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# A Visual Tool for Understanding Wicked Problems in Design Research: a Case Study of Marginalized Youth Unemployment

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**Abstract:**

Design thinking has been widely embraced as an approach that fosters discussion and facilitates innovations that promote inclusion and empowerment in the public and private sectors. However, recent concerns have been expressed over its limited application and the exaggerated claims of its impacts when addressing wicked problems (WPs). A central challenge is comprehending how to support the process of simultaneously understanding WPs and acknowledging their uncertainty and risk. Through an action research project (aimed to help reduce youth unemployment by involving marginalized youths in service development in South Africa), this paper investigates the use of the Mess Mapping™ tool for collectively understanding, visualizing and aiding in decision-making related to the complexities of socially-oriented design research. We demonstrate that through a 'co-documenting, co-discovering and co-defining' process, it is possible to identify and understand the challenges and complexities that designers may encounter when informing future design research on WPs.

**Keywords:** wicked problems, participatory design, service design, design for social innovation, Mess Mapping™

## Introduction

The focus of design is moving towards exploring its roles in addressing society's most pressing problems (Meroni and Manzini 2014), such as poverty, aging, healthcare and social well-being. These problems are increasingly complex and unsolvable and have come to be called 'wicked' in the literature (Rittel and Webber 1973). The ability to adapt and change effectively in relation to a wicked problem (WP) is gaining increased research attention in design schools (Buchanan, 1992; Farrell and Hooker, 2013), particularly in service design (Sangiorgi 2009) and design for social innovation (Manzini 2015). This widespread application of design has significantly democratized the design process and shifted the role of designers towards that of facilitating the co-design/participatory process in social-material controversies (Ehn 2008) and in WP projects (Cipolla et al. 2013).

Attempts have recently been made to propose frameworks for working in the development context (e.g. Kuure and Miettinen 2017) and approaches to co-designing with 'non-designers' in the conception, development and scaling-up of social innovations (Hillgren et al. 2011). Tools have been developed for mapping complex issues in participatory design, for example, community asset mapping (Alevizou 2016) and context mapping (Visser et al. 2005). The most recent version of the Design Council's (2020) Double Diamond highlights the expanded role of designers. It sets up a process to enable designers to better serve in complex challenges that do not seem to be well-characterized and are more complicated and multifaceted, with higher levels of uncertainty than a problem. Designing in different local and global contexts can be compelling, but also fraught. As Westerlund and Wetter-Edman (2017, 17) point out: "designers whose mind-set and approach works well considering the impact in Buchanan's first and second orders, may not have the tools, mind-set or approach to create

understandings of the impacts in the third and fourth orders of design." Hillgren et al. (2011, 172) identify that "some actors working with social innovation have recently expressed concerns about the role of design in this field, pointing out the weaknesses of designers and the limits of design methods." Traditional design research approaches, methods and tools stemming from conventional problem-solving practices often aim to solve a simple problem in isolation and achieve a set of predetermined goals. They are ill-equipped to tackle the problems in WP projects, as 'it is painful to try to solve a complex problem using tools and approaches that are designed for simple problems' (Seybold 2013, 2; apud Conklin 2006).

Problems can be divided into three typologies: tame, complex and wicked and different problems need to be tackled by different types of tools (Roberts 2000; Head and Alford 2008). Therefore, WPs require different forms of handling to tame and complex problems. Without appropriate tools that could help deepen the understanding of the WP in its context, designers are unlikely to democratize the design process and create sustainable and morally justifiable changes (Gunn et al. 2013). This paper aims to investigate how a tool that is developed for tackling WPs can be used to collectively understand, visualize and aid in decision-making related to the complexities in a socially oriented design research project.

Drawing on information mapping tools from policy, design sciences and management, a recent review analyzed 20 tools that handle complex situations and identified four visual tools specifically aimed at WPs: Mess Mapping™, Resolution Mapping™, dialogue mapping and morphological analysis (Suoheimo, 2019). Mess Mapping™ (MM) was suggested to be more suitable for designers than the

other tools, because it captures and presents complexities visually (ibid.) and complements designers' ways of working. The MM tool was thus selected for this investigation.

The authors perceive the WP as a dynamic target rather than a static goal, which responds to people's ever-increasing understanding of the interdependencies of a social system in which economic, legal, political, cultural, and other systems are embedded. The authors' collective experience in dealing with complex issues suggests that as a response, designers should immerse themselves in the context as facilitators by experiencing and researching the WP, preferably with the people who are affected by it, starting from the discovery phase of the design development process. This reflects the 'two-stage social design research' idea proposed by Kimbell and Julier (2019), including (1) the 'prototyping-project' stage, during which designers work with participants who have only some relevant knowledge to co-produce the spaces of social design posed by a WP through which new knowledge and researchable problems can be generated; and (2) the 'prototyping-solutions' stage, during which participants co-design solutions to address the researchable problems. This paper proposes the adoption of the MM tool in the 'prototyping-project' stage, to create a shared understanding of the WPs among researchers and multiple stakeholders in the context of marginalized youth unemployment. Our two research questions are:

1) What key areas of the WP do designers work on in the 'prototyping-project' stage?

2) What are the advantages and disadvantages of using the MM tool in a socially oriented service design project?

This article introduces the characteristics of a WP and a MM tool. Through an action research project, it reports on an attempt to apply the MM tool in socially oriented design to tackle a WP. The

application process consists of three phases through which the designers, as facilitators, engage multiple stakeholders to identify and help understand the related challenges and complexities.

This article's main contribution is its introduction and application of the MM tool in design, and how designers can use it to identify and analyze WPs together with researchers, community members and stakeholders and support the planning of future directions based on the findings. Through a 'co-documenting, co-discovering and co-defining' process, the multifaceted understanding of a WP can be represented in visual language units in future work, resulting in the consensus identification of interconnected giant problems, and many subproblems under the WP. The case study, which aims to help reduce youth unemployment by involving marginalized youth in service development in South Africa, depicts the characteristics of the WP. This application could provide a reference for designers to research WPs in socially oriented design projects.

**Taming WPs**

The notion of a WP resonates with social problems (Rittel and Webber 1973) and social messes (Horn and Weber 2007). Rittel and Weber (1973) define ten characteristics of a WP. As shown in Figure 1, there is no true or false framing of the problem. Problems like these are inherently so complex that conventional working groups, even with expert knowledge, partial suspension of self-interest, and excellent facilitation are often insufficient to make progress in taming them.


**Figure 1** Ten characteristics. Adapted from Rittel and Webber (1973); Suoheimo and Miettinen (2018); Suoheimo (2019)

A WP is considered multifaceted, as ‘many different problem views are viable’. Involving multiple stakeholders in defining the WP is crucial for the socially oriented design, because how the WP is interpreted sets the parameters that define how the possible resolutions could be achieved (Horn and Weber 2007). New tools are needed to help designers meet such expectations and support social design and innovation in sophisticated ways (Ceschin and Gaziulusoy 2016), especially in WP contexts (Sangiorgi 2009; Bofylatos and Spyrou 2016) and during the discovery phase of the design development cycle.

**Mess Mapping™ Tool**

MM is a visual analytical and collaborative reasoning tool. The mapping processes aim to acknowledge uncertainty and risk, competing points of view and values, and help stakeholders arrive at a joint,

holistic framework for understanding WPs. MM is like a set of mind maps for 'collecting, sharing, organising and evaluating information' related to a WP (Horn and Weber 2007, 9). By showing the interconnected clusters of information, the final map unpacks the complexity of a WP. MM consists of various visual language units through the combined use of images, shapes and words to represent the WP as an interconnected giant problem with many subproblems. Changes in one subproblem might have an impact on the other subproblems in the web. MM provides opportunities for local people and relevant stakeholders to share and evaluate points of view. It is considered a powerful analytical tool in the phase of understanding WPs such as mental healthcare services, nuclear waste management or climate change. As the tool creates and captures the dialogue in a visual form and compliments designers' ways of working, during the discovery phase it can offer useful insights into the design development process and thus help in understanding the challenge (Suoheimo and Miettinen 2018).

**Methods**

The MM tool represents a promising tool from policy sciences for application in socially oriented design research and practice. Due to the nature of WPs, it might take several years to understand, discuss and define commonly agreed problems on which designers can act. Therefore, the implementation and testing of the analytical tool cannot easily be studied in a real-time perspective. This paper uses an action research project as a case study to explore, understand and reflect upon the process in real time. The case study forms part of a larger research and innovation staff exchange project: Participatory Tools for Human Development with Youth (PARTY). PARTY was a four-year interdisciplinary project that aimed to reduce youth unemployment by increasing the involvement and inclusion of young people in service development. The project focused on working with indigenous San youths in South Africa and Namibia through the use of participatory and explorative service design

tools. The PARTY Platfontein action project involved San youths and a local non-governmental organization working with San youths, the South African San Institute (SASI), as the main actors in the Platfontein community.

This study chose and adopted participatory action research (PAR) and a case study as a combined research strategy (Figure 2) for several reasons. Firstly, the use of PAR assists in 'real-world' investigation by expanding knowledge and linking theory to practice to obtain clarity in complex social situations (McKay and Marshall 2001), particularly WPs in a complex environment (Souleles 2017). The iterative process of PAR involves the cycles of fact-finding and diagnosing, planning, implementation, evaluation, and modification, leading to continuous improvements and new knowledge (McKay and Marshall, 2001). Secondly, the participatory design 'adopts an egalitarian idea of sharing in the decision-making process' (Souleles 2017, 929) and is embedded in collaboration and research with the people. Being centered on people, the outcomes of PAR often take the form of case studies. The case study aims to research in 'real world' settings and offers deep understanding and intensive knowledge about a subject in the complexity paradigm (Gummesson 2017).

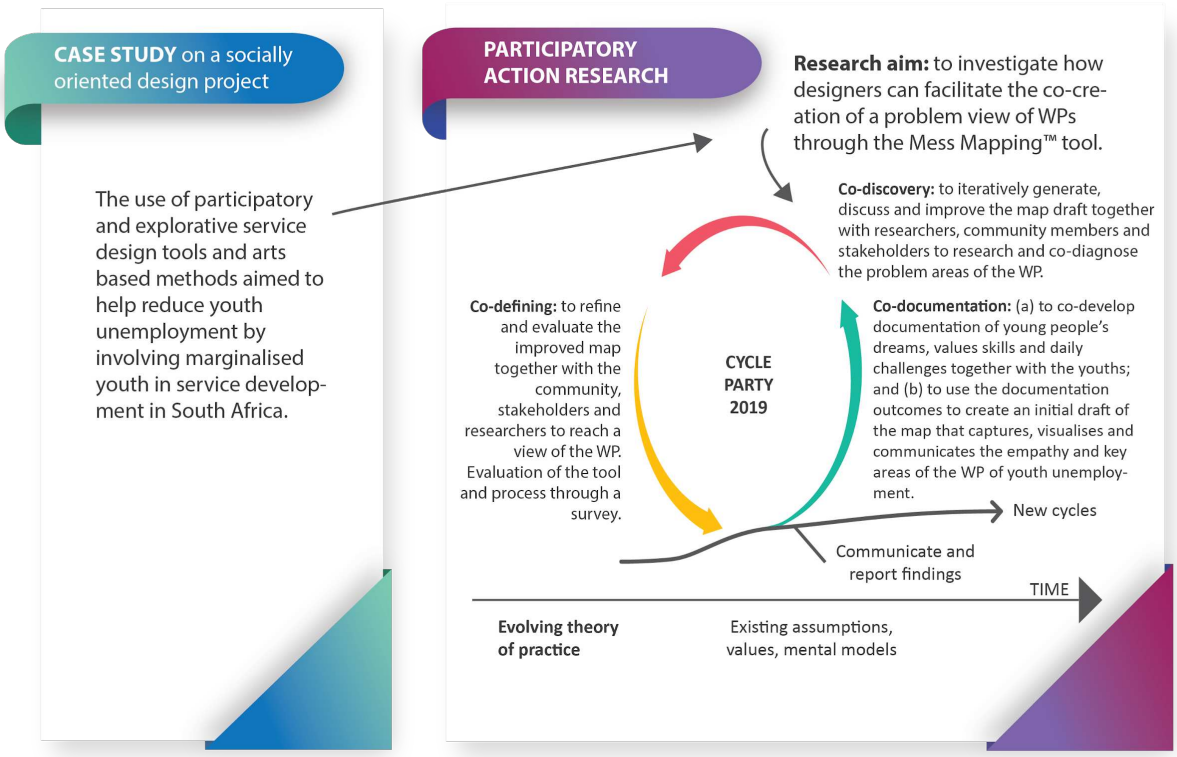


**Figure 2** Research strategies.

The development of the map went through a number of iterations to ensure that the project progressed in the commonly agreed direction.

As there is no definite formulation of a WP, the MM process is never finished, and no 'final' definition is ever determined. The experiences in the co-definition phase are fed into an iterative process within the 'prototyping-project' stage, either directly by the initial study with a more focused direction, or by a new project that researches a new WP.

**Case Study - Applying MM in the PARTY Platfontein Project**

**Context**

The context of the case study is the San culture in Platfontein, South Africa within the !Xun and Khwe San communities residing in the settlement. Platfontein has about 7000 inhabitants. Although a united community, it visibly displays elements of disintegration and group tension (van Wyk 2014; Mollema 2017).

Poverty is acute and visible in Platfontein. The primary sources of income are child support, pensions and disability grants, on which individuals and families cannot survive. The basic services available are a school, two shops, a municipal building, and a health clinic. Social services are inadequate to meet needs. Alcoholism, drug addiction, domestic violence, teenage pregnancies and HIV/AIDS are serious problems among San people in Platfontein. Suicide as a cause of death is disproportionate to the population in this small settlement (Tempelhoff 2014; Beyene 2014).

Platfontein's San community is undergoing a profound process of comprehensive cultural transition to an urban society. Urbanization and other effects of globalization have caused the San culture and identity to start disappearing. Some San traditions, values and customs are breaking down. This same decline is affecting the San languages, due to the dominance of Afrikaans and English as official languages in schools and public services. As a result, San youths suffer from educational as well as socio-economic marginalization and have a high school dropout and unemployment rate (Tempelhoff 2014; Hitchcock et al. 2006).

It is estimated that 95% of the economically active people in the community are unemployed, and that 97% live off only one dollar a day (den Hertog and Gilmoor 2017). Due to a lack of formal education,

insufficient educational qualifications and skills restrict San people from competing in the job market, which demands qualifications. Alienation from work has made the youths forget the traditional skills of hunting, gathering and healing, at the same time making them unable to acquire other modern productive skills. Such alienation diminishes their psychological satisfaction and self-worth (Tempelhoff 2014; Bahta 2014). San youth unemployment is a WP, as it is intertwined with many issues such as education, alcohol abuse, HIV, and teenage pregnancies.

**PARTY MM Process**

The authors were part of the research team, participating in the research activities, service design and art-based workshops and interacting with the youths, stakeholders, researchers and practitioners involved in the project. Various data collection techniques were used in the three-phase development process of the Mess Map™, which included co-documentation, co-discovery and co-defining (Table 1). The research followed the San Code of Ethics (San Code of Ethics 2018). Informed consent was obtained throughout the study.

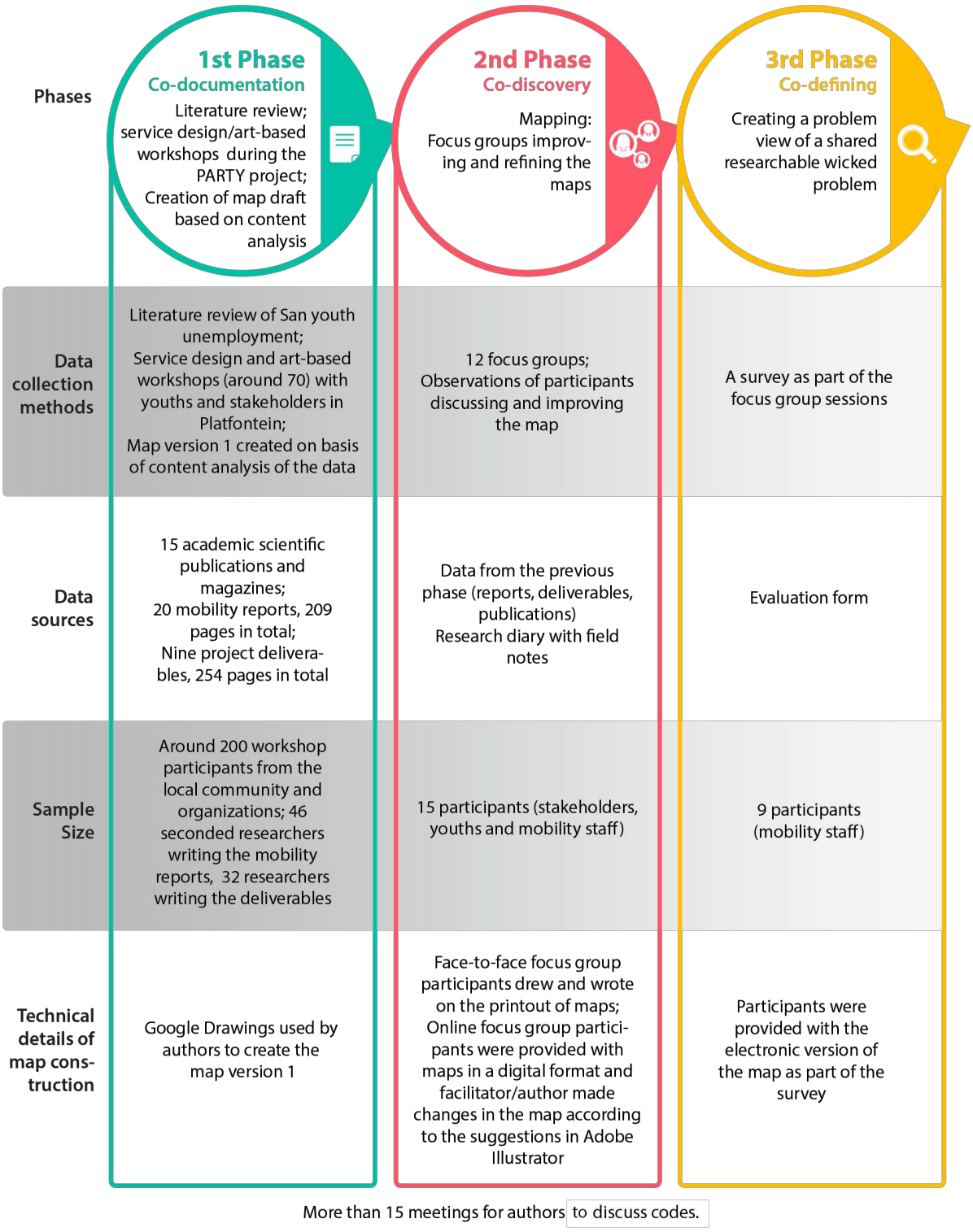


**Figure 3.** Three-phase MM process in PARTY Platfontein case study.

***Co-documentation***

To achieve the first purpose of the co-documentation, a literature review and field observations were conducted, through which the researchers orientated to the community. The participatory service design and art-based workshops and methods were then selected, adapted and developed to help the youths co-create the documentation tools and activities. By taking a dualistic role of designer and facilitator of the workshops, the researchers identified and adopted natural ways of expression, such as storytelling, singing, acting and playing, enabling the youths to 'tell their stories' (Tang et al. 2019). By recognizing the power and significance of everyday life and local knowledge, the intention was that the facilitators and youths were equal participants, exploring the following:

- young people's dreams, aspirations, fears, statements and commitments;
- places and people – the youths usually met in their daily lives;
- behaviors and feelings in different contexts (e.g. at school, in the village or at other meeting places, like bars) and with different people (e.g. teachers, family members, friends, strangers);
- self-awareness of the youths' skills and characteristics;
- value systems concerning youths' traditions, stories and cultural backgrounds; and
- common problems and daily challenges.

A series of workshops (Tang et al. 2019) were organized and run to enable the researchers to create empathic connections with the San youths and gain an in-depth understanding of their circumstances and the micro-problems they encountered.

The project was run on the basis of staff exchange mobilities. Reports that documented the workshop process, outcomes and reflection of both the participants and facilitators were written, uploaded and shared with the project partners and stakeholders for comments. During the four-year PARTY project, 46 researchers generated 20 reports (209 pages) and nine project deliverables (254 pages). The relevant mobility reports, deliverables and articles were coded (e.g. YTH for youth in Figure 4) and analyzed using content analysis (Patton 2014). The related codes were collated, and data were clustered under the relevant themes. Themes and detailed subthemes were identified and given tentative labels. Each theme contained three subthemes: 1) Insights and Challenges, 2) Opportunities and 3) Impacts. Green dots indicate the project focus areas in which the PARTY project had worked and red dots the areas that required more investment (Figures 4 and 5). The directions of the arrows show the connections between the boxes of WP areas. The colors of the arrows represent the box colors, which are used to merely distinguish one area from another.

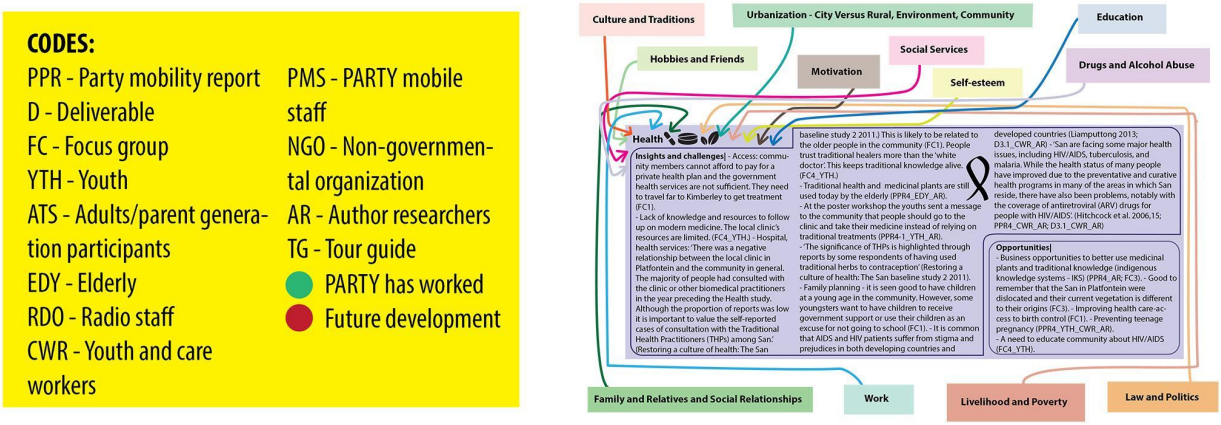


**Figure 4** Codes as instructions for reading map and areas that influence health.

An inductive approach was taken to ensure that the themes were strongly related to the textual data. The themes were reviewed and adapted to better fit the data through an iterative process of close examination of the texts and considering the entire data corpus, guided by Bernard and Bernard (2012).

Discrepancies were discussed until the authors achieved consensus (Ryan and Bernard 2000). The authors held over 15 meetings to discuss, compare and validate the emergent themes and collaboratively create the first draft of the map in Google Drawings.

### *Co-discovery Phase: Focus Group Sessions*

In the Co-discovery phase, 12 focus group sessions with 15 participants (youth representatives, stakeholders and researchers) were conducted to review the map. The focus groups were audio-recorded and notes were taken. New insights and boxes with new themes were generated, discussed and added to the map at the end of each session. New lines were added to the map when participants acknowledged linkages between different theme boxes. For example, the 'Urbanization' box was regarded as being related to 'Poverty', because the focus group feedback showed that some workshop participants had no money to pay for bus tickets, which meant they also struggled with job seeking in the town. Through the co-discovery stage, the focus group sessions enabled the identification and integration of the interconnections between the themes generated. The map was improved and refined on the basis of the feedback from a series of focus group sessions until themes started to recur, and data saturation was achieved.

### *Co-defining Phase*

To define the common view of the WP, a survey with the improved map was distributed and used to collect individual views on the map at the end of each focus group session. Fifteen participants (researchers, youth and stakeholders) took part in this phase. The final version of the map was created on the basis of the results from the survey (Figure 5). Appendix 1 contains the map in A1 size.

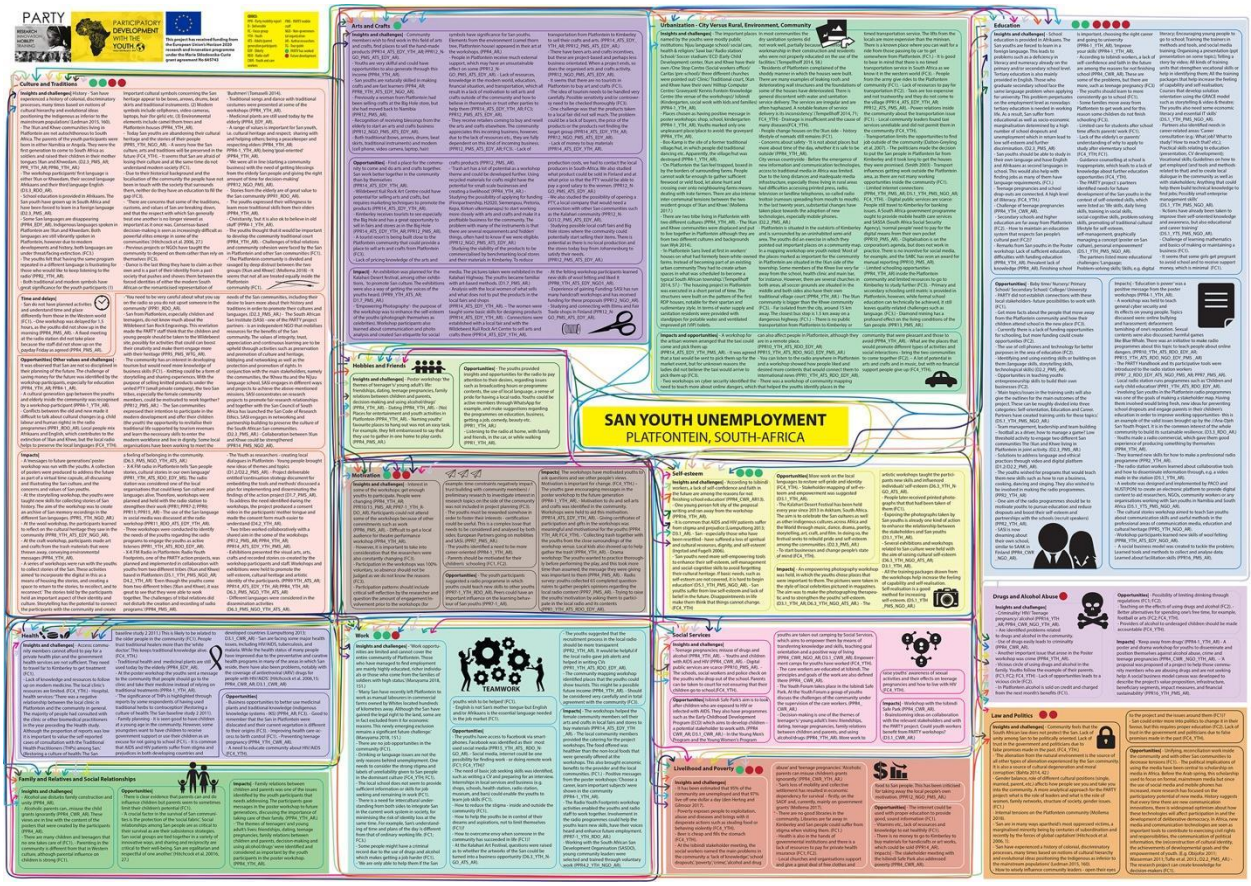


**Figure 5** The final map.

## Participants

The participants' average age was 39 years and they had 10.5 years of experience. The majority were from the design field (8/15). The educational level varied from secondary school graduate, through bachelors and masters, to PhD students and PhDs. The average time for which mobility staff participants were seconded to work in the field was 1.5 months, varying from one to four months.

## Evaluation

Nine of the focus group participants answered a survey that was sent to all of them with the map.

Despite various attempts to get answers from the community and stakeholders, only the party mobility

participants answered it. The evaluation form's intention was to evaluate the usability (how usable the tool was in the socially-oriented design project) and effectiveness (how much the use of the tool helped achieve a shared view of the WPs) of the final map. All nine participants (mobility staff) had a university degree and around ten years of experience on average. The average age of the participants was 38.

**Results**

The data analysis was guided by two questions. The code given to the focus group participants was FG and that given to the evaluation participants was EE. Most insights came from the fieldwork reports, and secondly from the focus group discussions. Some new insights emerged during the focus group sessions that the researchers did not present in the mobility reports. As shown in Figure 7, the majority of the codes were generated on the basis of the workshop activities with the youths, followed by their parents or the adult generation.

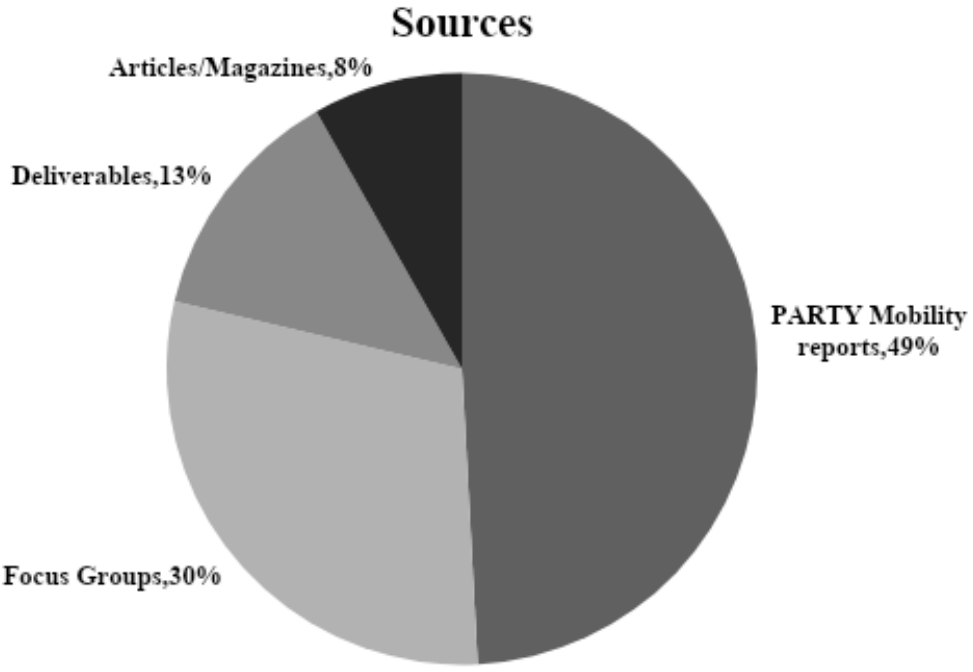


**Figure 6** Sources of insights.

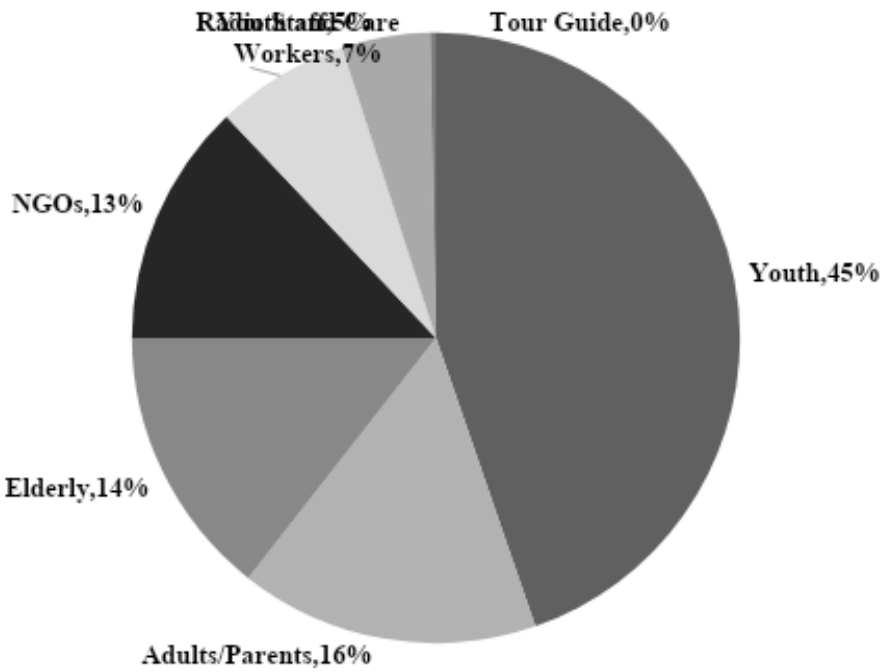


**Figure 7** Generation of insights.

The areas with the most codes (Figure 8) were Culture and Traditions, Arts and Crafts, and Urbanization and Education. The areas with the least amount of codes included Hobbies and Friends, Law and Politics, and Family and Relatives. We can inductively assume that the project was more active in the fields with more codes or when more pressing issues arose in the workshops.

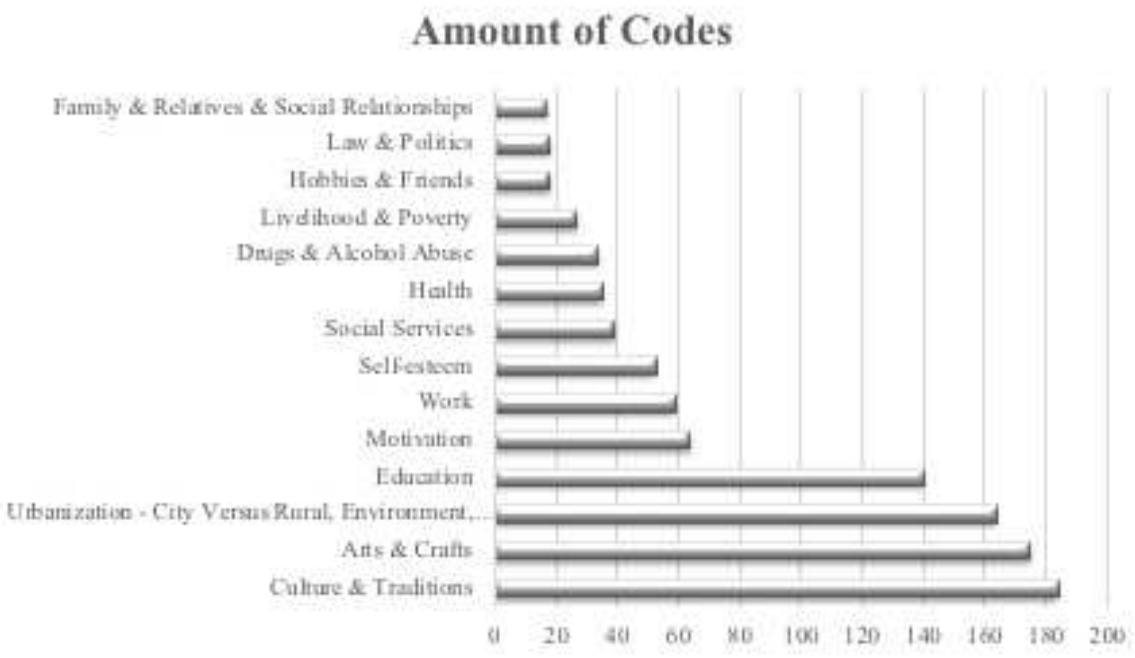


**Figure 8** Amount of codes by areas.

The survey data revealed that the project covered a variety of problems related to youth unemployment in Platfontein, including Education, Self-esteem, Livelihood and Poverty, Culture and Tradition, Work, Motivation, and Arts and Crafts. The areas with green dots on the map showed those in which the respondents felt the project had worked. The participants recognized that more work was needed in Education, Motivation, Law and Politics, Livelihood and Poverty, Drugs and Alcohol Abuse, and Work.

Using a 'working' map as an outcome of the co-documentation phase is useful in helping the participants co-discover and co-define the WP in two ways. Firstly, unpacking the complexity of a WP and developing the map together with the youth representatives, stakeholders and other researchers involved in the project increased the participants' level of self-efficacy for handling and overcoming the fear of complexity that they faced. During the early stages of the focus groups, some participants

were reluctant to comment on youth unemployment. They hesitated because they considered the topics complex and as being made up of interrelated issues, or regarded their experience in the field with youths as too short or limited to gain a proper understanding. The use of the map was incomplete, indicating the need for a structure in which to discuss, develop, adjust, and refine it. In addition, the 'working' map enabled the participants to identify and reflect on areas that might be excluded from the written reports but fundamental for future studies to focus on. Examples of these themes were policy and youth motivation.

The map generated during the process showed that an area that needed additional attention was Politics. The map had arrows pointing in every direction but only a few pointing towards the politics box. It was recognized that the involvement of the local governmental institutions and public sectors could have helped establish a shared vision and gain support as well as protect future courses of action.

The box of culture-related issues was the biggest, which might reflect the fact that the project was run by cultural entities. The local NGO also had similar interests, because the cultural preservation of the San heritage is a wider concern. The purple area of Arts and Crafts is closely related to topics of exploring how the cultural knowledge of making crafts could be used in order to create working opportunities. The Education box was large and many actions took place there, leaving many opportunities for future research. The use of drugs and alcohol is a great challenge in the community, but this area did not receive much coverage during the project.

The feedback from the focus groups illustrated that many issues could be solved by increasing the youths' motivation to become engaged, and thus to make changes, but limitations in the larger social

system were also observed (Figure 5). As FG08 pointed out, young people could be highly motivated but take no action because the system did not allow them to progress. A youth representative (FG11) recognized that motivation was vital for change, mentioning that the PARTY workshops motivated the youths to ask and reflect on questions they had concerning their community. Participant FG09 suggested that motivation might be the center of the whole map as it connected with so many aspects and was of central importance. At various points in the focus group sessions, the participants suggested that all the areas of the map were highly interconnected. If a project had worked in one of the areas, it would have influenced all the other boxes/themes to which the arrows pointed. To maintain a manageable map size, no causal links, showing the causes of the problems, or links presenting collaborations were used in this case, although causal links are common in the MM process.

In reference to the second research question, the focus group participants and experts were asked to discuss the advantages and disadvantages of using the MM. They saw it as beneficial to use the map in the planning stage of the WP projects; as its use opens issues and challenges in one place. The map was characterized as a holistic tool and the lack of clear solutions was accepted. The focus group participants described how the map helped them see the problems in a broader context, and as a visual tool, it tracked the relationships between problems. In addition, adding relationships between the boxes on the map enabled more discussion and collective reflection on the relevance and impact of the problems. Many participants reported having gained revelatory insights during the map-making and felt that their voice had been heard. The participation of the youth representatives from the Platfontein community was believed to be important for the mapping process. Participants suggested that the map could be used to understand activities or phenomena of convergent and complex natures, for example, educational reform, and helping youths manage their lives and careers.

The participants made some suggestions for future improvements. One critical feedback point was that the map offered a limited overview of the subject area relevant to the WP, and each subject area required its own Mess Map. It was also suggested that the map should be made more graphically attractive and less 'academic', as its aesthetic complexity could be off-putting for non-academics (EE07). The map could have two versions: one version for the academic researchers and another concise and crystallized version for the community participants (for the youths). There has been discussion in the academic field on making research more popular and accessible for larger audiences. Probably due to content analysis, the map was heavier in content than usual. Another suggested area of improvement was adding arrows to the map if they pointed in one direction or two directions and that the arrows could be of different widths; for example, more important connections could have thicker lines.

## Discussion

### Benefits of the Tool

The key practical benefits of the MM tool for design researchers and practitioners engaged in the 'prototyping-project' stage of WP projects manifested in four ways:

(1) The tool offered a visual method for design researchers to perceive the connectedness and explore the uncertainty that characterizes WPs. The boxes of themes and subthemes illustrated in the map and their distribution in different (social, political and economic) sectors highlight the scope and content of the design researchers' and practitioners' work. By responding to the changing mindset of treating WPs in their entirety instead of simplifying them, the tool has the potential to address the

oversimplification of complex problems that is established in the design research literature (Docherty 2017; Ceschin and Gaziulusoy 2016).

(2) It enabled designers to open up and recognize the need for collaboration from the early stage of the project development process in order to tame the WPs. The PARTY project participants recognized that youth unemployment was a large, intertwined WP and required more investigation of each sub-area identified in the map. They felt that the uniqueness of the tool was that it provided researchers, community members and stakeholders from diverse disciplines with the opportunity to see each other's perspectives from a very early stage and participate in the strategic discussions. The tool supports designers' roles as facilitators to help identify the composition of the actors involved and support the participation of the community members and stakeholders. Service design has always stressed the merit of understanding holism and involving the actors in the co-design process (Stickdorn et al. 2011). However, it is not clear which actors need to be involved (Ceschin, 2014). The results of the focus group sessions suggest that the participants recognized the importance of involving community members, governmental institutions and public sectors for establishing a better understanding of the WP. They felt that the tool allowed the researchers to see the bigger picture (FG01) and to zoom in on the causes and impacts of the problems to obtain more detail (FG07). Explicit recognition of the linkages of problems and cross-sector influences would help the establishment of a broader network of actors (FG18).

(3) Applying the tool together with service design methods in the three phases of 'co-documenting, co-discovering and co-defining' democratized the power by giving the marginalized youths a voice throughout the process. It would be unethical to put a socially marginalized user group together with other stakeholders in a co-creation workshop without preparation (Hussain et al. 2012). Artistic and creative methods (Tang et al., 2019) were adapted or developed to make participation

in the ‘co-documenting’ phase more accessible and attractive to the participants, regardless of their formal education level or experience. The group of San youths were empowered to express their intentions and concerns. The process gathered views and stories from the marginalized youths concerning the problems in the community, but also helped identify and increase the engagement and commitment of those who wished and were motivated to participate in the ‘co-discovering’ and ‘co-defining’ phases of the mapping.

(4) The tool provided the design with a facility for planning and managing WP projects. A WP is characterized by its complex nature in the framing of the problem (Rittel and Webber 1973). It was unlikely to be a linear process from start to end like the ‘youth unemployment’ in the case study. The map was continuously adjusted as a result of what the actors learnt during the mapping process. The tool plays a valuable role in helping designers learn the dynamics and become aware that the WP project vision is not a static outcome to be achieved. Iterations are necessary for a social development context. This tool is particularly useful as it enables reflective practices. Design researchers gain new knowledge, insights and self-confidence from collective mapping. By reviewing, mapping, discussing and reflecting on the experiences in a group, the researchers became more aware of what they had achieved and positive about managing the open search and learning process.

**Limitations and Recommendations for Further Work**

Two limitations of the MM tool were identified and should be considered when planning new projects. (1) The visual qualities could be further investigated. The format of the tool could have been less academic and complicated, so that the research findings and project planning would have been presented in a way that a layperson (e.g. community members and design practitioners) could

understand it more easily. This might be remedied by running more interactive co-defining workshops with the non-academics and using creative service design-oriented tools such as role-playing and acting out problems, and then integrating the insights gained from the workshops into the map. To ensure that the map includes the voices of a broader group of actors, a non-academic version of the tool could be considered.

(2) The map ended up being so vast that altogether 14 sub-WPs emerged from the case study. Future studies could create separate Mess Maps for each problem area identified, which would encourage more debate and consideration of the factors and forces leading to the subproblems in each theme. To ensure that the tool meets its full potential, the causal links between the theme boxes need to be used to show the causes of the problems and the links presenting the collaborations. We malleably adapted Horn's tool (2018) for this specific situation and how we saw it to best serve this WP purpose. The map is too large to use causal links to show where the problems derive inside it, which is why we recommend applying techniques in Horn (2018) and making separate MMs that are more visually readable. Furthermore, improving the visualization and interaction of the map construction might be another way forward in this work.

The most obvious area for further exploration is that of using the Resolution Mapping™ tool (Horn and Weber, 2017) to create ideal scenarios and the steps needed to address the problems identified in the Mess Map™. The intention is that the map could be further developed in conjunction with a wider group of actors, to provide a basis for discussing the possible avenue of development and identifying action points to tame WPs. However, in this article, we focus on the main MM process.

**Conclusions**

This article's main contribution is its novel application of the MM tool in socially oriented design research projects through the combined use of participatory artistic and service design workshops, content analysis and focus group sessions. To better serve complex challenges, we argue that MM could be an initial step towards embracing the complexity of WPs in the design projects. MM can help design researchers work as facilitators, to understand challenges and support reaching a commonly shared view of a WP, including its uncertainty and risk, although agreement is not always reached at the end of the mapping. It is important that the problem is not oversimplified. The process of defining problems is not linear but goes in cycles of iterations and interactions from the first discovery phase. Iterations enable designers, as facilitators, to continuously develop, adjust and refine the approach to embrace the complexity of the problem. In this way, designers work with researchers, practitioners, community members and stakeholders, looking for the non-obvious leverage points for transformation from the very early phase of the design development process.

To promote social inclusion and community empowerment, designers must learn to play a more effective role in facilitating genuine participation in addressing WPs. They should be aware of the complexity and uncertainty that characterize the problems and learn to guide, orient and manage the continuous adaptation and evolution of the project vision and actor involvement. Educators may want to equip future designers with skills that are fundamental to addressing WPs. Based on our findings, they may train their students to be capable of effectively communicating and illustrating complex information, enabling the engagement and commitment of a wide range of actors and facilitating the convergence of the actors' expectations to develop shared project visions and action plans. This study has opened up debate as to what WP tools are appropriate for designers, and through robust research has led to a much clearer understanding of the application of the MM tool in design research projects.

Further work is required to apply this tool in a set of real cases and to evaluate its value in enabling service design and supporting social innovations in the complexity paradigm.

**References**

Alevizou, G., K. Alexiou, and T. Zamenopoulos. 2016. "Making sense of assets: Community asset mapping and related approaches for cultivating capacities." Working Paper. London: The Open University and the AHRC.

Bahta, G. 2014. “Cultural conflicts, dilemmas and disillusionment among the San communities at Platfontein.” *TD: The Journal for Transdisciplinary Research in Southern Africa* 10 (4), 36-51.

Bernard, H., and H. Bernard, 2012. *Social research methods: Qualitative and quantitative approaches*. London: Sage.

Beyene, H. 2014. “Socio-economic factors as causes and remedies for conflict of the San community in Platfontein.” *TD: The Journal for Transdisciplinary Research in Southern Africa* 10 (4), 99-119.

Bofylatos, S. and T. Spyrou, 2016. “Supporting design dialogue through a communication framework using four layers of abstraction.” *The Design Journal* 19 (2), 269-282.

Buchanan, R. 1992. "Wicked problems in design thinking." *Design issues* 8 (2), 5-21.

Ceschin, F. and I. Gaziulusoy, 2016. “Evolution of design for sustainability: From product design to design for system innovations and transitions.” *Design studies* 47, 118-163.

Cipolla, C., P. Melo, and E. Manzini, 2013. “Collaborative services in informal settlements. A social innovation case in a pacified favela in Rio de Janeiro.” Paper presented at the *NESTA Social Frontiers: The Next Edge of Social Innovation Research Conference*, 14.

Conklin, J. 2006. Dialogue mapping. *Building Shared Understanding of Wicked Problems.* West Sussex: John Wiley & Sons.

Conklin, J. 2006 *Wicked problems & social complexity*. San Francisco: CogNexus Institute.

den Hertog, T. and A. Gilmoor, 2017. Informal care for people with chronic psychotic symptoms: four case studies in a San community in South Africa. *Health & social care in the community* 25 (2), 538-547.

Design Council 2020. What is the framework for innovation? Design Council's evolved Double Diamond.

Docherty, C. 2017. “Perspectives on design thinking for social innovation.” *The Design Journal* 20 (6), 719-724.

Ehn, P. 2008. "Participation in design things." Paper presented at the Participatory Design Conference, ACM, Bloomington, October 1-4.

Farrell, R. and C. Hooker. "Design, science and wicked problems." *Design studies* 34, 6 (2013), 681-705.

Gunn, W., T. Otto, and R. Smith, (Eds.). 2013. *Design anthropology: theory and practice*. London: A&C Black.

Gummesson, E. 2017. *Case theory in business and management: reinventing case study research*. Los Angeles: Sage.

Head, B. and A., John. 2008. "Wicked Problems: Implications for Policy and Management." Paper presented at the Australasian Political Studies Association Conference, Brisbane, July 6-9.

Hillgren, P., A. Seravalli, and A. Emilson, 2011. Prototyping and infrastructuring in design for social innovation. *CoDesign*, 7 (3-4), 169-183.

Hitchcock, E., K. Ikeya, M. Biesele, R. Lee, R. Hitchcock, and K. Ikeya, 2006. "Introduction: Updating the San, Image and Reality of an African People in the Twenty First Century." *Senri Ethnological Series* 70, 1-42.

Horn, R. E. 2018. *The Little Book of Social Messes: Connecting the Smudges in an Age of Wicked Problems.* Macro-Vu.

Horn, R. and R. Weber, 2007. New tools for resolving wicked problems: Mess mapping and resolution mapping processes. *Watertown, MA: Strategy Kinetics LLC*.

Hussain, S., E. B. N. Sanders, and M. Steinert, 2012. "Participatory design with marginalized people in developing countries: Challenges and opportunities experienced in a field study in Cambodia." *International Journal of Design* 6(2).

Kimbell, L., and G. Julier. 2019. “Confronting bureaucracies and assessing value in the co-production of social design research.” *CoDesign* 15(1), 8-23.

Kuure, E., and S. Miettinen, 2017. Social Design for Service. Building a Framework for Designers Working in the Development Context. *The Design Journal 20* (sup1), S3464-3474.

Manzini, E. 2015. *Design, when everybody designs: An introduction to design for social innovation*. Cambridge: MIT press.

McKay, J., and P. Marshall, 2001. The dual imperatives of action research. *Information Technology & People*.

Meroni, A. and E. Manzini, 2014. Catalysing social resources for sustainable changes. Social innovation and community centred design’. In C. Vezzoli, C Kohtala and A. Srinivaan (ed.) *Product-Service System Design for Sustainability,* 362-379. Sheffield: Greenleaf Publishing

Mollema, N. 2017. “The San values of conflict prevention and avoidance in Platfontein.” *TD: The Journal for Transdisciplinary Research in Southern Africa* 13(1), 1-8.

Patton, M. 2014. *Qualitative research & evaluation methods: Integrating theory and practice*. London: Sage.

Rittel, H. and H. Webber, 1973. “Dilemmas in a general theory of planning.” *Policy sciences* 4(2), 155-169.

Roberts, N. 2000. "Wicked Problems and Network Approaches to Resolution." *International Public Management Review* 1(1): 1-19.

Ryan, G. and H. Bernard, 2000. “Data management and analysis methods.” In NK Denzin and YS Lincoln (ed.)*, Handbook of qualitative research*, 769–802. Thousand Oaks: Sage.

San Code of Ethics, South African San Institute, Accessed 16 July 2020. https://www.globalcodeofconduct.org/wp-content/uploads/2018/04/San-Code-of-RESEARCH-Ethics-Booklet_English.pdf

Sangiorgi, D. 2009. “Building a framework for service design research.” Paper presented at the *8th European Academy of Design Conference*, Aberdeen, March 31 – April 4, 415-420.

Seybold, P. B. 2013. ‘Netting It Out’, review of How to Address “Wicked Problems”: Use Dialogue Mapping to Build a Shared Understanding and Evolve a Group’s Thinking, Patricia Seybold Group.

Souleles, N. 2017. “Design for social change and design education: Social challenges versus teacher-centred pedagogies.” *The Design Journal* 20 (1), 927-936.

Stickdorn, M., J. Schneider , J., Andrews, K. and Lawrence, A. 2011. *This is service design thinking: Basics, tools, cases* (1). Hoboken, NJ: Wiley.

Suoheimo, M. and S. Miettinen, 2018. “Complexity Mapping and Mess Mapping Tools for Decision-Making in Transportation and Maas Development.” Presented at the 21st DMI: Academic

Design Management Conference, Academic Design Management Conference, London, August 1-2, 1176-1188.

Suoheimo. M, 2019. “Strategies and Visual Tools to Resolve Wicked Problems.” *The International Journal of Design Management and Professional Practice* 13(2): 25-41.

Tang, T., S. Chivuno-Kuria, F. Pierandrei, and S. Remotti. 2019. “Designing dialogues for complexities with marginalised youth: Processes and tools.” In S Miettinen and M Sarantou (ed.) *Managing Complexity and Creating Innovation through Design*, 47-63. Routledge.

Tempelhoff, J. 2014. “A first generation African community grappling with urbanisation: the views of Platfontein's San on water and sanitation service delivery.” *TD: The Journal for Transdisciplinary Research in Southern Africa* 10 (4), 52-83.

Van Wyk, A. 2014. “The militarisation of the Platfontein San (! Xun and Khwe): the initial years 1966-1974.” *TD: The Journal for Transdisciplinary Research in Southern Africa* 10 (4), 133-151.

Visser, F. S., P. J. Stappers, R. Van der Lugt, and E. BN Sanders, 2005. "Contextmapping: experiences from practice." *CoDesign* 1 (2): 119-149.

Wetter-Edman, K. 2014. “Design for Service: A Framework for Articulating Designers’ Contribution as Interpreter of Users’ Experience.” PhD diss., of Gothenburg.

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Dr Tang Tang is a Lecturer in Sustainable Design. Tang is passionate about creating meaningful design solutions for better health and social sustainability. She has managed and worked on many research and consultancy projects, particularly relating to the user-centred and participatory design for sustainable and healthy behaviour. She was Principal Investigator at the University of Leeds, and oversaw the completion of the ground-breaking EU Horizon 2020 funded PARTY (Participatory Development with the Youth) project which aimed to understand the complex challenges of youth unemployment in the African San community. Her research interests include design for behavioural change, experience design, design for health and wellbeing, cross-cultural design and transformation design.

Tarja Juvonen (D. Soc. Sc., Licensed Social Worker) is a University Lecturer at the University of Helsinki, Faculty of Social Sciences, teaching social work at the Discipline of Social Work. She has also been working as a social worker among adults, elderly people, children, families and also in the social emergency services. Her research interests include social work and youth research dealing with vulnerable young adults and their agency. She has studied social control, autonomy, independent living, cultural expectations and indebtedness in youth and the migration of young Lappish people. Her newest research are aimed at the agency and locality of young San people in South Africa, Aftercare in the Metropolitan area of Finland and Home visiting in child care and veterinarian practice.