What Influences Users' Decisions to Take Apps into Use? A Framework for Evaluating Persuasive and Engaging Design in Mobile Apps for Well-Being

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ABSTRACT
Personal well-being is influenced by small daily decisions such as what or when to eat or whether to go jogging. The health consequences of these decisions accumulate over time. Mobile applications can be designed to support people in everyday decisions and thus help to improve well-being real-time. In this paper we propose a framework to study the influential factors for users to download and use applications from the wide selection currently available in App stores. The framework includes attractiveness, value, ease-of-use, trust, social support, diffusiveness, as well as fun and excitement. We illustrated how the framework works in practise by applying it to an online survey to assess 12 mobile Apps for well-being. The results showed that these influential factors did match the decisions on users' attitudes toward taking Apps into use. User feedback explained how people assessed the influential factors before actually using the applications.

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

General Terms
Human Factors; Design; Measurement.

Keywords
Mobile Applications (Apps); Well-being; User Survey; Persuasive Design; Technology Acceptance Model for Mobile Services (TAMM), infographics

1. INTRODUCTION
Improvements or deteriorations in health are consequences of small daily decisions which accumulate over time. Mobile phones are often present in daily situations where health related decisions are made, thus providing opportunities for timely interventions to support behaviour change [1]. The technical capabilities of mobile devices enable not only collecting user data but also analysing and interpreting it to provide relevant real-time information to support decision making [2].

Designing Apps that guide users' daily decisions to support and/or improve users' overall mental, physical, and social well-being is challenging [3]. With well-being applications effectiveness in intervention and persuasiveness in behaviour change are important qualities in designing a successful App in addition to ordinary user acceptance criteria of mobile services [4]. That is why we broadened the ordinary user acceptance framework with criteria from health behaviour change and persuasive design as explained in the following sub sections. Before the user evaluations we carried out expert evaluations with three experts who represented expertise on user acceptance of mobile services, well-being technology, and persuasive system design [11]. Each expert defined relevant criteria and carried out expert evaluations of all twelve Apps individually. The aim of the evaluations was to identify the strengths and shortcoming of the current mobile App design. The expert evaluations are described in details in our earlier paper [11]. In the following sub sections we describe the evaluation criteria and the research framework that we built based on the expert evaluations.

1.1 User acceptance of mobile services
Expert evaluation on user acceptance was based on the Technology Acceptance Model for Mobile Services [5]. The model covers perceived value, ease of use, trust and ease of adoption. The TAMM model is intended for user evaluations but in here it was used as a framework to analyse the applications from potential users' points. The contributing criteria built based on the model include:

- ✓ Perceived ease of use – From users' perspectives, how effortless it seems to use the app? Are functions easy to identify, find and use? Is information provided to the user easy to understand?
- ✓ Perceived value to the user - What is the targeted value of the application to the user? Is the proposed value credible?
- ✓ Trust - Does the information and feedback provided to the user seem reliable? Are there threats related to privacy or safety?

1.2 Well-being Technology
Expertise on well-being was formed based on the evaluator's knowledge about effective features of technology-based

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interventions for health behaviour change [3]. User engagement and effectiveness of technology-based interventions can be increased through various intervention methods and support features, profiling and personalization, data interpretation to improve comprehension, holistic approach rather than a narrow focus, and overall novelty. The contributing criteria include:

Figure 1. Illustration of complex factors for designing persuasive and engaging mobile App based on various literatures

- ✓ Profiling and personalization - Information is collected to profile the user and tailor output based on user needs and characteristics [6]
- ✓ Holistic approach - A wide spectrum of health and well-being is covered: physical, mental, and social aspects [7]
- ✓ Social support - Social support features; social support is an important factor in psychosocial well-being [8], and can increase user engagement in technology-based interventions [9]

1.3 Persuasive design in mobile applications

The criteria was built mainly based on Persuasive System Design model [1] but modified specifically for this study. Comprehensive considerations were given to original twenty-eight principles in four categories: primary task support, system credibility, dialogue support, and social support, and in addition, goal setting [10]. Persuasiveness in this model focuses at the set of attributes that bear on the ability of software to support change in its users' attitudes and/or behaviour, especially the primary task support and the dialogue support. The final contributing criteria include:

- ✓ Social support - including social facilitation, social comparison, normative influence, social learning, cooperation, competition, and recognition
- ✓ System credibility (trust) – including trustworthiness, expertise, surface credibility, real-world feel, authority, third-party endorsements, and verifiability

1.4 The combined research framework

Creating a favourable first impression of an App is crucial to motivate users to try it out. Based on the criteria used by the three experts, we set up the framework to understand users' attitudes toward taking Apps into use and what influenced their decisions on whether to download an App to use or not. The factors of the framework are based on multidisciplinary literature and mutually agreed by experts from persuasive design, user acceptance, and well-being technology [11]. The framework includes the following factors:

- ✓ Attractiveness for engaging user experience [1 & 12]
- ✓ Perceived Value / personalization [4 & 2]
- ✓ Ease of Use [1 & 4]
- ✓ Trustworthiness /system credibility [1 & 4]
- ✓ Fun & excitement [1 & 12]
- ✓ Diffusiveness, whether the App will be accepted, mentioned, and spreaded easily and fast [13]
- ✓ Social support [1 & 2]

The factors may influence the designed system, the using behaviour, and the interaction between users, systems and social network (Figure 1).

Based on the framework, users' attitudes toward well-being Apps can be visually presented with an infographical system (Figure 2) similar to the ones often used to analyse roles in strategic role playing games (RPG). It visually provides both overall and individual strengths and weaknesses of the App.

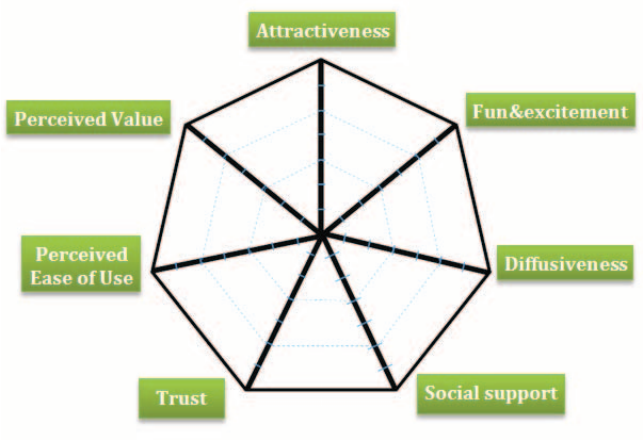

Figure 2. Framework for user attitudes for designing persuasive and engaging mobile App

1.5 The selection of applications

The purpose of this study was to understand users' attitudes toward taking well-being Apps into use, and to grasp influential factors for their decisions. Twelve Apps (Table 1) were selected from thousands of well-being Apps we found in App Store (iPhone) and Android Market (Android) in May 2011. The selection was based on our design goals: focusing on mental well-being and balanced lifestyle, and going beyond self-tracking. The Apps were initially evaluated by the three experts in persuasive design, user experience, and well-being technology.

App-name	*Characteristics*
miMood (miM)	Mood-tracking over time, option email mood history
Mood Runner (MoR)	For female users, self-monitoring emotional patterns w/ diet, exercise, sleeps, stress, energy level, sex drive and menstrual cycles. Lack of social features.
LiveHappy (LiH)	Survey input, therapeutic guides for happiness and mood, connect to Twitter or Facebook, innovative intervention
Healthy Habits (HeH)	Self-tracking new/old habits, reminders/encouragement features
SeemyCity (SmC)	Recommend ways to explore a city based on user type
Anger Coach (AnC)	Survey input, therapeutic guide for anger management, tool-like
Moodkit (Mok)	Cognitive Behaviour Therapy, survey input of social, sport, productivity, enjoyment & diet, commit to actions
Awareness Lite (AwL)	Visually attractive, aphorism, mood lifting by rehearsing peace
My Balance (MyB)	Self-monitoring life balance with nutrition, fitness and lifestyle
Mood Meter (MoM)	Automatic data collection, present moods by droid smiley, motivation messages, humorous but with modest content
My CalmBeat (MCB)	Reduce stress by practice breathing, "great simple idea"
T2 Mood Tracker(T2M)	Self-monitoring mood based on daily events for targeted groups

Table 1. Selected Apps

Expert evaluations provided initial insight into strengths and weaknesses of the Apps. The applications were ranked based on the overall grades given by the three experts (Table 2) [11]. To get feedback from potential users we carried out an online survey study to investigate what kinds of design decisions would be considered attractive by users or were seen as barriers to use, and what the potential usage contexts would be.

In the following, we first describe the user survey design in the Methods section, followed by the Results section, which presents the results of the survey. We then go on discussing the findings, and conclude by reflecting on findings with the proposed framework.

Rank	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
App	LiH	MoK	HeH	MoR	MCB	T2M	AnC	MiM	MyB	AwL	MoM	SmC
PD	13	12	5	3	3	2	7	2	1	6	3	3
WT	4/5	4/5	3/5	2/5	2/5	2/5	2/5	2/5	2/5	2/5	2/5	1/5
UA	4/5	3/5	4/5	3/5	4/5	4/5	3/5	3/5	3/5	3/5	2/5	2/5

Table 2. Overall rankings and individual marking from Persuasive Design principle occurrences (PD), Well-being Technology rating (WT), and User Acceptance rating (UA)

2. METHODS

2.1 Survey design

We carried out an online survey, where we simulated the real life situation where users make decisions of taking Apps into use. The survey started with a short introduction of the study's aims, followed by the twelve pre-selected Apps introduced in an order based on the experts' rankings (high to low, in Table 2). Information of the Apps was extracted from the online market page to mimic the actual user experience when users decide whether to download the application and use it (see example Figure 3).

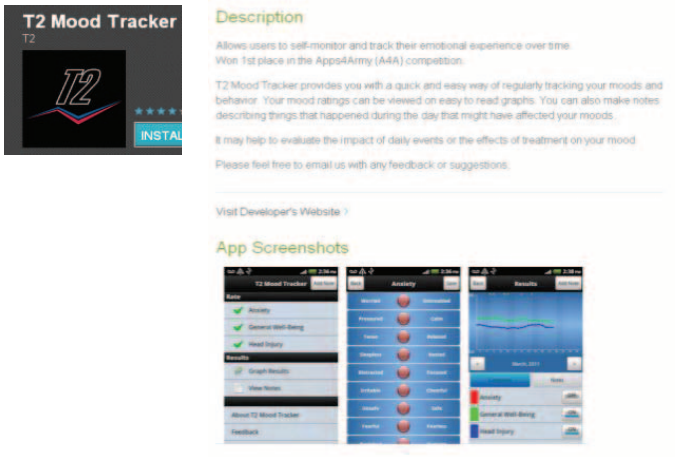

Figure 3. An example of App information in Android Market.

Following the App introduction, a series of semantic or open-ended questions were presented based on the proposed framework.

The main questions were related to attitudes towards taking the App into use. The questions were single choice questions (from "totally agree", "somewhat agree", "somewhat disagree", "totally disagree", or "I don't know"):

- I would download this App and use it. (overall take-into-use)
- This App seems easy to use. (perceived ease of use)
- I find this App attractive. (attractiveness)
- This App suits my needs. (perceived value & personalization)
- I find this App exciting. (fun & excitement)
- This App seems useful. (perceived value)

- This App seems fun. (fun & excitement)
- This App seems safe and trustworthy. (trust)
- I would consider mentioning this App to my friends or family. (diffusiveness)
- I would like to connect my Facebook profile with this App. (social support)
- I would like to use this App because: (open-ended comments)
- I don't want to use this App because: (open-ended comments)

The supporting questions were related to the following themes:

- Demographics (genders, age, and geographic location)
- Participants' mobile phones
- Participants' prior App use (general and well-being related)
- Participants with Facebook profiles
- Questions regarding personal interests to improve well-being in following areas: Exercise and physical activity, Diet and nutrition, Weight management, Stress management, Sleep quantity and quality, Social relationships, Leisure time, Mental well-being

2.2 Participant recruitment

Invitations were sent to several university-based international newsletters and posted on a few Facebook groups and discussion forums. Lotteries for movie tickets and i-Tunes gift cards were drawn at the end of the study.

3. RESULTS

3.1 Participant characteristics

68 participants responded within a week (July 5-11) and spent averagely 28 minutes to complete the survey. There were 36 females, 30 males and 2 undisclosed participants from around the world (34 from Finland, 11 from the rest of EU, 17 from USA, and 6 from the rest of the world).

25 participants used Android phones, 16 used iPhones, 22 used other smart phones, and 19 used other phones. 52 participants had previously downloaded and used mobile Apps, and 29 of them had used health or well-being related Apps (web or mobile). 46 participants said they would consider using mobile Apps to help daily well-being. 58 participants had a Facebook profile. Participants showed personal interests to improve well-being in the following areas: Exercise and physical activity (58), Diet and nutrition (48), Weight management (41), Stress management (51), Sleep quantity and quality (36), Social relationships (32), Leisure time (36), and Mental well-being (39). Out of all 68 participants, 13 were interested in well-being improvement across all areas.

3.2 User attitudes

Based on the answers to each question for each App, the twelve Apps were ranked based on the overall preferences. Table 3 presents these rankings, percentages of participants who said they would download and use the selected App, and the total numbers of positive and negative comments given for each App.

App	Expert Rank	User survey			
		Rank	Download & Use	Positive written comments	Negative written comments
LiH	1	6	37.0 %	23	32
Mok	2	5	39.7 %	18	28
HeH	3	3	49.5 %	23	18
MoR	4	9	29.7 %	14	29
MCB	5	4	41.7 %	21	22
T2M	6	8	30.3 %	13	28
AnC	7	12	19.3 %	11	28
MiM	8	11	28.1 %	9	26
MyB	9	2	54.2 %	21	17
AwL	10	7	30.7 %	11	22
MoM	11	10	28.2 %	10	21
SmC	12	1	55.7 %	20	16

Table 3. User rankings, answers to "I would download and use this app", positive or negative written comments

3.3 Applying proposed framework on user attitude studies

Users' attitudes were corresponded to the factors defined in the proposed framework –

- **Attractiveness** for engaging user experience **(A)** and users' responses to "*I find this App attractive*";
- **Value (V)** and users' responses to "*This App suits my needs*";
- **Ease of Use (U)** and users' responses to "*This App seems easy to use*";
- **Trustworthiness (T)** and users' responses to "*This App seems safe and trustworthy*" ;
- **Fun & excitement (F)** and users' responses to "*I find this App exciting; this App seems fun*";
- **Diffusiveness (D)** and users' responses to "*I would consider mentioning this App to my friends or family*" ;
- **Social sharing (S)** and users' responses to "*I would like to connect my Facebook profile with this App*".

The results for each evaluated App are presented in the following sections. Open questions provided a lot of additional insights especially into the reasons for not wanting to take an App into use. Selected positive and negative written comments are provided below for each App.

3.3.1 Live Happy (LiH)

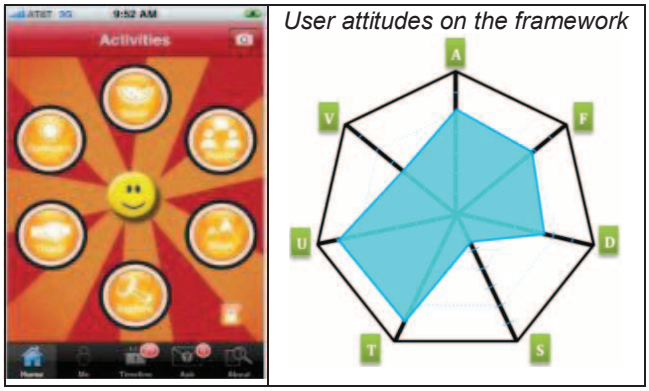

Table 4. Live Happy user ratings and comments

Live Happy (Table 4) provides personalized suggestions and activities based on positive psychology to improve happiness and mood. It also gives an option to connect to Twitter and Facebook.

Users' were generally in favour of the positive feelings the App would help to arouse but a common concern was the large amount of effort it requires to use. While Live Happy was the

top-ranked App in expert evaluations, it was ranked 6th by the participants and 37.0% of them would download and use it. Based on the user ratings Live Happy was perceived as relatively easy to use, trustworthy, attractive, and fun, but not particularly fitting to personal needs. Positive comments included *"would help me to remember the good times", "convey positive feelings", and "seems easy to use"*. However, there are also some negative comments, such as *"useless to me"* and *"looks like a lot of work to set up"*.

3.3.2 MoodKit (MoK)

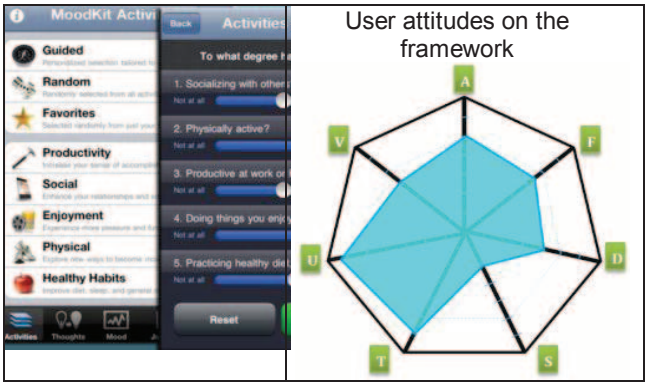

Table 5. MoodKit user ratings and comments

MoodKit (Table 5) is based on cognitive behaviour therapy and designed to help users commit to behaviour changes. It collects user inputs about mood, social interaction, exercise, productivity, enjoyment and diet.

Users responded well toward the idea of linking daily behavioural patterns to mood changes. Self-tracking was also well-received as "*helpful, practical and easy to use*". The clinical information provides a sense of professionalism and increases trustworthiness. On the other hand, the *"clinical"* feeling of the interface also gives users the feeling of *"cold"* and *"lack of visual appearance"*. Participants expressed very low desire to connect this App to their Facebook profiles, and one found it "*silly and embarrassing*".

3.3.3 Healthy Habits (HeH)

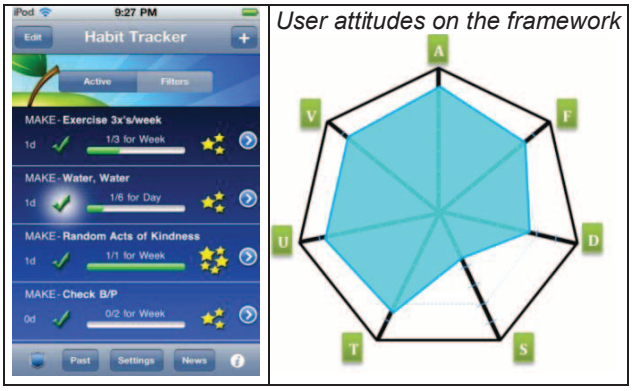

Table 6. Healthy Habits user ratings and comments

Healthy Habits (Table 6) supports users in tracking various habits. It provides reminders and includes customizable encouragement features (badges, postcards).

The participants considered it one of the most attractive, exciting, fun, useful, and valuable Apps. They found *"monitoring habits, reminders, setting goals, guides to action"* very helpful. The "*outfit*" appeared to "*informative*" and *"interesting*". However, participants felt some resistance towards a mobile App telling them what to do. Some participants also found the UI a bit "*crowded*". 26% of respondents would connect this App to their Facebook profiles, but there was still reluctance to display one's habits to the entire social network.

3.3.4 Mood Runner (MoR)

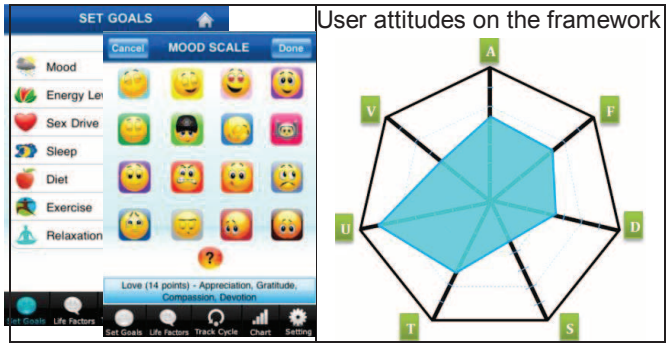

Table 7. Mood Runner user ratings and comments

Mood Runner (Table 7) is mainly designed for female users for self-monitoring emotional patterns with diet, exercise, sleep, stress, energy level, sex drive, and menstrual cycles. It provides a set of selectable mood icons, but lacks social features. The icons of smiley faces clearly divided opinions.

Participants either found it "*cute", "intuitive and fun", "a nice touch", "attractive UI"*, or *"childish", "horrible", "Weird", and "not convincing"*. Some of them considered it valuable to have as it is "*a package with many functions*" and "*combination of automatic tracking with self-tracking*". While MoR was seen as easy to use, fun, valuable, Facebook-friendly and worth mentioning it to family, less than 30% of the participants stated they would download and use it (the 4th lowest ranking). We would suspect the reasons being the smileys and the female-oriented features, based on the negative comments.

3.3.5 My Calm Beat (MCB)

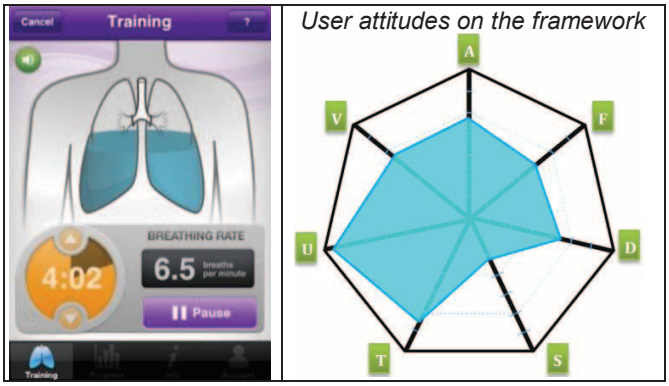

Table 8. My Calm Beat user ratings and comments

My Calm Beat (Table 8) is designed to reduce stress by practicing breathing, specifically, by simple instruction with pace and timing. Experts considered it a "*great simple idea*".

Respondents saw a good value in it and would consider mentioning this App to their friends and family. It gains trusts by presenting "*scientific method/concept with simply exercise*". Participants responded that they can even imagine their doctors recommending this App to them, and one had already downloaded this App on their iPhone. As it is considered a situational App, some users did not find it useful toward their personal needs. The interface was appreciated for demonstrating its professional information in an intuitive way (2nd highest as easy-to-use).

3.3.6 T2 Mood Tracker

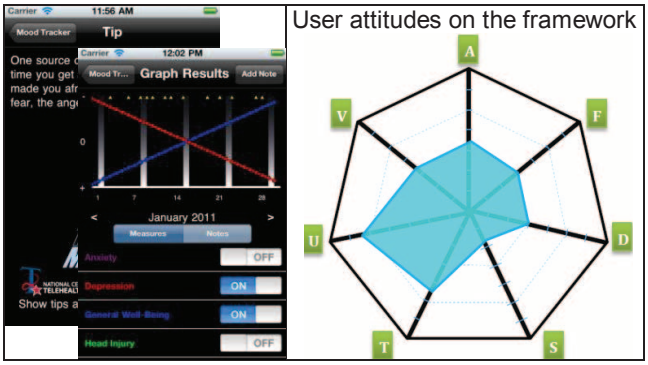

Table 9. T2 Mood Tracker user ratings and comments

T2 Mood Tracker (Table 9) is designed for self-monitoring mood based on daily events for targeted groups. Although some respondents found it *"easy*", "*simple*" and "*quick to use*" many more showed their dislike toward the interface as it had *"old-fashioned graphics*" and *"lack of eye-candy or anything that'd make it special"*. Respondents also reacted strongly toward the introduction contents which mentioned *"head-injury"* to be included in the target user groups as well as how negative mood history will not help to build positive future moods. The application was particularly low-ranked in excitement and fun (2nd lowest).

3.3.7 Anger Coach (AnC)

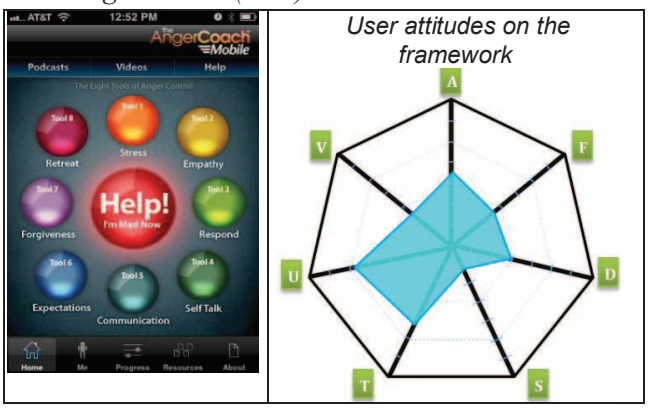

Table 10. Anger Coach user ratings and comments

Anger Coach (Table 10) is designed as a therapeutic guidance tool for anger management. It provides personalized advice to help to deal with daily stresses.

Although some participants showed curiosity toward this App, only 19% responded that they would download and use this App (lowest; the 2nd lowest had 28%). Most participants felt that this App did not suit their needs, even though it looked "*quite professional and trustworthy*" and "*could be useful for someone I know who has an anger problem*". Participants responded in fear of being associated / labelled with anger problems to their Facebook friends. The negative sound of the name and the design using black and red theme were mentioned as reasons why not to use the application. Negative feelings toward this App were explained e.g. as "*it seems weird", "I would not like to share my anger level with my Facebook friends", " I'm not a very angry person"* and *"would you stop in the middle of your anger and really use this?"*.

3.3.8 miMood

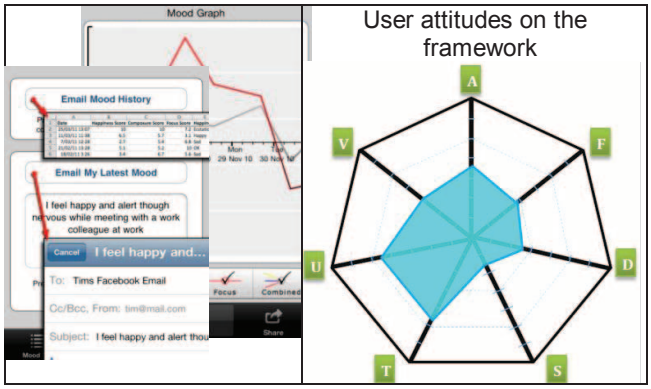

Table 11. miMood user ratings and comments

miMood (Table 11) is a App that track mood over time, with an option to email mood history to others and/or share it on Facebook. It is a simple and self-descriptive App for tracking mood. However, it was rated the least persuasive by the persuasive design experts, and got least positive comments from respondents. Users found it *"too simple*" and "*seems useless*" as "*it doesn't give actionable information"*. The UI was considered "*boring*" and *"not attractive", "definitely made by IT guys"*. A great deal of concerns were expressed toward sharing moods on Facebook as *"moods directly as facebook status feels not private enough", "this app is too much about mood sharing",* and *"too intensive, too much work"*.

3.3.9 MyBalance

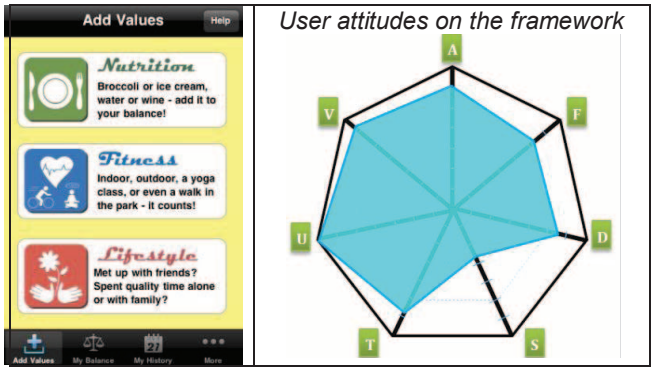

Table 12. MyBalance user ratings and comments

MyBalance (Table 12) is designed for self-monitoring and managing a balanced life with nutrition, fitness, and lifestyle. Although it was also considered by the experts one of the least persuasive Apps in the selected pool, MyBalance turned out to be the second favourable by the participants and over 54% of them would download and use it.

Participants found it *"motivating", "fun and informative", "tracking things that's important in life", and "exactly what I want"*. The idea of associating a balanced life with well-being was very well received. The UI was considered "*nice, clear and simple enough to use*" and somehow brought out several personal stories regarding health and well-being. Several participants mentioned that they have already been tracking their diets with various tools therefore this App would not be so useful. Some negative comments were made about the font style. MyBalance was rated the most useful App and participants found it highly valuable, easy to use, and trustworthy.

3.3.10 Awareness Lite

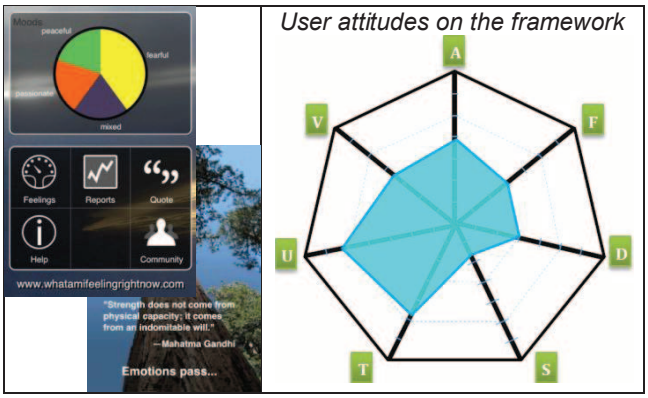

Table 13. Awareness Lite user ratings and comments

Awareness Lite (Table 13) is the free version of the Awareness Pro. It provides mood lifting interventions by meditative exercises. It is visually attractive and includes lots of aphorisms.

Participants appreciated the visual design and found it "*a fun way to read quotes on emotions*" as it promotes awareness and provides calming and peaceful theme. Nevertheless, some participants also regarded inspirational quotes to be *"irritating", "hippie", and "too touchy feely"*.

3.3.11 Mood Meter

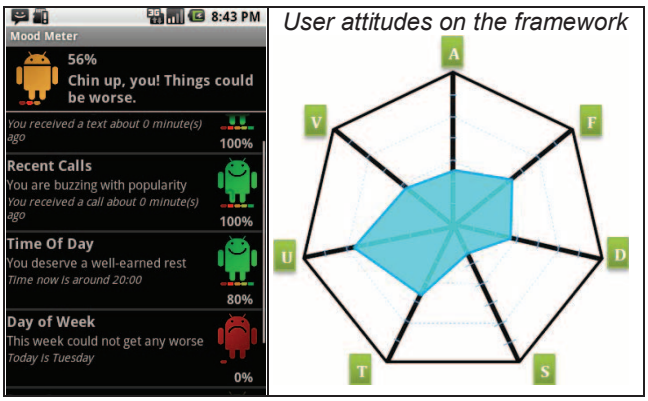

Table 14. Mood Meter user ratings and comments

Mood Meter (Table 14) collects user data automatically via phone usage and contextual information; it presents mood scores with droid smiley as well as motivational messages if the mood score is low.

It was considered humorous but with modest content. Most respondents reacted to the automatic tracking of usage data very well although many found it questionable for an App to be able to interpret their happiness or mood. Several participants worried about the negative feedback from this App because it measures the level of social interaction only through the phone. Some participants also found it potentially dangerous as *"social nightmare if someone uses my phone and see it"*. The UI was considered "*childish", "creepy*", and "*not well developed*".

3.3.12 SeemyCity

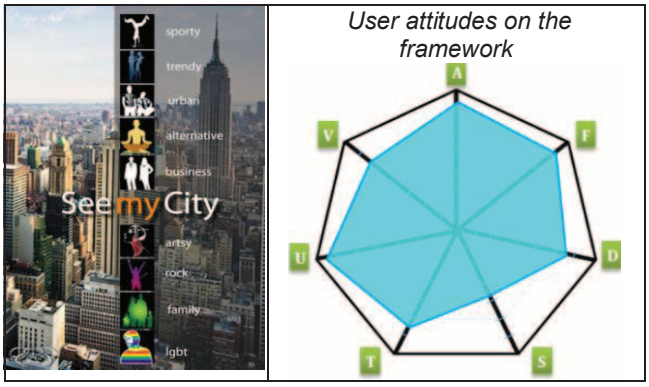

Table 15. Mood Meter user ratings and comments

SeemyCity (Table 15) gives recommendations to explore a city based on the user's mood type. It was selected based on its personalization and recommendation features, but experts considered it less relevant for health promotion.

Most participants found the idea of mood-based exploration original, useful, and fun, although many felt it was questionable to be categorised by stereotypes. GPS tracking worried several participants. The comments reflect a similar misunderstanding as the researchers initially had, that this App is *"overlaying mood and geo-location data could be very useful, in aggregate"*. Therefore, it sounds like *"a very nice and original idea, I even download it", "fun idea, looks nice and fun in practice"* and *"a good app, unique perspective"*. It also raised concerns such as *"I'd worry I'd miss out on cool stuff because it doesn't fit my type…", "interesting idea but I don't identify with 'tipo'(stereotype)", "probably like Yelp, a bunch of opinionated nobodies rate the spots"* and *" "False definition of friendship"*.

4. ANALYSIS OF INFLUENTIAL FACTORS

Figure 4 visualizes all participants' attitudes toward the twelve applications in all factors on the proposed framework, From Figure 4 we can identify an almost-general lack of design for ***social support***. We can also identify large varieties of ***perceived value***, ***attractiveness, fun & excitement,*** and ***diffusiveness. Ease of use*** is perceived good or at least moderate with all the applications. ***Trust*** towards the applications also seems to be at least moderate.

We further looked into the correlations between questions and were able to trace some reasons that influence users' decisions whether to take the mobile applications into use. In particular, **Download & use** is highly correlated with **Needs** (0.8073), **Excitement** (0.7016), and **Usefulness** (0.7185). **Social support** is correlated with **Sharing with friends & family** (0.6096), and **Sharing with friends & family** is correlated with **Usefulness** (0.7143).

Furthermore, user attitudes toward the twelve Apps' regarding **Attractiveness** and **Fun & excitement**, seem to fall into three categories (Figure 4): application highly fun and attractive, the average ones, and the not-so- fun and attractive ones. The

categorization results matched the **Perceived value**, which again, answered Norman' statement "attractive things work better" [12].

The survey respondents were asked to describe why they would like to use and why they would not like to use each application. Main reasons to use an application were related to the perceived value. The participants appreciated the possibility to see records of their activities and thought that these applications could help in changing their habits.

Fun and curiosity were also often mentioned as reasons to use. Attractive user interface was mentioned often, as well as simple and straight forward user interaction. Trust-related usage motivations were described with attributes such as clinical, professional and scientific. These qualities seemed to raise trust towards the applications.

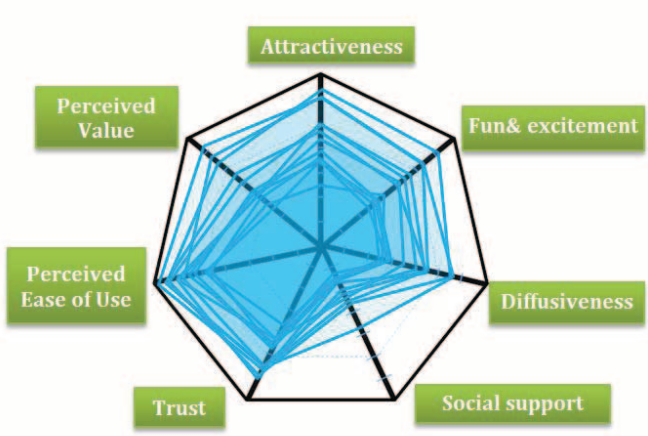

Figure 4. All twelve Apps mapped on the framework

When respondents mentioned reasons why they would not use an application, trust-related reasons were mentioned most often. The respondents felt that their privacy was threatened and that the applications dealt with too personal issues. Often the respondents did not feel that they were part of the target group of the application, and thus did not see value in it. A common reason not to use the application was non-attractive user interface and a feeling that usage and maintenance would cause too much effort.

The written comments reflected quite well our framework, as most of the comments were related to some of the factors of the framework. In the following we will analyse the written positive and negative comments for each factor of the framework. This analysis aims to highlight the kinds of application qualities that may affect the attitudes of the users.

4.1. Perceived value

In terms of users' **perceived value** of the twelve Apps, their considerations and preferences seemed to be given toward over-all well-being Apps, as MyBalance and Healthy Habits got best grades. However, in the written comments the participants also valued simplicity and clear focus. The participants pointed out the value of self-knowledge: "*it would help me track my health priorities*" and self-guiding: "*this could motivate me*". Long-term data on own behaviour was considered interesting as such and the users pointed out how they could analyse the data and learn from it: "*Nice to chart my moods and see what is causing the bad ones*".

With applications with low value the participants most often mentioned that they did not recognize themselves as the target group for the application: *"Self mind-coaching is not for me*". The term *"useless*" was often mentioned.

The results highlight that there seems to be room both for overall health applications that are covering many fields and to focused applications that are supporting single health or behaviour issues.

4.2. Perceived ease of use

When the users assessed the **ease of use** of the applications without actually using them, they commented perceived ease of use often with the terms "*simple*" and "*straightforward*", also nice-looking interface was connected to the comments of ease of use: "*looks nice, relevant and simple enough to use*".

On the other hand negative comments related to perceived ease of use were most often related to perceived complexity: "*too complicated*", "*too many reminders*", "*too much work*", "*too time-consuming*". Efforts related to setting up the application were also often mentioned: "*looks like a lot of work to set up*".

In this study the applications got quite good grades on ease of use, however, the results highlight that before actual use, users are often assessing the ease of use based on perceived simplicity versus complexity.

4.3. Trust

All the applications got at least moderate grades regarding **trust**. In the written comments the users based their trust on professional or scientific appearance: "*seems scientific*", "*looks professional*". Trust could also be based on conveying positive feelings.

However, lack of trust was the most common issue why participants would not have wanted to start using the application. Concerns about privacy were often expressed, and some applications were seen as too intrusive, too creepy, too personal or too exposing. Some participants commented that they did not trust machine over a human: "*I don't like to put my psychology on mobile. Hey, it is a machine!"* Trustworthiness was sometimes assessed based on the appearance of the application: "*Looks childish and not very convincing", "Looks dangerous".*

Trust was often mentioned as the reason why not to use an application. It is worth considering, how to convey trust in the appearance of the application. Obviously it is essential to design the applications for trust, and take proper care of data protection and privacy issues. It is also worth considering how reliable the provided solution for a given issue is, and what kinds of conclusions can actually be made of the measurements.

4.4. Social support and diffusiveness

Social support and **diffusiveness** were not often mentioned in the written comments, so it seems that these are not the main factors why people decide to start using an application or not. **Social support** got quite low grades with all the applications except for SeeMyCity. It has to be kept in mind that most of the applications in this study did not include features for social sharing. The idea of Facebook sharing clearly raised privacy concerns: "*I would never share my mood on the internet"*.

Although participants were very clear about the idea of *"linking the App to Facebook"* and *"mention it to friends and family*",

many remained skeptical. The only two Apps participants mentioned that they would download immediately were the two Apps rated comparatively high in **diffusiveness** (My Calm Beat and SeemyCity).

Designing a successful well-being App must consider its social use, so that it will be quickly-accepted, mentioned, and spread easily and fast. Many participants had concerns regarding connecting the Apps to Facebook because of privacy and the representation of their personal matters. One solution could be to apply positive design and / or gamification to represent personal data in a more engaging and fun way to share and to "**play**" [14].

4.5. Fun and Excitement

Fun and excitement grades varied a lot between the applications. Actually the term "***fun****"* was repeated quite often in the written comments, as well as "*interesting*" and "*curious*". The users gave usage motivations such as "*fun idea, looks nice and fun in practice*" and "*curious which advice will be given*". On the other hand in the negative comments the participants were using attributes such as "*silly*", "*embarrassing*", "*annoying*", "*childish*" and "*irritating*". These comments reflect that the participants felt that they would not be respected as users.

Based on these results it seems that fun and excitement can influence the decision to start using an application. It seems important to provide to the user some kind of surprise elements. On the other hand the user has to be respected, and (s)he should never feel embarrassed or annoyed when using the application.

4.6. Attractiveness

Similar to fun and excitement, **attractiveness** grades also varied a lot between the applications. Visual attractiveness was often mentioned as a reason to start using an application, e.g. "*the design is cute*" or "*UI looks attractive*". Negative comments regarding attractiveness included often terms such as "*boring*" and "*ugly*". The participants were not interested in applications that looked unfinished, old-fashioned or just did not differentiate. They commented for instance "*this is definitely made by IT guys*" and "*lack of eye candy or anything that'd make it feel somehow special*".

Attractiveness was mentioned quite often both in positive and in negative comments, so it seems to affect the decision to start using an application. It is important to differentiate from the mass and to provide professional and finalized appearance.

5. CONCLUSIONS

Our framework to study user attitudes towards wellbeing applications was built in cooperation with multidisciplinary experts in persuasive design, user acceptance and well-being technology. The framework was evaluated by using it as the basis of a survey where users assessed 12 mobile well-being applications. The proposed framework worked well as the basis of the online survey to gather user insights and initial attitudes toward taking well-being Apps into use. The framework helped to compare mobile applications systematically. By first answering their decisions on whether to download and use the App, and then answering simple and straightforward questions built on the proposed framework, users were able to give clear opinions about each App, and we were able to compare the results and learn from them.

The participants completed their grades with detailed personal opinions and comments. Users' feedback to the reasons why they would or would not like to use the applications were focused on whether the applications fit their needs, if they liked the interface or appearance, whether Apps sounded interesting or trustworthy, if they were relevant to their needs or to their family and friends, and privacy issues especially regarding Facebook connection. Thus the written comments were well aligned with the factors of our framework. However, the survey questions may have directed participants to assess those qualities that were included in the survey.

The survey results visualized in the infographics highlight clearly the overall qualities of the application entity that was studied, and the results help to identify improvement areas. Ease of use and trust were assessed moderate or good with almost all applications whereas variations could be identified with the factors perceived value, attractiveness as well as fun and excitement. Social support was missing from almost all applications and the diffusiveness was quite low. Nonetheless, our definition of social support was arguably fairly narrow, since it mainly referred to willingness to connect the app with Facebook.

Users valued both overall health applications that were covering many fields and focused applications that were supporting single health or behaviour issues. Ease of use was often assessed based on perceived simplicity versus complexity. Trust-related issues were often mentioned as the reason why not to use an application, so ways to design and convey trust are important considerations in mobile well-being applications. Expected fun and excitement were common reasons to use an application. The participants were expecting some kinds of surprise elements. On the other hand the users were very sensitive for threats of feeling embarrassed or annoyed when using the applications. Positive attractiveness qualities that participants highlighted were differentiating from the mass as well as professional and finalized appearance. Social sharing and diffusiveness turned out to be very interconnected; if an App was felt useful, and users were willing to connect it with Facebook, they would then gladly mention or pass on these Apps to their friends and families. Participants were worried about sharing their well-being data in social network. Especially mood data was considered sensitive. The potential social stigma from using Apps which target negative traits was a significant usage barrier in the case of Anger Coach; many participants told that they would not like to be associated to Anger Coach.

Over 50% of the participants said they would download and use the three highest-rated Apps: Healthy Habits, MyBalance, and SeemyCity. These three Apps appeared, at least on the surface, to provide useful assistance with a proper amount of tracking of relevant data. Their interfaces usually communicate easily to the potential users with simple yet attractive ideas. Both MyBalance and Healthy Habits provide personalized overall well-being information based on collected data. In contrast, five Apps (Awareness Lite, T2 Mood Tracker, Mood Runner, Mood Meter, and miMood) would have been downloaded and used by 30% or less people, and one App, Anger Coach, would only get 19% of users to download and use it. This seems to reflect the situation in current App markets, where a large amount of Apps are available but only few are viewed and even fewer are put in to test / use. Moreover, these less desirable Apps all covered more

sensitive topic, mood, and appeared to fail to present their functions in an attractive, fun and socially acceptable way.

Some gaps were identified between the expert evaluation results and user preferences / feedback. Experts and users held similar preferences to Healthy Habits and My Calm Beat, compared to least-favouring T2 Mood Tracker, MiMood, and Mood Meter. On the other hand, contrast opinions between experts and users were given to Live Happy, Mood Runner, Anger Coach, and SeemyCity. Certain characteristics of mobile Apps seemed to alert users, namely the name of Anger Coach, the smiley faces on Live Happy and Mood Runner which users either loved or hated, and the false advertisement of SeemyCity (that recommendations can be based on moods rather than just shallow categorization).

Certain limitations need to be considered in this study. 1) SeemyCity turned out to be not as relevant as we first understood from the description page, but was very well-received by participants; 2) potentially the sample respondents might have been biased and not representative of the general population.

6. FUTURE WORK

From this study we were able to understand various complex factors influencing users' attitudes toward taking well-being Apps into use. Our goal was to learn from existing applications for designing new well-being applications. An ideal application could include Awareness Lite's interface (attractiveness), SeemyCity's fun and exciting yet practical goal, provide balanced support as MyBalance (answers need, useful, would mention to friends and family), be based on trustworthy sources such like Moodkit and My Calm Beat, provide positive feelings equivalent of LiveHappy, and represent data in an easily understandable way as Healthy Habits. Furthermore, it would be able to automatically gather relevant user data in the same manner as Mood Meter attempts to, but it would never have a stigmatizing name like Anger Coach.

The proposed framework was applied and examined by user feedbacks, in comparison to the original criteria supported by experts from persuasive design, user acceptance, and well-being technology. We believe that this framework can provide value both for designing mobile Apps for well-being and serve as evaluation framework for future studies.

Our future plans include using the framework as the design framework in designing our own application and further using it as the evaluation framework. To design engaging user experience for well-being mobile Apps, the design challenges of fun, attractiveness, and excitement should be thoroughly considered. We are considering approaches such as serious games, gamification, and positive design.

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