



Design Thinking as an approach to develop
sustainable physical activity and nutrition
interventions in low re-sourced settings

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Describing a Design Thinking methodology to develop sustainable physical activity and nutrition interventions in low resourced settings

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Abstract.

The objective of the study is to describe how design thinking as a participatory process can be applied in determining how sustainable physical activity and nutrition interventions should be implemented in a low resourced community in South Africa. Physical inactivity is the 4th leading cause of mortality world-wide. Associated with inactivity, a high prevalence of obesity is reported. Evidence based research indicate that sustainable physical activity and nutrition interventions will reduce the burden of physical inactivity and obesity. Poverty, and its inherent lack of food security, further impacts the health of people living marginalized, increasingly urban lifestyles. The intent of the project is to change attitudes and behavior towards physical activity participation and nutrition choices. Design Thinking is typically implemented using a five-step process where the community is engaged with presenting the problem they experience, defining the problem, presenting solutions to the problem and finally developing a prototype in solving the problem they experience. The principle of the Design Thinking process is that the low resourced community holds part of the answer to the problem and has a desire to change their health. The proposed solutions, coming directly from the participants, are therefore considered viable. Once a desired prototype is developed and tested in the community, feasibility can be determined. The presence of these three factors, is expected to result in an innovation.

Keywords: Design thinking, feasibility, viability, desirability, innovation, low-resourced communities, physical activity, nutrition.

1 Background

1.1 Introduction

More than five million premature deaths each year are caused by physical inactivity, making it one of the most significant contributors to the global burden of disease [1]. Research offers confirmation of the valuable effects of physical activity on psychological health and management of stress and burnout [2], but more importantly highlight the significance of physical activity in managing overall well-being, instead of just body weight [3]. Ding and Hu (2009) [4] conclude that encouraging physical activity and promoting a healthy diet are both equally essential to maintain a healthy body weight and diminish the risk of non-communicable Diseases (NCDs) and premature death. This paper aims to give a detailed representation of the methodology (grounded in the design thinking paradigm) we will implement in order to address physical inactivity and unhealthy eating in a low-resourced community in South Africa. We continue the first section with a brief sketch of the problem statement, followed by a concise listing of our aims and objectives in section 2. In section 3 we present design thinking and the theoretical framework in which we will carry out our future study, which flows into section 4 where we offer a hypothetical application of our methodology. The last three sections of this paper are respectively dedicated to pitfalls, considerations and a succinct view of our future work in this study. Please be aware that this is not an empirical study, but rather a reflection and clarification of the methodology we are proposing for our future intervention activities.

1.2 Problem Statement

Physical inactivity and poor diet are associated with a wide range of non-communicable diseases (NCDs), which includes hypertension, stroke, coronary artery disease, type 2 diabetes mellitus, cancer and osteoporosis [5]. General physical inactivity results in the prevalence of a largely overweight population and this too is evident in South Africa, where obesity coexists with the less than sufficient levels of activity amongst the general population [6, 7]. Regular physical activity may also have other beneficial effects that provide protection against the development of NCDs, despite the already present primary risk factors [8]. The increased incidence of NCDs in South Africa accentuates the necessity to promote a healthy lifestyle through increased participation in physical activity and healthy eating habits [8]. It has been documented, however, that even though most people know that inactivity is a risk factor for heart disease, persons from low-resourced communities lack understanding on the execution, implementation, and management of physical activity [9]. This failure to change behavior is evidenced by the large number (57%) of South Africans that are treated with chronic prescription medication for conditions that are easily corrected through regular physical activity [10] and combined healthy eating [11].

Physical activity (PA), for obvious reasons, is featured in the World Health Organization's Global Action Plan for the Prevention and Control of NCDs 2013–2020 [12].

The plan informs public health policy and South-Africa has included this in their National Sport Plan of South Africa as one of the key performance areas [13]. Nearly one third of adults are inactive worldwide and there is an increased evidence-base on the associates and determinants of physical activity and effective interventions to increase PA [14]. There does however, remain a paucity in the evidence related to interventions in low and middle-income countries (LMICs). Multiple levels of impelling reasons are responsible for physical activity participation, or the lack thereof. These include individual, social, and environmental factors [6]. Individual factors such as i) the need for confidence, ii) motivation and time and ii) environmental factors, including their physical neighborhood environments and safe accessibility to physical activity resources are all factors that individuals face and may hinder sustainable participation [15].

In one of our previous studies, a review focused specifically on physical activity implementation and healthy eating in South-Africa [16], we concluded that research should focus on tactics that increase the knowledge of physical activity in the population and be linked with interventions to overcome barriers to activity. An advance toward being physically active should include education on how to be active with regards to duration, intensity, frequency and modalities of physical activity. Various physical activity programs have been implemented in South Africa, yet the level of physical activity in South African is at an average of 50% [12]. All previous interventions were based on solutions from the researchers with regards to increasing physical activity and implementing healthy nutrition. The aim of this paper is to describe the use of the Design Thinking process for developing sustainable PA and nutrition and to present the framework for how this study will be conducted. The Design Thinking process is based on the premise that communities know what they need, and the solution is also within them. The benefit of this approach in determining a sustainable physical activity and nutrition intervention is the fact that the community will form part of developing the solution and not just the researchers.

2 Research Objectives

The following objectives set for the study:

1. To describe the theoretical underpinning of design thinking;
2. To describe the Design Thinking process;
3. The design of a framework of Design Thinking in developing sustainable physical activity and nutrition interventions in low resourced communities.

3 The process

3.1 The Theoretical underpinning of Design Thinking

Collaborative design in software development is not a novel approach. One of the most used approaches, especially when it comes to software development for education purposes, McKenny's design cycle [17] is often used. However, although this and other similar approaches [18] include scope for context analysis and understanding the end user to help define the problem, they often neglect to explicitly direct researchers to actively engage the user community in defining the solution. Once again, creating a solution based on what researchers believe the users need, rather than a solution the user wants. This extends into the sustainability of research-designed interventions. That is, solutions which are wanted will be used, negating the novelty effect usage pattern of hypothesized interventions, described by high initial number of active users with a low retention rate going forward in time.

Design thinking on the other hand is a human-centered process honed at Stanford University's d.School [19]. This process is used in businesses, schools, organizations and numerous other settings to create change and foster innovation. Design thinking, as a process, encourages participants to develop a positive, proactive and optimistic stance toward addressing complex problems. Design thinking supports divergent, lateral thinking – thinking that promotes and encourages problem finding rather than quick, often short sighted, problem solving. Using design thinking, users come to realize it is possible "... to creatively attack the world's greatest problems and meet people's most urgent needs" [20].

Design thinking can be used to develop eight core abilities:

- Navigate ambiguity - ability to persist with the discomfort of not knowing
- Learn from others – ability to emphasize and embrace diversity
- Synthesize information – ability to make sense of information and find insight and opportunity
- Experiment rapidly – ability to quickly generate ideas in written, drawn or built forms
- Move between concrete and abstract – ability to move between needs, ideas, and define ideas
- Build and craft intentionally – ability to thoughtfully make or construct ideas into tangible, shareable forms
- Communicate deliberately – ability to form, capture and related stories, ideas, concepts, reflections and learnings to diverse audiences
- Design – ability to recognize a project as a design challenge and then decide on people, tools and techniques required to tackle it [19].

3.2 The Design Thinking process

As described by d.School, Figure 1[19] illustrates the five steps of design thinking. These five distinct steps are Empathize, Define, Ideate, Prototype and Test. To determine the real problem a community experiences, an empathetic listener is needed to ask questions from the community to present the problem they are experiencing. The next step would be to clearly define the problem, as presented by the community. Through ideation, the community is then drawn into the process of supplying potential solutions to the problem they experience. The principle here, is that the answer to the problem lies within the person/people who have the problem. These steps are continuously repeated to make sure that correct information is obtained. Once a solution idea is formed, a prototype with regards to this solution can be developed. The community is then encouraged to further refine the prototype. This inclusive process of continuous refinement aims toward an iteratively improved prototype. Once a solution has been found, the testing of the prototype can be conducted.

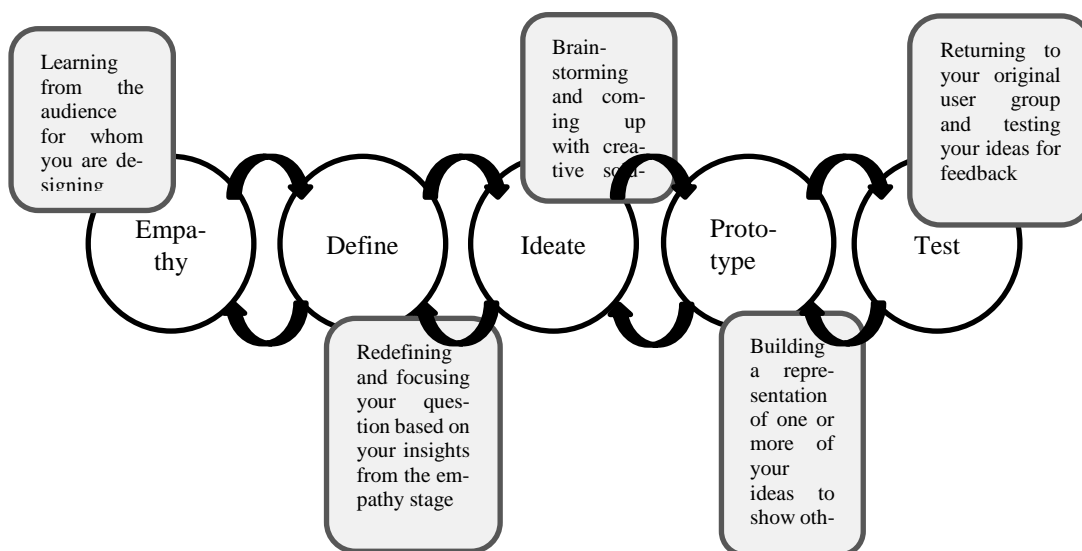


Fig. 1. The design thinking process (Adapted from: Stanford d.School)

Through the process of determining the problem based on the input of the community, we are in effect determining the desirability and desirability of exercise interventions and good nutrition within a low resourced community. Once this process is completed, it is important to understand the viability of the change that is about to take place. Therefore, the contribution of the community to the solution of the problem, makes the solution more acceptable with a high uptake and retention rate. When defining the problem and presenting with prototypes, the viability of the solutions is tested. The last step in the

development of an innovation, is to conduct a larger-scale feasibility study with the uncovered prototype.

As a research methodology, design thinking can be found in the work of participatory design [21] and Collective Impact [22]. Both these approaches place the individuals being studied at the heart of the work and views them as participants in both the process and product. Both Participatory Design and Collective Impact include participants in all aspects of the research, from setting the research agenda and questions to determining metrics for evaluation and terms for data analysis.

Design thinking is well suited for research questions that are complex by nature and wicked. Wicked problems do not refer to mean problems, but rather to problems that seem impossible to solve – problems like many of the United Nations Sustainable Millennium Goals[23]. Ten characteristics of wicked problems include:

- There is no definitive formula for a wicked problem.
- Wicked problems have no stopping rule, as in there's no way to know your solution is final.
- Solutions to wicked problems are not true-or-false; they can only be good-or-bad.
- There is no immediate test of a solution to a wicked problem.
- Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly.
- Wicked problems do not have a set number of potential solutions.
- Every wicked problem is essentially unique.
- Every wicked problem can be considered a symptom of another problem.
- There is always more than one explanation for a wicked problem because the explanations vary greatly depending on the individual perspective.
- Planners/designers have no right to be wrong and must be fully responsible for their actions [23].

When considering the aim of the research study to develop a sustainable physical activity and nutrition intervention will involve behavior change. This triangular interplay between the main factors behavior change, physical activity participation and healthy nutrition is in itself a wicked problem as it has no stopping rule and the solution may never be final. These are all symptoms of each other and an ever-changing environment with so many factors that participants in a low resourced community face this complexity of the three factors are indeed unique. This is why the researchers hope that Design Thinking will be able to provide a solution for this wicked problem.

4 Application of this approach

The researchers identified the issues based on literature of developing and maintaining an active life style and improving nutrition amongst an identified low-income population in South Africa as wicked problems – problems without obvious and / or immediate

solutions. The researchers recognized globally there have been numerous interventions “given” to low-income populations in the hope they would improve outcomes, change behaviors and address the risk of NCDs and premature death. A consistent finding of most of those interventions has been their inability to make sustained change [16]

As Einstein wisely noted, the definition of insanity is doing the same thing and expecting a different outcome. Keeping this in mind, the researchers turned to design thinking to create an iterative approach that focuses on problem finding, honoring participant voice, and ideation and iteration. The design thinking process allows researchers and participants to work together to create innovative ideas and possible interventions. The researchers suggest that it is through the ideation, prototyping and testing steps that Design Thinking comes into its own as a powerful, collaborative methodology, allowing participants to begin to make their thinking visible [24]. In a research context, prototyping can take the forms of storyboards of intervention steps or sketches of tools or resources [25].

As stated earlier, Design Thinking has five distinct steps. They do not need to be linear, and quite often, they are completed in a recursive way, moving from empathy to ideation to definition and re-definition to developing more empathy before prototyping promising ideas. To gain information with empathy, the researchers should identify (1) an initial set of open-ended questions (Figure 1), and (2) identify the sectors of the population from which information should be gathered. Within the context of physical activity and nutrition, it is important to acknowledge that self-responsibility is a major factor in the development of sustainable interventions, therefore following the process with individuals from the community would be of importance. Other role players would be community health care workers that are employed by government to interact with the individuals in the community to ensure continuous interaction and health support.

To gain a clear understanding of what is happening in the community in question, field visits will be conducted. Table 1 gives a breakdown of how these principles will be applied in the community. In returning from the field visits, the researchers will begin to Define the challenges participants faced. This definition stage of the Design Thinking process encourages researchers to interrogate their assumptions based on the literature, their experiences and beliefs with the participants’ comments and lived experiences from the participants. Based on the definition of the participant challenges, the researchers’ can then begin the Ideation phase – the develop of potential solutions / interventions / ideas that might address the participant concerns. Ideas generated at this stage should be visualized by a medium that is both understandable and somewhat culturally sensitive to the community. For the low resource target community of this study, this would typically include storyboarding and graphical representations as opposed to online broadcasts that would be more suited to communities with a wider range of ICT possibilities. An example of this could be a frisbee with a visual plate model printed that will guide food selection and portion control but can also serve a plate. The storyboard and graphics would then be taken back to the community for their feedback, critique and ideation as well.

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Table 1. A Design Thinking Framework for low resourced communities

Design Thinking Steps	Application	Consolidation actions
Empathize	<p>Interviews, focus groups and workshops to better understand the problem and desired solutions.</p> <p><i>Initial Target information from HCW:</i></p> <ul style="list-style-type: none"> • Investigate working conditions and obtain possible improvements; • Understand the perceived level of technology experience and competence. <p><i>Initial target information from community:</i></p> <ul style="list-style-type: none"> • Current interaction with HCWs; • Understand their relationship with nutrition and physical activity; • Determine their willingness to use mobile technology. 	Confirm findings with additional groups
Define	<p>Synthesize all individual data gathering efforts into an inclusive and well-defined problem set.</p> <p><i>Hypothetical example:</i> Mobile solutions should be on simplified devices</p>	Begin to develop initial ideas and confirm them with the participants.
Ideate	<p>Add detail to the ideas and relay them to the participants as workable solutions.</p> <p><i>Hypothetical example:</i> Application should be icon-driven as opposed to a textual interface</p>	Work with participants to integrate participant ideation with researcher ideas.
Prototype	<ul style="list-style-type: none"> • Before actual prototyping, develop comprehensive design principles to guide all further development; • Commence storyboarding the solution content (be cognizant that content can be repurposed for multiple application modes). <p><i>Hypothetical example:</i> The logical order of icon selection starts with icon x, followed by icon y...</p>	Take storyboards back to participants for their critique.
Test	<p>Allow participants to have a hands-on experience with the prototype</p> <p><i>Hypothetical example:</i> Return to the field with a mock-up of the mobile application.</p>	<p>Monitor participant engagement with prototype solution in the areas of:</p> <ul style="list-style-type: none"> • Usage; • Skill development; and • Behavior change.

		Refine prototype as needed.
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5 Potential pitfalls and challenges and how to overcome them

Using Design Thinking as a methodology to gather data from low-resourced communities will most certainly not be without challenges and pitfalls. There are several factors that researchers will have to keep in mind. Firstly, language and culture might play a role and could influence the answers given by the participants. Making use of students that know the context well and speak the language of the people in the community will also help to eliminate some of the issues surrounding cultural differences. A fourth factor could be that researchers may be faced with distinct community groups who experience their environment differently, resulting in potentially conflicting data. The more traditional way to combat this is to ensure that you have a fully representative (and homogenous) community group. The risk however, is that you may encounter social structures where the more influential groups will drive the conversation and as a result, bias the data. With design thinking, researchers should rather keep different community groups apart and synthesize their data with background and context perceptions deeply considered. Physical problems such as hearing, whether by physiological or outside influencers, could influence the discussions. However, Design Thinking manages to curb communication interference in that the information the researchers thought the participants said should be sound boarded back to them before proceeding into the next phase. This will quickly determine any misinformed issues.

6 Considerations

Researchers are often influenced by external drivers into shaping a solution that fits greater international streams. For instance, one of the goals of the WHO is to make use of mobile technology to empower community members, especially those that cannot get to a clinic due to distance. As researchers we should identify where and how mobile technology could be incorporated into the current situation and provide this as a part of the scope definition when approaching the community. It is paramount though, in a Design Thinking approach, that community members are aware of this scope right from the outset. For example, this mobile approach could support the performance of health care workers. This can be attained by the distribution of clinical updates, learning materials, and reminders [26]. The use of mobile technologies may further enable health care providers to aid patients to improve their health in real time, empowering them to personalize their health care options and monitor their progress [27].

Having said all that it is important to remember that technology can be defined as the application of scientific knowledge for practical purposes, especially in industry[28]. This could mean that our idea of the technology our target community needs

may differ from what they actually want. It might just be that a different type of technology could be more successful with them such a flyer or a booklet. Design Thinking does not tolerate the trivialization of community wants, but to remain sensitive to international drives, the best solution should incorporate both possibilities—a booklet augmented with a mobile platform perhaps.

We conclude that a Design Thinking Process is well-suited to tackling our wicked problem of decreasing the incidence of physical inactivity and poor nutritional habits in low-resourced communities. We foresee that Design Thinking is likely to bring alternative innovations and ideas to the table that are within the wants, rather than needs, of the community. Continued investigation of these innovations by means of a prototype will shape the outcome of the study through directing the very technologies being used to reach the outcomes of the study. Throughout the research journey, Design Thinking will continuously remind us that the best technology is the one most likely to bring forth a change in behavior. That is, the technology the community wants.

7 Future work

This paper gives a theoretical background physical activity and nutrition intervention as a wicked problem. It describes the process of Design Thinking and presents the framework that will be used by the researchers to implement this process in their research. Report on the results gathered, the process of implementation and the prototyping that was created will be presented in future papers. Furthermore once the prototype is accepted and approved by the community it will be developed to be a working application and then implemented and tested. The intervention will be followed for 1 year after the researchers are no longer involved to determine sustainability. Results on the success of the intervention will be reported.

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