

## **Design synthesis: An act of Research through Design**

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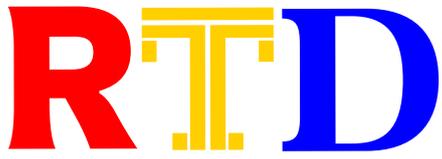
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# Design Synthesis: An Act of Research through Design

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**Abstract:** We present a reflective practice where challenges of assembling, making sense of and drawing conclusions from co-created materials were addressed through a process of design synthesis that improved the clarity and meaning making during the interpretation process. In this paper, we illustrate our point by presenting a set of design research artifacts resulting from design synthesis: a manifesto, a scale model, a set of storyboards and illustrated characters. Inspired by the arts and creative practice in other disciplines such as film making, we adapted these methods as a means of transforming participants' contributions into inspirational resources for interactive design. This process encouraged the production of new creative and active forms of documentation and enabled us to handle interpretation in a way that embraced the inspirational and provisional nature of our creative and participatory processes. By doing so, we broaden the current practice of documentation in design and show how our process of design synthesis can serve the purpose of co-creation. Finally, we encourage design practitioners to adapt and develop design-based methods to filter and externalize insights, making their thinking tangible for them and others so they can be collectively discussed, tested and reflected upon to inspire future ideas.

**Keywords:** design synthesis, documentation; co-creation; interpretation; inspiration; process



## Introduction

We present insights from our practice-based research exploring the design of interactive and multisensory experiences in house museums – a particular type of heritage site that requires an experiential, inclusive and sensitive approach to exhibition design. By using Research through Design (RtD) and co-creation, we developed our understandings of technology and shaped new exhibition practice. This work was led by the first author who is a design researcher supported by her PhD supervision team. In our paper, ‘we’ represents the collective discussions that were facilitated by what the first author produced.

Central to our research was for the first author to engage a community of volunteers at the Bishops’ House museum – one of the few surviving examples of Tudor timber frame house in Sheffield (UK). In this process, the volunteers explored the potential of technology to augment the visiting experience and to increase engagement by presenting multiple narratives and by revealing temporal aspect of the place. The co-creation process led to the Interactive Tableaux (Figures 1 & 2), a multisensory and interactive experience that engaged visitors with the many people who lived in the House across different centuries.

Multiple creative and active forms of documenting this collaborative RtD process became necessary in-between the steps of co-creation: this process of design synthesis is transformative in nature and contextual to the research rather than retrospective and factual. In the following we first discuss our motivations and review the literature on RtD documentation. Then, we describe design synthesis as a deliberate transformative act that can help designers to create a tangible chain of thoughts. To illustrate our point, we give examples of design research artifacts that were created as a result of design synthesis; a means to filter and make sense of participants’ contributions. Finally, we reflect on the ways our process of design synthesis nurtured collective forms of creativity by bringing together the richness of participants’ expertise through design.

## Motivations

When taking a participatory approach to RtD, we believe that practitioners have the responsibility to include participants’ contributions in their process so that the resulting designs reflect the aspirations of the community taking part. Moreover, the decision making and connections between the participants’ contributions and the final outcomes should be made explicit; it is the practitioners’ responsibility to find ways to document the in-between steps of co-creation in order to make their process more transparent and inclusive. In this perspective, our motivations with this paper are twofold: firstly, to address the challenge of finding an interpretive approach that remains faithful to the nature of co-creation, and secondly, to pay more attention to the critical role designers have in making sense of participatory and creative processes. We detail these two points below.

Designers often focus on creating bespoke approaches to help people make sense of their experience. Methods like design probes (Wallace et al. 2013a) and generative toolkits (Sanders and Stappers 2014) give participants the means to reveal what they know, what they think and feel (Stappers and Sanders 2012). Through making, they bring insights to the surface and express thoughts that are difficult to communicate verbally (Sanders and Stappers 2014). However, these



**Figure 1.** The Interactive Tableaux exhibited at the museum. Visitors choose one digitally-augmented object for their visit. They then show it to the tableaux to trigger different reactions from the characters. Photo: Caroline Claisse.

approaches have introduced new types of materialized outcome that are difficult to interpret, and concerns have been raised against too many interpretive approaches that do not embrace the nature of participatory and creative processes (Gaver et al. 2004; Boehner et al. 2007). Instead, practitioners should handle interpretation of rich and dense materials in a way that serve the purpose of design. More specifically, the act of interpretation should be a dialogical response that opens up a variety of possibilities instead of fixing one single and true understanding (Boehner et al. 2007).

In the participatory process, the practitioners’ attention is often on participants’ personal gains, i.e. how people felt empowered and saw things in a different way. As well as helping participants to make sense of their experience, practitioners should explore the benefits of creative methods to help them be more reflexive: ‘it is by far more common to record interactions and real-time observations of “users” but not practitioners’ (Wakkary 2004, p. 443). In this paper we argue that this step of self-reflection can be done and made explicit through design synthesis. We built on previous research about the benefits of designers’ creative practice for collaborative exploration and meaning making (Bowen et al. 2016) and show how design synthesis can contribute to the development of ‘first-person methodologies’ (Wakkary, 2004) by making explicit the designer’s implicit knowledge gained through co-creation. Our contribution to the RtD community is a practice-based example of dealing with participatory and creative processes. In doing so we address long standing concerns about RtD documentation (Frayling 1993, 2015; Dalsgaard and Halskov 2012; Bardzell et al. 2016; Durrant et al. 2017) and rethink what documenting means in the context of co-creation: from what it *is*, to what it *does* to our creative process (Bardzell et al. 2016).

## Documenting is RtD

The difficulty to capture and make sense of the design process has pushed some to describe it as a ‘black box’ (Yee 2017), a form of ‘black art’ (Wolf et al. 2006) or as magically derived (Kolko 2010), possibly because of a lack of documentation and transparency (Frayling 1993, 2015; Bardzell et al. 2016; Durrant et al. 2017). Documentation of the design process is critical for demonstrating rigor (Bardzell et al. 2016; Stappers and Giaccardi 2017), one of the three criteria of good research (Biggs and Büchler 2007). The lack of RtD documentation means that, often, outcomes cannot be legitimized or recognized as contribution to knowledge: if an artifact is to function as a means of conveying new knowledge, justifications of those claims should be provided and traced back (Scrivener 2002). Thus, designers are expected to report their process, to provide justifications for decisions, and for insights to be made relevant and communicated to the wider community (Stappers 2007). This is at the core of RtD, an approach concerned with the articulation of knowledge gained through the act of designing (Frayling 2015; Stappers and Giaccardi 2017). However, little effort is spent on reporting such knowledge and designers’ rigor in doing so has been questioned (Frayling 1993; Stappers 2007).

One question we ask with our work is how can we document a process that is defined as provisional, contingent, and aspirational (Gaver 2012), and how can we do it so it embraces the values and nature of design research? Indeed, ‘RtD has to find its own ways of approaching traditional research qualities such as reliabilities, repeatability, and validity through ways that are trustworthy while true to the approach’

**‘RtD has to find its own ways of approaching traditional research qualities such as reliabilities, repeatability, and validity through ways that are trustworthy while true to the approach’.** Zimmerman, Stolterman and Forlizzi 2010, p. 310

**Figure 2.** One workshop with museum volunteers who were prompted to imagine content for the interactive installation. Photo: Caroline Claisse.



(Zimmerman, Stolterman and Forlizzi 2010, p. 310).

Biggs and Büchler (2007) have redefined the criteria of rigor to fit the purpose of practice-based research. For them, it is not the final artifacts that are rigorous but rather the process; in fact, ‘rigor in research is the strength of the chain of reasoning’ (Biggs and Büchler 2007, p. 69). In our research, by capturing the process we built a solid chain of reasoning and justification for ourselves and others so we could progress in a confident and consistent manner. Key was to rethink documentation as an ongoing constant part of our process: an act of doing RtD (Bardzell et al. 2016).

### Design synthesis: creative acts of documentation

A range of methods has been introduced for documenting RtD outputs. Overall, documentation is often done in a supportive and retrospective capacity, at a post-design stage where documents are assembled together into annotated portfolios (Gaver 2012), conference’s pictorials (i.e. DIS Conference) or experiential books (Eudes and Maire 2017). While these are valuable means for communication and dissemination, there is a need to develop methods for documenting the in-between steps of the RtD process. More specially, for encouraging self-reflection along the way to help practitioners address the challenges of longitudinal studies and collaborative processes i.e., ‘how to assemble, condense, and make sense of the streams of data that are generated during the process?’ (Dalsgaard and Halskov 2012, p. 429). This is investigated in our research by exploring different ways to synthesize materials generated from participatory sessions with volunteers. Next, we define what we mean by design synthesis and how this process can be understood as a creative and active form of documentation.

The discussion in this paper revolves around the first author’s practice-based enquiry with a group of museum volunteers. Her aim was to give form to their ideas and for the design research outcomes (an interactive multisensory installation exhibited at the museum) to reflect the needs and aspirations of the participants. Generative design methods such as design probes (Figures 3 & 4) and co-creation workshops (Figure 5) were used to co-envison interactive experiences at the museum. However, when dealing with participants’ contributions, traditional methods of analysis were found restrictive and not keeping within the ‘probological attitude’ of being inspirational (Boehner et al. 2007). In other aspects of our research, we borrowed existing methods such as thematic analysis (Braun and Clarke 2006)



**Figure 3.** The Creative Package personalised with participant’s name. It featured 6 design probes and was given to 10 museum volunteers. Photo: Caroline Claisse.



**Figure 4.** The Creative Package completed. Probes unpacked with examples of participants’ contributions. Photo: Caroline Claisse.



**Figure 5.** Examples of participatory and generative methods used with volunteers at the museum. Creative inputs from workshop participants (top image). Generative toolkit (bottom image). Photo: Caroline Claisse.

to guide interviews analysis and to generate design principles (Claisse et al. 2018). However, making sense of participants’ contributions generated in the creative sessions was different from interview analysis: we did not aim to reach a final conclusion or singular understanding, instead, we aspired to keep within the open-ended and creative nature of our enquiry. Motivated by this, the first author created design research artifacts (i.e. a manifesto) to synthesize the information she gathered in a designerly way, as a means of making sense and refining ideas through design. Such an attitude in design research is described as *bricolage* (Louridas 1999; Yee 2010; Mose Biskjaer, Dalsgaard and Halskov 2017) – an approach that goes beyond mixed-methods and fosters methodological innovations (Yee 2017). Next, we provide concrete examples by describing a set of design research artifacts, which were appropriated in novel ways for design synthesis.

### Artifacts as a provisional resource for inspiration

In RtD, artifacts are instrumental to the generation of new knowledge as insights come into existence and become observable through design (Stappers and Giaccardi 2017). Stappers (2007, p. 84) emphasizes the skills of the designers who through designing products, ‘absorb knowledge from different directions and confront, integrate and contextualise this knowledge’. Products in RtD are described in terms of ‘ultimate particulars’ (Stolterman 2008): bespoke artifacts created for a specific purpose and concerned with addressing the situation at hand; for instance, people’s needs and desires. Most of the time this refers to the final outcome of the research, in our case the Interactive Tableaux (Figure 1). In this paper, we focus on design research artifacts: another type of output that can help designers reflect on their process and externalize tacit knowledge. These are equally instrumental to design but they are often underestimated in RtD (Pierce 2014).

Design research artifacts (i.e. Figures 6 & 7) were created for the purpose of reflection, progression and inspiration. They composed a body of knowledge or a chain of thoughts that facilitated meaning making by crystallising information into tangible forms. For us, design research artifacts were a means to preserve information and understanding (Mäkelä 2007), and to embed participants’ ideas as silent knowledge (Brix 2008). By means of the design research artifacts we were able to go back and forth and revisit our process for validation or inspiration.



## The Creative Package

Early on in our research, the first author gained an insiders' perspective by becoming a volunteer at the Bishops' House museum. Inspired by her fieldwork, she designed the Creative Package (Figures 3 & 4) to invite 10 volunteers to reflect on their experience at the House and to prompt them to express ideas in forms and formats that were inspiring for exhibition design (see details in Claisse, Ciolfi and Petrelli 2017). This method was informed by probes used in design research to gain rich understandings of people's lived experience (Wallace et al. 2013a) and featured six hands-on probes that were inspired by the fieldwork, research questions and themes (i.e. volunteering, exhibition, home). The package did not look too polished but rather, it stood as a hand-crafted gift made of various textures and materials. The probes were numbered so participants progressed from straightforward to more imaginative tasks. For example, *Best wishes* (probe 1) invited them to write about their experience at the House by sending us back a postcard; *My dream exhibition* (probe 3) featured a map and personalised sketchbook to share their favourite stories and museum objects; *Seed wish* (probe 5) used the metaphor of growth to prompt their imagination about future scenarios for the museum.

Overall, the package allowed volunteers to see the place from a new perspective and facilitated a sense of shared creation (Claisse, Ciolfi and Petrelli 2017). However, while we were inspired by participants' responses, it was challenging to move from the completed probes to the phase of ideation. Indeed, making sense of probes is a highly subjective and complex process, thus making it challenging to provide clear guidance (Gaver et al. 2004). Research has provided guidelines on the making of probes (Wallace et al. 2013a), drew attention to the setting in which probes are introduced (Koulidou and Wallace 2017) and showed how the designer moved from completed probes to the final design that was bespoke to one individual (Wallace et al. 2013b). However, when reporting on probes, designers tend to black-box the interpretive stage, making this rich process impersonal and leaving undocumented the methods they used to make sense of participants' responses (Boehner et al. 2007).

### A manifesto as a visual reminder

In the Creative Package, participants were prompted to reflect on their volunteering experience at the House, their motivation and the skills they developed as volunteers (i.e. via probe 1, more details in Claisse, Ciolfi and Petrelli 2017). The first author designed a manifesto as a means to process and synthesize the participants' narratives. She used quotes and insights from the completed probes that were then assembled into a visual statement: the Volunteer Manifesto (Figures 6 & 7).

A manifesto is defined as a written statement declaring publicly the intentions, motives, or views of its issuer (Merriam-Webster Dictionary). Since the 20<sup>th</sup> Century, it has been used as a standard feature to define and critically establish new forms of art such as the Futurist and Surrealist movements. Manifestos are visual documents, which are self-contained; standing alone as an ideology crafted to convince and convert (Caws 2001).

We found that the process of designing a manifesto helped us in two ways: firstly, it clarified our understanding about volunteers' practices by shedding light on the personal, emotional and social dimensions of being a volunteer at the House. Secondly, the visual statement



Figure 6. The Volunteer Manifesto. Screenprinted, each participant received a print. Photo: Caroline Claisse.

stood by itself and brought different voices together. When looking at it, we were able to grasp volunteers' experience as a whole and immediately. We used it as a catalyst for inspiration and discussion at the museum. As a means to succinctly communicate a strong message, the manifesto was effective beyond the circle of volunteers: when presented at a conference on heritage, it was commented upon as evocative and a good tool to discuss values and roles of volunteers within heritage institutions.

### Scale model as a 3D representation of ideas

Inspired by exhibition ideas shared via the Creative Package (i.e. via *My dream exhibition* probe 3), the first author created a small-scale model to visualize participants' favourite spots at the museum. Her motivation behind model making was to transpose the personalised maps (Figure 8) into a three-dimensional visualisation as she believed it would help her capture the density and richness of materials generated by participants. To do so, she photographed and illustrated things that were labelled as important by the volunteers. These were then pinned onto a rigid two-floor plan of the museum. Snippets of text describing volunteers' stories or reasons for being their favourite spots were attached onto the pins. Like the manifesto on the wall, the physical model was a document of what volunteers valued at the museum. It stood on the desk as a tangible reminder of the broad expertise and interests volunteers have in the House.

This research model differs from the ones used in exhibition design. Traditionally, model making is used to translate proposals into three-dimensional and solid forms. Designers create physical models that have the ability to represent aspects of an idea that cannot be captured on paper. Building models afford mobility and different perspectives: designers move around them and shift things to create new associations and narratives (Spankie 2009). In our case, we adopted model making not as an intermediate representation of a future exhibition, but rather, as a means to collect and preserve the richness of information generated from the Creative Package. The model was useful for synthesizing the many places and stories that were indicated by volunteers in a way that did not reduce them to a single or textual description. Using spatial mode of representation was also a way to familiarize with the place. The process of drawing the different points of interests slowed the first author down and gave her time to process and think about the stories in relation to the building. The multiple and emplaced stories explored through modelling sparked new ideas. Indeed, it informed the concept for the Interactive Tableaux (Figure 1) where we used embedded technologies to connect stories to the actual building whilst revealing multiple threads of content in place.

### Co-creation workshops

During the co-creation process, museum volunteers took part in various activities where ideas were collectively refined into an interactive and multisensory installation: The Interactive Tableaux. Each tableau represented a character from a particular era who might have lived at the House and different reactions were triggered from the characters depending on which object was showed to them. In the development phase, two workshops prompted volunteers to imagine the characters, their objects and narratives (see details in Claisse et al. 2018). For each session, the first author designed a generative toolkit to give participants the means to collectively imagine and express their ideas for the tableaux (Stappers and Sanders 2012).



Figure 7. The Volunteer Manifesto created to make sense of participants' contributions.

Workshop 1 aimed to speculate on what a day in the life of previous inhabitants might have looked like. In pairs, participants used prompt cards, mood boards and role play activities featured in the toolkit to imagine characters before stepping in their shoes (Figure 9). One participant acted out the imagined character whilst the other one took on the role of a reporter with the task of interviewing the character in situ. The output of workshop 1 was imagined characters described in personalized ID cards and their stories reported in the forms of diary entries and front-page articles. The aim was to use these as a starting point in workshop 2 for participants to develop content for each character's tableaux.

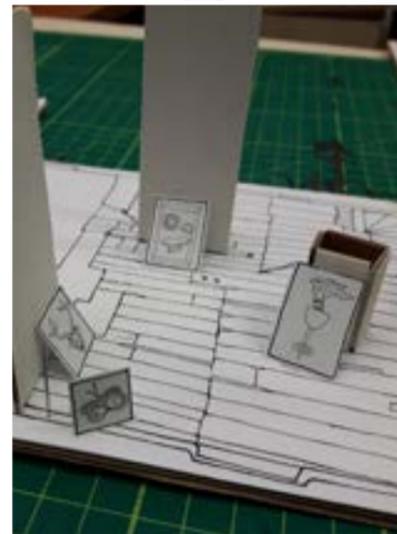
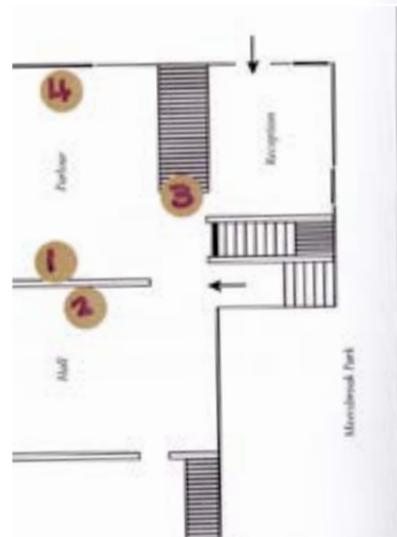
At this stage, it was important to visualise the characters, both their profile and stories so they could be discussed and incorporated into the design of the tableaux. However, like before with the Creative Package, we faced the challenge of making sense of the rich materials generated during co-creation. Next, we show how, by drawing, more specially sketching storyboards and illustrations, the imagined characters and their stories were materialised.

### Storyboards and personas

Like previously, we used design synthesis as an intermediary step to make sense and refine participants' contributions. During workshop 1, conversations were audio recorded to observe how participants negotiated and influenced each other during character formation. The first author worked from the audio recordings to draw insights from the workshop: instead of transcribing, she drew while listening as a means to materialize the rich narratives imagined by the different pairs. In design research, some have recognized the value of drawing as a way to reveal new insights and understandings, a method defined by Schön as the drawing back-talk (Schön 1991). Recent examples in RtD are drawing comics to communicate and reflect upon the research process (Dykes et al. 2016) and scribing to document the discussion and interactions in the moment (Wallace et al. 2015).

In our research, drawing made more sense than producing a written transcription as the sketches captured the complexity and non-linear aspects of participants' conversation. Their unfinished quality presented the characters in a state of becoming, revealing the negotiations and compromises participants made during the co-creation workshop. This process encouraged a reflexive conversation with the workshop outputs where insights from participants' contributions were revealed in action, through drawing; by slowing down and absorbing characteristics that were valued by the participants. We continued our exploration and used storyboarding as a means to synthesize characters' narratives. Inspired by the diaries and front-page articles (Figure 9), the first author produced one storyboard per character, each composed of three to five illustrated scenes that visualised what a day in the life of the imagined characters looked like.

Storyboards are widely used in the film industry for production purposes, to help directors visualize the scenes before execution. Product designers have also used storyboarding to envision situations, atmospheres and feelings in product-user interaction (van der Lelie 2006). In our case, storyboarding helped condensing the dense narrative into a visual sequence. The storyboards presented rich pictures of the characters' every day, showing them in the place they inhabited together with the people they lived with. An example of this



**Figure 8.** Working from volunteers' personalized maps completed as part of the Creative Package and creating a scale model of the House to represent volunteers' favourite spots at the museum. Photo: Caroline Claisse.

is a scene showing the character Mary doing her embroidery by the fire (Figure 10, top right). One drawing condensed a rich episode portrayed by the participants: Mary feeling bored, the servant stepping in the room to change the lavender from the bowl, the dog sleeping next to Mary's feet and the flame of the candle light flickering. Also, elements such as the castle drawn at a far distance in the window contextualised the scene while revealing important historical connections described by the volunteers.

The storyboards were used in a follow-up meeting with a smaller group of volunteers as a tool for refining the stories while checking for their accuracy. Volunteers shared their expertise, which generated additional insights about the House. In this process, the scenes in the storyboards were annotated with suggestions and corrections. This exercise gave substance to the characters and their personality slowly took shape. Indeed, the first author became familiar with the characters, which were illustrated in an environment that was imagined partly by the volunteers and partly by the first author as, through drawing, she completed the pictures first envisioned by the workshop participants. Design synthesis in this case enabled her to go beyond representing participants' stories. In drawing, she revealed qualities and relationships that were invisible beforehand, when just reading about the imagined narratives. Moreover, the storyboards informed the set designed for each of the character's tableau (Figure 10).

One final step was to give life to the five final characters who were to be featured in the tableaux. We were inspired by personas, which are used in interaction design and user-centered design for addressing a design problem from the perspective of the user (Chang, Lim and Stolterman 2008; Matthews, Judge and Whittaker 2012). Personas give designers a person to connect with so they can develop human-centered design (Chang, Lim and Stolterman 2008). While some practitioners have not found personas useful (Matthews, Judge and Whittaker 2012), others have developed creative ways of using them, from three-dimensional representations to personas generated based on designers' imagination and experience instead of 'real' users (Chang, Lim and Stolterman 2008).

In this research, we used personas to serve a different purpose and describe them as a set of illustrated characters. In our case, they were not used to solve a particular problem from a user's perspective or to represent the users of the final designs (i.e. museum visitors), they were created to materialise the characters imagined by our participants during workshop 1. Inspired by personalised ID cards (Figure 11), the first author drew them to provide a tangible representation of previous inhabitants of the House, making them more real and legitimate. Characters were merged or joined together as five cards, each composed of an illustrated character and a short narrative description on the back. These were used in different ways: we sent them to the curator of Social History at the City museum to select objects from the collection that were inspired by the characters and we used the illustrated cards in workshop 2 to collectively develop content for the Interactive Tableaux (Figure 5).



**Figure 9.** Co-creation sessions with volunteers featuring hands-on methods and role play activities. Participants use the generative toolkit to imagine characters for the Interactive Tableaux. Creative outputs from the session are diary entries and front-page articles. Photo: Caroline Claisse.

## Reflections

Here we critically reflect on what design synthesis, the creative and active forms of documentation we generated, did to our design process. We show that when considered as an inherent part of RtD, documentation can be used to enhance practice and help practitioners make sense of co-created materials in ways that embrace the provisional, contingent and aspirational nature of the RtD process (Gaver 2012).

### 1: Design synthesis for making sense of co-creation

In our research, we realised that the purpose of co-creation differed from other type of research i.e. conducting interviews. For the first author who is a designer by training, it was important to find her own way to handle interpretation as she found that existing tools did not keep within the RtD spirit. In co-creation, effort is spent on generative design tools to help participants connect ideas together (Stappers and Sanders 2012); we believe that design researchers need to develop new tools for themselves as a means of making sense of creative and participatory outcomes. We name this design synthesis, a creative and active form of documentation for one's own sense-making process conducted for the purpose of reflection, progression and inspiration.

For the first author, design synthesis took the form of design research artifacts that helped her handle interpretation: through making, she was able to externalise what is usually performed in the head (Kolko 2010). New connections were forged, ideas sparked, and information was absorbed from different directions. The physicality of the artifacts also made the ideas and connections more real; indeed, it gave tangible forms to an abstract and chaotic process. By synthesizing materials, she felt highly invested and moved in-between the steps of co-creation more confidently.

### 2: Design synthesis for bringing the richness together

Participants described the co-creation process as an opportunity to create something that was meaningful for them personally while at the same time, being experienced as a joint effort. Design synthesis played a significant role in preserving and assembling volunteers' contributions. This process brought together the richness of co-creation in a way that was sensitive to each individual involved in the process. Pete, one volunteer observed: The fictional characters created reflected what the individual members of our group were interested in. Helen, another volunteer involved in our research reflected: You did this, you made the connections, which brought it to life. Here, we want to emphasize the designer's role in making connections explicit and bringing ideas together through design synthesis. We encourage others to adopt a bricolage attitude to develop interpretive approaches where the role and subjectivity of the designer are more acknowledged. Indeed, we believe that these are essential and instrumental to construct richer meanings during the RtD process.

### 3: Design synthesis for nurturing collective creativity

By using design synthesis, the first author translated participants' contributions into a tangible chain of thoughts. This helped clarify her process as she was able to provide justifications and trace back her design decisions. Participants were also able to see their influence on the creative process. Nick, the Head of the House Committee reflected: *What I found really interesting is how volunteers' ideas were determining the format and outcome of the project. They [the volunteers]*



**Figure 10.** Examples of storyboards translating participants' narrative for their imagined characters. The drawings informed audio-visual content and the design of the prototypes and final tableaux. Photo: Caroline Claisse.



could really see the contributions they have made in the end result. In synthesizing materials, we made connections between participants' contributions and the final designs more explicit. This process encouraged a sense of shared creation where ideas were partly made by both parties: the design researcher and the participants. Creating design research artifacts and bringing them to the participants allowed us to expand the dialogue started with the participatory activities. The tangible manifestations nurtured collective forms of creativity over time. This was appreciated by the participants who felt closely and carefully included in the process: *It's lovely the way you [the designer] have involved the volunteers, used our ideas and made us part of it (one volunteer).*

We show here the potential of design synthesis to make the design process more transparent and inclusive: by practising design synthesis in a visible manner, connections between inputs and outputs were made more explicit (Kolko 2010). This is critical for participatory design practice where designers have to ensure that the outcomes reflect participants' inputs. By using creative and active forms of documentation, we argue that practitioners can address the challenges of assembling, condensing and making sense of the streams of information generated during longitudinal process (Dalsgaard and Halskov 2012). Moreover, we think that by experimenting with design synthesis, practitioners will develop methods that support 'collective reflection-in-action' and fulfil their commitment to ensure that participants play a critical role in the process (Simonsen and Robertson 2013).

## Conclusion

In our paper, we introduced design synthesis as a creative and active form of documentation for handling interpretation in a way that fulfilled the nature and purpose of co-creation. We discussed concrete examples to show how we adapted design-based methods such as modelling and storyboarding for the purpose of reflection, progression and inspiration. These enhanced our practice as it enabled us to (1) make sense of co-created materials, (2) bring together the wealth of responses in provisional and aspirational interpretation, and (3) nurture collective forms of creativity over time. By forming a tangible chain of thoughts, design synthesis made our process more consistent and rigorous. We encourage other practitioners to experiment with such approach to make RtD process more transparent: to facilitate their interpretation of co-created materials while creating richer meaning that can be shared and benefit co-creation.



## 'What I found really interesting is how volunteers' ideas were determining the format and outcome of the project. They [the volunteers] could really see the contributions they have made in the end result'

Nick Roscoe,  
Head of the House Committee.

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**Figure 11.** Five illustrated characters inspired by participants' contributions from workshop 1. Photo: Caroline Claisse.

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