Seeking New Insights: A Design Thinking Approach to the Development of Persuasive Technology Aimed at Supporting Clients on a Weight Management Program

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ABSTRACT
The application of persuasive technology has been shown to be effective in a weight management context. However, it has been observed that the impact is not as significant as predicted. The aim of this project was to investigate whether a Design Thinking approach could generate new insights that could be used to drive the development of an innovative application to help people on their weight management journey. Findings show that although no radically new user needs were identified, the needs that users did express most pertinently are not effectively met by currently available technology. Further, we examined the Design Thinking approach itself and sought to identify criteria for the design of successful insight gathering activities, through end-user engagement. We summarize these at the end of this paper.

Author Keywords
Persuasive technology; design thinking, weight management, service design, behavior change.

ACM Classification Keywords
H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces: User-Centered Design.

INTRODUCTION
There is a significant body of literature and numerous commercial applications that offer support to people who have a personal goal of weight loss and/or weight management. The conceptual models resulting from the work of Fogg [2] and Oinas-Kukkonen [10] have provided frameworks to aid the development and evaluation of such systems. These models in themselves are underpinned by theories of behavior change, notably Theory of Planned Behavior, Transtheoretical Model, Social Cognitive Theory [14]. Such applications have been shown to have a positive impact [14, 3], yet there is concern that there is little certainty as to which feature/s are associated with a positive impact on weight change, or improvements in attrition levels on a weight management program [8]. Further to this it has been suggested that whilst the impact of Internet based support can be shown to be positive, this impact is small, variable and not sustainable [5] .

The Persuasive System Design model offered by Oinas-Kukkonen [10] is very comprehensive, offering four categories of persuasive system support (Primary Task, Dialogue, System Credibility and Social) each having 7 principles and illustrating each principle with numerous examples. In a study of health and wellbeing apps with a stated aim of positive behavior change [6] the application of these models has been found to be limited. It was found that self-monitoring was universally used for primary task support along with pre-defined suggestions to make goal setting straightforward. Dialogue support was also utilized, most commonly in the form of reminders. However, targeted dialogue was identified as underutilized. Social Support was also identified as minimal and typically limited to sharing widely through mechanisms such as Facebook links. Crucially the study concluded that none of the applications under review exhibited any characteristics that reflected the user group or context, with no opportunity for tailoring to address this.

The project reported on in this paper set out to seek new insights into how technology could be applied to the weight management context. The longer term aim being to develop new digital tools that are fully underpinned by recognized theories and models, but without losing sight of the need to reflect the requirements of end users; and build tools that not only provide useful functionality, but specifically to build tools people want to use.

To respond to the challenge of increasing relevance to end users, a Design Thinking approach was adopted and relationships were established with end users, facilitated by organizations that offer weight management services to the health service and local authorities.

DESIGN THINKING APPROACH
Design Thinking or Service Design Thinking is a human-centered design methodology that uses co-design and intuitive problem-solving techniques to match people's needs with what is technologically feasible and organizationally viable [1]. End-users are involved at every stage. It is typically applied to deal with difficult, multi-dimensional problems that lack recognizable requirements and solutions – so-called "wicked problems" [11].

The first step in the process is to build empathy and the designers are directed to begin by setting aside pre-conceptions and knowledge of existing solutions. Damien Newman's squiggle illustration [9] captures this mindset and in particular the almost chaotic early stages of a Design Thinking approach:

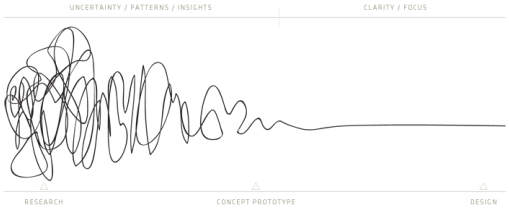

Figure 1: The Process Design Squiggle by Damien Newman

The squiggle celebrates the fact that at the beginning of a problem solving process, we take a seemingly directionless route from not knowing how to address the problem, gradually settling on a clear understanding as we gain insights, knowledge and a strong empathy for the target end users of the service. As well as the pursuit of empathy with end users, at the core of Design Thinking is the promotion of experimentation and, counter to the term Design Thinking, the bias towards action and doing.

Design Thinking as a methodology emerged as an approach separate from existing approaches, such as Human Centered Design, in the 1990's, promoted particularly by IDEO with their Deep Dive approach to problem solving [7]. IDEO identifies Design Thinking as a 'deeply human' process, one that trusts in our ability to be intuitive, to recognize patterns, to construct ideas that are emotionally meaningful as well as functional [1]. Subsequently Design Thinking has been further developed by others, including The Hasso Plattner Design Institute. The Institute have offered a framework that identifies five overlapping and inter-related activities which they have labeled as follows [12]:

Empathize

1. Define
2. Ideate
3. Prototype
4. Test.

It is this framework that has been adopted to drive the initial stages of this project; however, there are no hard edges between these stages, the stages themselves just providing a roadmap rather than a rigid framework.

RESEARCH AND INVESTIGATION

The project was initiated by a scoping activity. In keeping with the Design Thinking philosophy this initial stage was approached without pre-conceptions. To gain empathy for target end users and derive a clearer definition of the problem, some insight gathering activities involving clients of weight management programs were undertaken. The insights emerging from those activities were then used to drive an ideation process, designed to come up with new ideas for how the end users can be supported in their weight management journey. The project has reached this point.

Input into these processes was derived from a number of sources, including people engaged on structured weight loss programs run by two UK based organizations specializing in face-to-face support (MoreLife UK Ltd.[1] and ABL Health Ltd.[2]) weight loss program organizers and facilitators employed by collaborating organizations, Design Thinking practitioners (Uscreates Ltd.[3]) and academics from Leeds Beckett University.

Co-Scoping

The process was initiated by undertaking a co-scoping activity involving Leeds Beckett and weight management professionals - led by Design Thinking professionals. After agreeing the key goals of the project overall, a "What, Who, When, How" exercise was undertaken to reveal and share initial unknowns regarding the problem and the context. The questions that were captured provided a touchstone for assessing progress throughout the insight gathering phase of the project. Once the point was reached where new questions were difficult to formulate, the questions were added to post-it notes so they could be visualized as a whole and themes and groupings identified. The questions divided into two fairly clear groupings:

- Those that related to the individuals and their experience of seeking to lose weight e.g. "what triggers positive or negative eating behaviors"; "how do you quantify success" etc.
- Those that related to the broader context of weight loss and weight loss programs e.g. "do those that drop out of programs have any common characteristics"; "what are the success criteria for the program" etc.

Examining the blocks of questions and drawing on prior experience of working with clients using a Design Thinking approach, techniques to be applied to the engagement with stakeholders were identified. Structured interviewing was identified as a suitable approach to work with employees of weight management programs, to explore the wider context of weight loss and weight loss programs. Whereas a more engaging insight gathering workshop, using playful activities, was devised for working with individuals taking part in weight management programs. The particular activities used were designed by the Design Thinking practitioners, drawing on their prior experience of similar workshops and client groups

[1] http://www.more-life.co.uk/
[2] http://www.ablhealth.co.uk/
[3] http://uscreates.com/

Insight Gathering

An insight gathering workshop was run with one group of clients as a pilot, after which some small adjustments were made before running the workshop again with four further groups. There was no attempt to select participants; the groups worked with were those that were part of existing groups supported by the two program providers. In total 29 individuals contributed to the workshops, Table 1 shows the age and gender profile of participants.

	Male	Female
Over 50	13	5
31-50	3	6
18-30	0	2

Table 1: Age and Gender Profile of Participants

The workshop room was deliberately set with the use of flowers, music and dressed tables to foster a sense of occasion and generate positive energy within the room.

Prior to engaging participants with planned activities the potential of the project was explained with a strong focus on the positive impact their contribution could have. Thereby generating a sense of being an integral part of the process and project.

The initial workshop consisted of four separate activities, each designed to provide different insights into the participants' life experience. Activities were:

Activity 1: Life Pies

The Life Pie activity asked participants to consider their life priorities and then consider how they spent their time in their normal daily lives; with the latter task being captured on a circle divided in 'pie slices'. A short period of reflection followed to explore the differences between the outputs of the two tasks.

Figure 2: Life Pie Activity

Typical responses:

- Priorities: family, health, work
- Activity: work, TV, chores

Activity 2: Circles of Influence

Participants considered how their experience of weight loss was influenced both positively and negatively, and by whom. Firstly focusing on people that were very close to them such as family and friends; then widening their thinking to their environment such as neighbors, work colleagues and their local physical environment. Finally considering influences at the wider societal level, such as media and politics. All thoughts were captured on either pink (negative) or green (positive) post-it notes and organized in concentric circles to build a picture of these influences. Again there was a short pause to reflect on the output, particularly the mix of colors that developed.

Figure 3: Circles of Influence Activity

Typical responses:

- Inner
  - 'Husband takes care of children so I can exercise'
  - 'Husband wants cakes and desserts'
- Middle
  - 'Healthy options at canteen'
  - 'Biscuits at work'
- Outer
  - 'Weight loss blogs'
  - 'Air brushed models'

Activity 3: Modeling Measurement

Participants were given Play-Doh, a modeling compound usually played with by children, and invited to model the means by which they tracked their weight. Whilst the output was limited, the aim of this approach was to re-ignite the energy within the room and drive engagement by adding an increased sense of fun.

Figure 4: Modeling Measurement Activity

Activity 4: Hurdles and Drivers

The final task was Hurdles and Drivers, where participants were asked to consider hurdles they had experienced or

they perceived others had experienced when seeking to lose weight. Suggestion were captured on strips of masking tape that were placed on the floor to simulate hurdles; a workshop facilitator was then positioned by the hurdle and the participants were asked to offer ways in which the hurdle could be confronted or overcome. With the facilitator needing 5 suggestions to move on before another hurdle was requested.

Figure 5: Hurdles and Drivers Activity

Typical responses:

- Socialising
    - Reduce calories in advance
    - Check menu beforehand
- Setbacks
    - Ask for help
    - Recognize past success

The pilot workshop demonstrated that the overall approach was effective, but took too long to be easily repeated given the availability of participants. The Modeling Measurement was recognized as being overly time consuming for the insights gathered. This activity was therefore dropped and the insights associated with it collected through a brief discussion at the end of subsequent workshops. At the trial workshop the activity did have a noticeable impact on the mood of participants by increasing energy levels. However, at subsequent workshops it was seen that the increasing playfulness of the remaining activities kept participants focused and engaged when the Modeling Measurement was dropped.

All the insights were gathered as part of the activities, on post-its, masking tape and diagrams.

The data gathered was analyzed briefly on an on-going basis and after the 5th session it was recognized that very few, if any, new insights were emerging.

A mapping exercise was carried out on the insights gathered against the initial question set generated, confirming that the majority had been addressed and triangulated through repeated workshops.

Ideation

To initiate the ideation phase of the project the expertise of Design Thinking professionals was again utilized to facilitate a workshop which was attended by representatives from Leeds Beckett and from the design agency that will undertake any future application development. All the material that emerged from the insight gathering workshops was gathered and jointly examined in a structured way. The responses to each of the key workshop activities: Life Pies, Circles of Influence and Hurdles and Drivers were explored to seek out patterns and themes. The input from the weight management companies and the group facilitators was drawn on to provide a common understanding of the context in which the workshops had been run.

Through the Life Pie exercise it was possible to derive common traits and issues regarding how people spent their time when contrasted with their life goals. The three key findings that were identified were:

- People spend less time on health and wellbeing than their priorities suggest
- They spend even less time with Family and Friends than their priorities suggest
- Both work and watching TV are environments without physical activity and where unhealthy eating may occur frequently

The Circles of Influence activity drew responses that reflected the breadth of the differing life experiences of the participants. However, there were still some key insights to be derived:

- Inner Circle
    - Family and friends make an equally positive and negative contribution.
    - Own bad habits and those of others are difficult to overcome
    - A close supportive social circle provides a strong motivator
- Middle Circle
    - Temptations that can be controlled at home but are difficult to manage away from home
    - Sense that people react to events and encounters, rather than seek to actively steer a path toward positive actions and choices
- Outer Circle
    - Level of self-efficacy key to determining the analysis and response to societal level influences.

The Hurdles and Drivers exercise produced an output that addressed concerns similar to those emerging from prior exercises, but in a much more focused way. Consequently

the analysis at this point became a distillation of all the data collected to identify a number of key challenges that participants are commonly faced with, and perceived ones that present a threat to their continued progress towards meeting their weight loss goals.

These key challenges were:

- Managing Low Mood
- Facing up to the Long Haul
- Overcoming Temptation
- Securing Support

DISCUSSION

Considering the first two challenges: Managing Low Mood and Overcoming Temptation. These are dynamic issues, they occur without warning, those on a weight management journey can seek to plan their lives to manage them – with or without supporting technology – but it is the unexpected and unforeseeable that will generate these problems in a manner that can result in loss of commitment or focus.

Facing up to the Long Haul and Securing Support are planning issues. However, these could be easily overlooked at the start of a weight management journey, which can be started based on initial enthusiasm. Considering these issues as part of initial planning would be an investment that is more likely to have an impact later in a journey.

It would be difficult to argue that these four challenges cannot be addressed by techniques suggested by existing models. The Persuasive System Design model is comprehensive in nature and offers numerous principles that could be applied. For example Managing Low Mood could be addressed by support that provides praise or rewards, or through social facilitation or expert advice. All of which are principles in the PSD model [10].

It is notable that the issues that emerged are not expressed in a way that reflects any technology based support system. Although initially participants were aware of the longer term aim of developing a technology based support system, talk of technology was minimized during the workshop and there was no attempt to steer any discussion or output.

It is also notable that the issues do not address goal setting or weight tracking, which have been identified as the key components of many currently available health applications [6].

However, at first glance the four key challenges seem perfectly obvious. There were however some subtle nuances to the participant responses that were not anticipated. For example the desire to be part of a support network could have been predicted as all participants were part of a group that met regularly. However, the nuance that emerged was the primacy of support from close families and friends and the difficulty in securing that in a way that participants found positive. Likewise managing temptation could have been predicted, but the particular nuance that emerged was the impact of temptation in environments that could not be easily controlled.

A number of key lessons were learnt from the workshops. By limiting the introduction of perceived existing knowledge and understanding, the discussion was liberated from the desire to look for solutions – in this environment a strong empathy can develop and new insights can emerge. By gathering input through activities that had elements of playfulness, physical movement and visualization the engagement of participants remained high and the workshops flowed easily.

Capturing input as part of the exercises, particularly by visual means, allowed for a "quick and dirty" analysis to be carried out by all workshop participants. It is notable that the Circles of Influence and Hurdles and Drivers tasks generated much more positive energy than the life pies activities. The latter being the only task where participants captured their input separately, making it hard to share and reflect on.

CONCLUSION

This paper presented findings from an insight gathering process, working closely with the clients of face-to-face weight management programs. The key aim was to explore the use of Design Thinking as a means to generate new insights, which could then be further developed to plot a course towards a deeper understanding of how technology can be deployed to support those on a weight loss journey.

The Design thinking approach described by the Hasso Plattner Design Institute [12] was utilized on the project, and the co-analysis workshops run with clients as part of this process are described in some detail.

Five insight gathering workshops were completed, followed by an ideation workshop to explore the output and identify key themes and issues. The four key issues that emerged were:

- Managing Low Mood
- Facing up to the Long Haul
- Overcoming Temptation
- Securing Support

Although it cannot be argued that the key focus of these issues could not have been predicted, there are some nuances that are worthy of note. The desire for effective support was primarily focused on close family and friends, rather than others on a weight management journey. Temptation was seen as a particular challenge when it was perceived that the exposure to temptation was outside the individual's control. The need to secure support and consider a realistic time scale were identified as key initial planning issues that are often over looked. Reflecting on this, the Design Thinking approach did enable us to "see the familiar with new eyes", and gather new insights from the

obvious and sometimes the mundane. This was one of the key aims of our approach.

Reflecting on the experience of running the workshops a number of key characteristics that drive success have been identified:

1. The atmosphere at the start of workshops can be lightened by the use of staging to communicate a sense of occasion.
2. The focus of participants can be clearly intensified by the presentation of their role as one that was integral to the project and of greater importance than the facilitators.
3. The use of playful and physical activity can keep the energy in a room and commitment to a workshop, at a high level.
4. The gathering of data in a visual form allows for a 'quick and dirty' analysis that fully involves participants as well as facilitators.
5. The generation of output that could be easily shared and viewed collectively can be a very effective way to maintain momentum and engagement.

Having identified key issues of concern to existing clients of weight management services, the next step is to work on a co-design activity that will contribute further to the ideation stage of the project. Moving towards the prototyping of an application that can then be developed in an Agile manner and reflects both user group and context.

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