about the larger target groups, to get a first idea of the characteristics of the group, and prepare the user involvement sessions more efficiently. In the app, a menu can be shown for access to more in-depth background information, such as about inclusive design, the methods, user group information and best practices.

From the method descriptions, there are also links to this information. Because it is unlikely that users are going to read many pages from within an app, the complete information is also available in the form of a hardcover and e-book. The contents of the book and the app overlap, to accommodate both easy reading and flipping through paper pages, as well as the ease-of-use, portability and the help of links within in the app.

## **6. Implementation in iterative business processes**

Because of the limited preparation and analysis time needed for the methods covered by the toolbox, they are suitable to be implemented in business processes with short iterations such as Agile or Lean. User centred design based on design cycles is also a good fit. For other project structures, early user research can still be beneficial to starting the project on a relevant course, and also wherever there is a decision moment. In some cases, using the toolbox may even help practitioners to see their development process clearer, because the preparations for user research often include describing and focusing on the end-goals of the project.

## **7. Brand image / Commercial value**

Research results can be used as proof to clients, validating development decisions. Being able to show that their company is practicing inclusive design was also perceived to be a selling point towards new clients. The book accompanying the interactive app allows for that, and is also a visual reminder in the office to think about special user groups more often.

Another aspect is that being able to show customers what user research is, can convince them a project needs it. It also makes it easier to talk about inclusive design, if clients can learn about it from a third party. More efficient development processes combined with a better brand image, can increase the overall competitiveness of a business.

## **8. Terminology and tone**

The descriptions of the methods are void of design jargon and academic terminology as much as possible. The background information in both the book and the app, is written from a perspective of an SME entrepreneur, or IT practitioner, linking back to what they can get out of it in their work, or what it will do for their businesses. Furthermore, the steps of each method are balanced so that they give just the necessary amount of information without overwhelming or condescending.

## **EVALUATION OF TOOLBOX**

In addition to working with different SMEs in IT throughout the project, the final prototype of the interactive toolbox app [26] was evaluated qualitatively on visual and

interaction design and user perception with five participants, in three sessions. The participants of these sessions were practitioners in IT, with limited previous experience with user research. The evaluation method used was based on the Co-Constructing Stories [25] interview technique.

All participants said they thought they could easily execute the methods offered by the Include Toolbox, and appreciated the detailed workbooks. In general they were surprised each method could be executed in 8 hours and realising this was often a pivot point in the interview; from talking about difficulty and hurdles to talking about the benefits of involving users. They agreed that the toolbox language should be available in Dutch for ease of use with end-users from the Netherlands, especially for the target groups older people, people with low literacy, and children, who may not speak English. Another overall feedback was that the participants could appreciate the visual language of the toolbox, which was seen as colourful and inviting, and the information architecture, which was perceived as easy to use.

Participants commented on how they would use the toolbox app, by saying they would browse the overview page for a while first, before choosing a method to work with. Methods with 'research' in the name came across as boring and formal, and some inspirational methods were seen as too creative. Getting a recommendation of three selected methods when using the filters was a good number for participants. In practice, participants would like to spend a minimum amount of time in the app, just quickly choose a method, print everything out and get to work.

Some participants would have liked to see more best practices, some said they would need much more different user groups and more specific user group information because for each project the target user is different. At the time this evaluation took place, the content of the toolbox prototype was not yet complete, and some participants were eager to get the remaining method descriptions, perhaps showing their motivation to get started with the methods.

Participants also noted that it seemed to them that answering the questions in the filter bar of the app, would already bring some awareness to practitioners about inclusive design. Using the toolbox to educate their clients about user research, could give the clients more confidence to discuss the details of user research, making them more satisfied with the company in the long run. There were some concerns if the option to share the research result as a best practice, would safeguard the anonymity of the end-users enough.

The hardcover book that accompanies the Include App (Figure 5), was not yet finished by the time the final evaluations took place. During the sessions, an interesting contradiction arose when discussing background information about topics such as inclusive design, user involvement methods, user group descriptions and best practices. For many practitioners, it was important to know it was offered and how they could reach it easily. However, when it was visually represented in the toolbox, links to the information were appreciated, but not opened. In an

informal evaluation in an exhibition setting that did show the book, people were mainly attracted to the big size, and colourful layout.



Figure 5. The Include Book

## CONCLUSIONS & DISCUSSION

Even though there were some criticisms from the participants in the final evaluations, the overall feedback was positive, with participants envisioning their use of the Include Toolbox and expressing motivation to use it in their work. The toolbox app could perhaps reach more practitioners if it allows for more company profiles, next to the currently very specific: practitioners from SMEs in IT with little or no experience in user research.

Some participants would have liked to see more best practices in the toolbox, and this is indeed planned by allowing users of the toolbox to share their own experiences. This way, over time the toolbox content becomes an increasingly complete reference guide. Further progress towards a more complete and continuously updated toolbox could be made through making it possible for practitioners to add or edit information, for example add new methods, update target group information, provide tips and rate methods.

Other practitioners wanted more specific user group information, but by their own admission the specifics are unique to each project. It is our intention to add support for more end-user groups such as teenagers, non-native people, or people with physical or mental disabilities. In our opinion, next to using the general information in the user group descriptions, it would also be necessary to work closely with users in each project, thereby making sure of having the most specific, unique and up-to-date insights as possible.

In our evaluations where practitioners used a prototype of the toolbox in real projects, we and the practitioners found that inclusive design was within practical reach for them. The final evaluations showed acceptance of and enthusiasm for the visual design and the research methods offered.

## FUTURE WORK

The next phase of this project is the departure from the prototype stage, starting the development of the application, incorporating everything learned from the prototype phase. Compared with existing toolboxes and resources, we believe the Include Toolbox is specifically suitable for SMEs in IT, due to its visual design, setup, and the

difficulty level of the methods offered, more so than other toolboxes. However, this is something that needs to be further validated with a comparative study of toolkits amongst IT practitioners.

Although the first informal evaluations have been positive, more formal empirical study is needed to verify our claim that with the Include Toolbox, IT practitioners are able to perform user research with a quality adequate for their commercial purposes. Also we need to further substantiate the business rationale of inclusive design and user research.

To find out more about the need and use for background information and a physical book, further evaluations need to be done to find out if a book is the best form to present the information, and how much background information is in fact required by the SMEs.

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