# Design Guidelines for a Mobile App for Wellbeing of Emerging Adults

*Research-in-Progress*

**Michael Hermano**

Information Systems School
Queensland University of Technology
m.hermano@qut.edu.au

**Glenn Stewart**

Information Systems School
Queensland University of Technology
g.stewart@qut.edu.au

## Abstract

Mental health of young people may be improved through the use of mental health mobile applications, because young people engage with this technology freely. Mental health of young people is improved through the application of positive psychology, studies of which show that regular practice of one's signature strength increases happiness and wellbeing, while decreasing depression. The issue is how to develop a mobile application intervention so that regular practice of one's signature strength in novel ways occurs. This research project seeks to develop design guidelines discovered through the application of design thinking, actively working with emerging adults. In addition, this research is framed by the Design Science Research methodology to ensure that the resultant application is relevant and tested rigorously. This paper discusses the theory behind the application and discusses the research methods and research design, and will share the preliminary findings of the discovered design principles.

### Keywords

Design science research, design thinking, emerging adults, positive psychology, character strengths and virtues, mobile applications, mental health, well-being.

## Introduction

The world population reached 7 billion in 2011, of which 43% were young people under the age of 25 (UNPA 2011). There is a pervasive presence of mental disorders in the general population and most have its onset before the age of 25 (Kessler et al. 2009; Patel et al. 2007). Young people of this generation and future generations face the compelling challenge of being mentally healthy, with up to 25% suffering from a mental health issue in the last calendar year. Implications of serious mental disorders such as anxiety and depression can be chronic and disabling (Cosgrove et al. 2008); as such, further development of these disorders may lead to deliberate self-harm and suicidal acts (Beautrais 2000; Harrington 2001). Depression, anxiety, and, substance abuse and dependence are the most commonly reported mental health issues of young people between the ages 12 to 25 years old (Birleson and Vance 2008; Cheung and Dewa 2007; Fergusson, Beautrais and Horwood 2003).

Shifting our attention to young people is the first step in dealing mental health problems, however, actually improving the mental health of young people requires a better engaging strategy. Experts agree that early intervention could reduce the scale of mental health problems and possibly bring long-term positive outcomes (Hernan, Philpot, Edmonds and Reddy 2010; Kelly, Form and Wright 2007; McDougall 2011). Untreated or delayed treatment of mental disorders could impact young people's performance in education, social relationships, and occupational achievement, which may impact their long-term mental health (Harris et al. 2005; Jorm 2009). In extreme cases, one may suffer from major mental disorders that may lead to suicidal thoughts and acts (Cheung and Dewa 2007; Fergusson et al. 2003; Hernan et al. 2010). There is a compelling need for more effective early detection and intervention program.

This research conveys a different point of view on young people's mental health issues. First, through understanding the needs of a specific age group of young people – emerging adults, aged between 18 to 29. Secondly, through the application of Positive Psychology (Peterson, Park and Seligman 2005) which

has demonstrated that developing one's signature strengths in novel ways leads to happiness and increase in wellbeing (Gander et al 2012, Mongrain and Anselmo-Matthews 2012). Thirdly, today's smart device enabled world provokes a question if there are means to encourage regular practice using smartphones. This paper reports on research in progress to develop engaging activities using human-centered design approach to derive design principle in encouraging regular practice of one's signature strength.  The design guidelines required to encourage regular practice of a signature strength through a mobile app is the focal research question for this study.

This paper commences with a literature review and the posing of the research questions.  It then describes the research design and the progress to date.  It closes by discussion of the current and future phases of research.

## Literature Review

Motivated by the call to address young people's wellbeing needs, the literature review embarked with the focal questions – *Why are many young people at risk in experiencing mental heath disorders? What theories are available to ameliorate this risk? What intervention techniques can be employed to support the selected theory, in a way that is engaging to the target group of young people?*

This literature review commences with reviewing emerging adults (the context) and closes with a review of positive psychology (the kernel referent theory).

### Target Audience: Emerging Adults

Emerging adulthood is a life stage that describes the phenomena found in the developmental experiences of young people between the period of post-adolescence but not yet having reached adulthood and its concomitant responsibilities (Arnett 2000). Emerging Adulthood is a cultural theory that differentiates the young people of the 21st century over that of the late 20th century's. Primarily driven by societal and economic changes, young people of this generation experience delays in committing to long-term adult roles such as marriage and parenthood; furthermore, they are presented with a plethora of career options for work and education (Arnett 2004) and many emerging adults experiment with different career and education streams during this phase. Emerging adulthood is the time in which young people start to seriously think about the world they are living in (Arnett 2003) and delay in commitment to study, career stream and relationships.

Young people experiencing emerging adulthood are found to be common in industrialized countries, and are mostly prevalent in western countries such as America (Arnett 2000; Facio and Micocco 2003), European countries (Buhl and Lanz 2007; Macek, Bej ek and Vaní kavá 2007), and industrialized societies in Asia such as China (Nelson and Chen 2007; Nelson, Badger and Wu 2004) and Japan (Rosenberger 2007). Consistent to the description of experiences in emerging adulthood, Australian young people are found to have the same phenomena (Stanwick et al. 2013). Emerging adulthood is a cultural theory, and how young people experience this life stage is greatly influenced by their cultural beliefs (Arnett 2011). Emerging adults are generally young people between the ages of 18 to 25 (Arnett 2007) while in some other countries, mostly European, it may extend up to the age of 29 (Buhl and Lanz 2007).

As Arnett (2004) reviewed key developmental psychology theories, he argued that the process of identity formation begins in adolescence but mainly takes place in emerging adulthood. The scope and degree of identity exploration and experimentation during emerging adulthood are greater for most people in any life stage due to its lack of social role constraints and little normative expectations (Arnett 2004; Arnett 2001). Emerging adults' identity exploration concentrates in three areas: love, work and worldviews (Arnett 2000). As they have mostly just gained independence from adolescence, their experiences in exploring these areas often lead to confusion (Arnett 2005). Their experience in exploration and changes in life direction defines a distinct period of life course with five main features that are most common during emerging adulthood (Arnett 2007). These features begin to be expressed in adolescence and continue to exist in young adulthood; however, it is during emerging adulthood that they reach their peak (Arnett 2011).

Emerging adulthood is the age of identity explorations and high instability. Emerging adults' continuing identity construction is greatly influenced by explorations in love and work (Arnett 2004). Their emphasis in finding their work interests while realizing their distinct capabilities lead to frequent changes in college education and work occupation (Arnett 2000). This trying out of various possibilities often resulted in inability to find something that is satisfying and fulfilling (Arnett 2007). In love, emerging adults seek for qualities of a person that suits them while also adapting to how others evaluate them, which often result to disappointment, disillusionment, and rejection (Arnett 2011; Arnett 2006). Explorations in this area involve trial and error that lead to frequent changes during this life course and it is highly influenced by their likes and dislikes.

Emerging adults are the most self-focused age group. They are mostly free of obligations and commitments in long-term job, marriage, and parenthood (Arnett 2004); the attachments in these permanent roles usually take place in late twenties or early thirties (Arnett 2001). During emerging adulthood young people develop skills for daily living and make decisions about daily living to gain better understanding of themselves (Arnett 2000). Most decisions they made do not have the 'others' as part of consideration; these decisions are primarily focused in self-development (Arnett 2011) towards being self-sufficient (Arnett 2006). The frequency and complexity of role transitions during this life stage depict the difficulties in defining what it means to be doing well (Wyn and Woodman 2006).

Emerging adults often feel "in-between"; they do not consider themselves as adults yet, while having just freed themselves from their parents' supervision (Arnett 2000), they start to define and make sense of their own criteria of what constitutes an adult to them (Arnett 2005). More often than not, their set of criteria is mostly derived from their values and beliefs that are greatly influenced by their ethnic background and culture (Arnett 2003; Arnett 2011). In most cases, being an adult for them means to be able to accept the responsibility of their own actions, to decide for their own beliefs and values, to become financially independent, and, to become as equal relationship with their parents, that is, being able to do the same things their parents are able to do (i.e., capable of supporting their own family) (Arnett 2001; Arnett 2006).

Emerging adulthood is a significant period in which young people build the foundation of their adult lives; it is the age of possibilities. To most emerging adults it is an opportunity to make dramatic changes in their lives (Arnett 2005). Furthermore, it is also an opportunity to them to transform their lives from something that they did not like about their past (Arnett 2006), an opportunity to experience positive change (Masten et al. 2004). Young people at this age have unusual high expectations in life, they believe that they will ultimately prevail and consider less about the potential negative consequences of their actions (Arnett 2005; Arnett 2006).

Emerging adulthood is a period of which incidence of risk behaviors and mental health problems are relatively high (Arnett 2005; Kessler and Walters 1998). In Australia, one in four young people aged 16-24 years experienced at least one mental disorder a year prior to a survey conducted in 2007 (Milnes et al. 2011). Anxiety (14.4%), substance use (5.1%), and depression and related affective disorders (6.2%) were the most commonly reported disorders based on the 2007 Australian Bureau of Statistics National Survey of Mental Health and Wellbeing (Milnes et al. 2011; Access Economics 2009). Similar concerns have also been reported worldwide over the years (Kessler et al. 2009; Patel et al. 2007). The World Health Organization, World Mental Health Surveys reported that mental disorders commonly occur within the general population and has its onset in adolescence (Kessler et al. 2009).

These challenges to wellbeing are exacerbated by the emerging adults experimentation in roles, careers and employment. Each of these sets of experiments may lead to increased anxiety and self-doubt, particularly if the emerging adults' parents or peers question these episodes. These explorations and frequent changes in their lives have led identity issues to become a salient part of their life (Arnett 2006). The process of identity construction is often times confusing and can be difficult. Emerging adults reflect the difficulties in defining what it means to be doing well at their life stage (Wyn and Woodman 2006) Their autonomy to make decisions has lead to frequent changes in their lives (Arnett 2004). This suggests that they struggle to find what resonates with them as an individual and may cause poor psychological wellbeing such as depression, low self-esteem, and anger (Galambos 2006).

### *Positive Psychology – Character Strengths and Virtues*

After identifying the target group of young adults and describing their particular characteristics, a psychological theory that may assist in negotiating the issues and reduce the threats of mental health was sought. This led to readings in the theories of wellbeing, both subjective and psychological wellbeing. These readings then led to the theory of positive psychology, which is addressed in the next section of this literature review.

Positive psychology promises to help young people "*develop complex skills and dispositions necessary to take charge of their lives, to become socially competent, compassionate and psychologically vigorous adults*" (Kelly 2004: 258). Positive psychologists believe that the composition of a good life inevitably relates to virtues, values, and individual character development (Compton 2005; Peterson 2004).

Character Strengths and Virtues (CSV), developed by (Peterson and Seligman 2004), is a description and classification of an individual's strengths and virtues that enable them to thrive in life (Seligman et al. 2005). It has six overarching *virtues* that are cross-culturally accepted, each of which contains a unique set of *character strengths* that portray a particular virtue. CSV are pre-existing qualities that naturally arise to individuals and are intrinsically motivating to use (Brdar and Kashdan 2010). Character strengths are positive traits that are reflected in thoughts, feelings, and behaviors (Park and Peterson 2009a); each individual character strength can also be associated with indices of wellbeing (Park, Peterson and Seligman 2004). However, when character strengths are operationalized, one may not compare across strengths due to its variability (Park, Peterson and Seligman 2004).

By default, all individuals posses all character strengths however we differ by the extent of mastery we have over them and can be measured individually (Park, Peterson and Seligman 2004; Park and Peterson 2009a). The Values in Action – Inventory of Strengths (VIA-IS) is a self-report survey that is used to measure adults' (aged 18 and above) level of mastery of CSV while VIA Inventory of Strengths for Youth VIA-Youth was designed for young people (aged 10-17) (Peterson and Seligman 2004; Park, Peterson and Seligman 2005). The resulting top strengths (i.e., top five strengths (Park, Peterson and Seligman 2006) are regarded as *signature strengths* (Peterson and Seligman 2004); the resulting rankings does not particularly portray a meaningful difference and should not be viewed in a rigid way (Park and Peterson 2009a). Character strengths that fall short as signature strength are also not necessarily weaknesses (Park and Peterson 2009a).

Character strengths are flexible; it changes over time and can be cultivated. Each of the character strengths is found to be heritable (Steger 2007). The degree of mastery of each of the character strengths may change over time in various factors and occasions such as individual's experiences and environment (Park and Peterson 2009a; Park and Peterson 2009b; Park and Peterson 2009c). The improvement of character strengths may not only come from event based, they can also be nurtured when appropriate and effective intervention program is applied (Park and Peterson 2009a). The classification of CSV are of descriptive as opposed to theory based (Peterson 2006), therefore, intervention programs designed to improve and enhance specific character strength may take inspirations from related and associated theories (Park and Peterson 2009a). The selection of appropriate character strength to enhance or improve for emerging adults is important. Knowing and applying ones signature strengths in everyday life may lead a person towards psychological fulfillment (Seligman, Steen, Park and Peterson 2005). In addition, key scholars of CSV agree that building strong character strengths may serve as a foundation to a lifelong healthy development (Park and Peterson 2008). The 24 Character Strengths (and synonyms) and their associated Virtues are shown in Table 1.

In summary, it is the regular use of ones signature strengths in a novel way that promotes wellbeing. Key research findings of the regular use of signature strengths are summarized at (https://www.viacharacter.org/www/en-us/research/summaries.aspx) and include the following studies:

• Gander et al. (2012), and Mongrain & Anselmo-Matthews (2012) found that using one's signature strengths in a new way increased happiness for 6 months and decreased depression for between three to six months (Gander, Proyer, Ruch and Wyss 2012)

• Allan and Duffy (2013) found that the use of signature strengths is particularly important for those low in meaning and purpose.

- Forest et al. (2012) found that the use of signature strengths elevates individuals' harmonious passion (i.e., doing activities that are freely chosen without constraints, are highly important, and part of the individual's identity, which leads to higher wellbeing.

- Madden, Green and Grant found (2011) that among youth, the use of signature strengths in novel ways along with personally meaningful goal-setting led to increases in student engagement and hope.

- Karris and Craighead (2012) found that for college students, humor, love, kindness, honesty, and social intelligence were most endorsed.

Thus, regular use of a signature strength has positive outcomes of happiness, wellbeing and engagement for most people. These effects may be of particular benefit to emerging adults. The key is to develop a means of encouraging regular practice of a signature strength. This is the focal research question of this project, and, to date, there is no mobile application which has been implemented to develop an individual's signature strength.

| Virtues | Character Strengths |
|---|---|
| Wisdom and Knowledge | Creativity [Originality, Ingenuity, Practical Intelligence] |
| | Curiosity [Interests, Novelty-Seeking, Openness to Experience] |
| | Open-Mindedness [Judgment, Critical Thinking] |
| | Love of Learning |
| | Perspective [Wisdom] |
| Courage | Bravery [Valour] |
| | Persistence [Perseverance, Industriousness] |
| | Integrity [Authenticity, Honesty] |
| | Vitality [Zest, enthusiasm, Vigour, Energy] |
| Humanity | Love |
| | Kindness [Generosity, Nurturance, Care, Compassion, Altruistic Love, "Niceness"] |
| | Social Intelligence [Emotional Intelligence, Personal Intelligence] |
| Justice | Citizenship [Social Responsibility, Loyalty, Teamwork] |
| | Fairness |
| | Leadership |
| Temperance | Forgiveness and Mercy |
| | Humility and Modesty |
| | Prudence |
| | Self-Regulation [Self-Control] |
| Transcendence | Appreciation of Beauty and Excellence [Awe, Wonder, Elevation] |
| | Gratitude |
| | Hope [Optimism, Future-Mindedness, Future Orientation] |
| | Humour [Playfulness] |
| | Spirituality [Religiousness, Faith, Purpose] |

**Table 1. List of Character Strengths and Virtues**
**(adopted from Peterson and Seligman 2004; Peterson, Park and Seligman 2006)**

## Means of Encouraging Regular Practice

Emerging adults live in a technology-saturated world where most have their own portable smart devices and access to high Internet bandwidth. Most of this population engage with social media and use mobile devices to maintain social contact. Many within this population make extensive use of mobile applications. Mental health providers have recognized this trend, and there is high interest in developing mobile apps directed at mental and other medical health issues.

Mobile apps developed specifically for health alone are becoming increasingly popular in major app stores (Liu et al. 2011). Mobile Health or mHealth is the use of mobile apps for health and wellness (Handel 2011). Table 2 shows how mobile apps are used in different purposes in promoting mental wellbeing. These findings were collated from existing literature that have either reviewed a collection of apps available on the market or apps that were tailor-made for the interest of wellbeing research and studies.

| Role | Description |
|---|---|
| Reference | As a reference for clinical information, psychiatric diagnoses (Luxton et al. 2011) |
| Awareness | Tracking young people's experiences of mood, stress and coping (e.g. mood journal) (Handel 2011; Luxton et al. 2011; Prociow and Crowe 2010; Reid et al. 2011)<br><br>Leads to awareness of difficulties in self-management (poor rates of treatment adherence) and points to the need for better self-management strategies (Handel 2011; Lie et al. 2011) |
| Assessment/Triage | As an assessment tool for mental health (Luxton et al. 2011; Reid et al. 2011; Goldstein et al. 2011) |
| Reminder | As a medication adherence tool (Luxton et al. 2011) |
| Coach | As a provision of therapeutic skills training (Luxton et al. 2011) |

**Table 2. Roles of mobile apps in promoting wellbeing**

The research question is now *How can one develop a mobile app which encourages the regular practice of a signature strength in a novel way?*

The output of this research will be a set of design guidelines to develop a mobile application for any one of the character strengths in the CSV model of Positive Psychology. The research method being considered to guide this work is Design Science Research Methodology. In addition, the means to develop such guidelines will use Design Thinking and Human-Centered design methods. The research method for this project is discussed next.

## Research Framework

Design Science Research (DSR) is motivated by the need of creating new and innovative IT artifacts as well as the process of building these artifacts to improve the environment and/or serve human purposes (Hevner, March and Park 2004; Simon 1996). DSR is applied in many fields and disciplines most prominently in computer science and engineering. However, a defining feature of DSR in Information Systems (IS) is learning of the transformation of *justificatory knowledge* to solve real world problems through artifact construction (Hevner, March and Park 2004; Alturki, Bandara and Gable 2012) with emphasis in rigorous evaluation and codification of newly generated design knowledge in design theories (Masten et al. 2004; Kuechler and Vaishnavi 2012). A key objective of this study is to construct a set of design guidelines that will guide both researchers and practitioners as they develop and design tools in the pursuit of improving emerging adults' psychological wellbeing and, in particular, to develop mobile app encouraging regular practice of signature strengths.

The study's research question seeks to identify and transform informing theories into practice while presenting its learning as a contribution to a body of knowledge. To guide the achievement of this aim, this research employs Hevner's DSR three cycle model (Hevner 2007) which extends its predecessor, the IS research framework (Hevner, Mark and Park 2004). The initial intent was to provide researchers and practitioners in IS a guide to conduct and present DSR to address an organizational business need (Hevner, Mark and Park 2004). To increase the generalizability of the IS research framework, (Hevner 2007) presents the following DSR three cycle model shown in Figure 1.
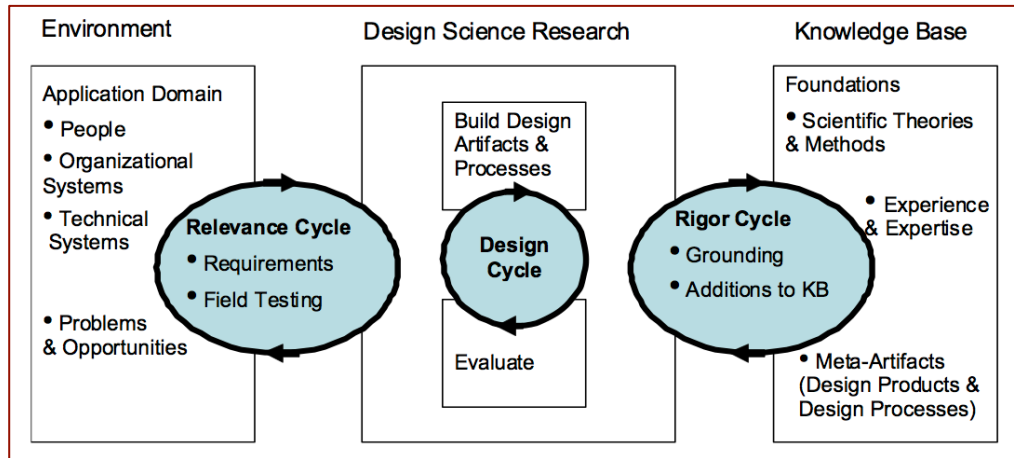
**Figure 1. Design Science Research Three Cycle Model (Hevner 2007)**

The *Relevance Cycle* identifies the problem derived from the application environment that translates to research requirements and acceptance criteria for ultimate evaluation; results in the field-testing determine additional iterations.

The *Rigor Cycle* provides design theories from a *knowledge base* of appropriate theories, learning from existing artefacts and experts, and methods for constructing and evaluating intended artefacts; each iteration updates knowledge base contents.

The *Design Cycle* drives the iterative nature of DSR through building and evaluating of design artefacts based from the inputs of the aforementioned cycles.

In this research, the execution of the relevance cycle led to the identification of the following research gaps: the application of positive psychology to develop signature strengths for emerging adults; the potential for a mobile application to regularly practice one's signature strength in novel ways; and the evaluation of the efficacy of such an application. The focal research question for this research project is how to encourage regular practice.

The execution of the rigor cycle will lead to construction of the component of the artifact that leads to regular practice.

The execution of the Design Cycle will be a process of co-evolution with emerging adults to design, develop and implement an engaging mobile application leading to regular practice of a specific signature strength.

There is an interaction between the Design Cycle and the Rigor Cycle during artifact creation as one tests and refines the emerging design with different research participants from the emerging adult population. This interaction leads to increasing the fidelity of the artifact design which has to achieve two outcomes: engaging to use; induces regular practice.

It is not within the scope of this study to assess the efficacy of the use of the artifact in terms of deepening the signature strength or the effect on such practice on greater goal clarity or pursuit of a path of study leading to a career. This study seeks to surface the principles for inducing regular practice of a signature character strength through using a mobile application. No studies to date have been identified that address the use of a mobile application to develop one's signature strength.

The IT artifact under development is a mobile application that will encourage regular practice of a selected signature character strength. The IS theory produced through this artifact design process will be the development of design guidelines for any such application. As designing for engagement is central to the success of the application, formal design methods will be employed that engage the target user group. These methods include Design Thinking and Human-Centered design methods, which are discussed next.

## *Designing the Artifact*

Design Thinking is a practice that has been embraced by significant enterprises such as SAP, IBM and Accenture. Brown (2008) describes this as "*a methodology which imbues the full spectrum of innovation with human-centered design ethos*", based on the understanding that innovation requires "*a thorough understanding, through direct observation, of what people want and need in their lives and what they like or dislike about the way particular products are made, packaged, marketed, sold, and supported*".

This research adopts this approach, using the design thinking method as shown at the Stanford D-school (2014). In particular, we adopt in this research project, an engagement with the target user group: emerging adults, and through a process of experimentation using intermediate prototypes of the artifact (a mobile app encouraging regular practice of a specific signature strength), elicit what features, strategies and methods are required by the users in order to encourage regular practice.

We will thus engage with the users in a process of co-evolution, seeking to identify the users needs through rapid prototyping, and observing the users with these prototypes, followed by interviews addressing questions such as:

• What did you like?

• What would you like to see added?

• What needs improvement?

• What was not clear?

These questions occur after one has presented the individual with the prototype and watched their engagement with it, assisting where necessary (noting where there is a requirement to assist them). As they engage with the prototype, one asks them questions such as:

• Ask what are they doing.

• How easy is that?

• What did you expect to get after that step?

There may be questions that are generated which specifically refer to elements of the signature strength or elements pertaining to the specific employed design approaches, as the goal of this research is to identify design guidelines pertinent to regular practice and relevant for that specific signature strength.

Usability studies such as Nielson and Landauer (1993) and Griffin and Hauser (1993) show that experimental engagement with as few as 10 individuals interacting with the prototypes reveal between 80-90% of the user needs. The graph of Griffin and Hauser are shown in Figure 2.
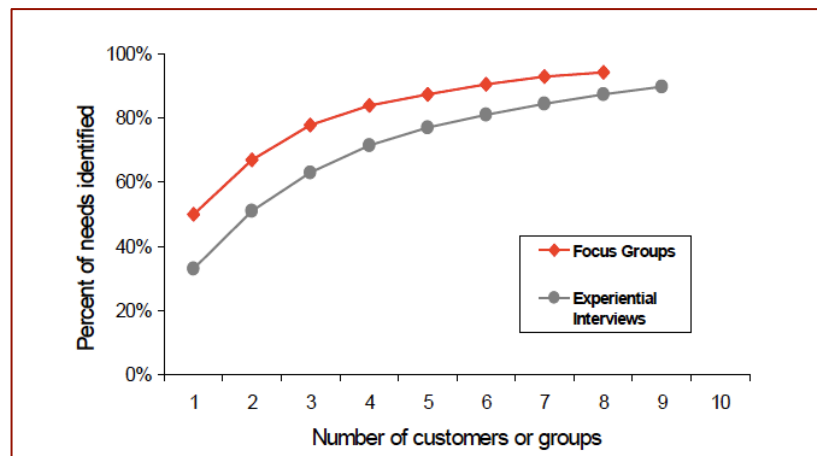


**Figure 2. Needs identified as a function of individuals observed and interviewed (from Griffin and Hauser 1993)**

Thus, as one iterates to more robust prototypes, experiments involving up to 10 research participants will be used to test and extend the user needs set for engagement with the signature strength activities as well as to elicit features that encourage regular practice. The actual app will track the practice times and frequency to determine empirically if the design guidelines have resulted in a mobile application that does encourage regular practice. It is beyond the scope of this research project to determine the effect of such regular practice.

These processes lead to the research design discussed in the next section.

## *Research Design*

To conduct this research, a sample of emerging adults will be obtained. This will come from participants recruited at university, post-secondary education, retail, and trade environments. Participants will first complete the VIA-IS in order to determine their signature strengths. This is a survey available online from either the University of Pennsylvania or the VIA Institute of Character and these sites are cited in the references. Students will be recruited during the orientation week of the semester, commencing in semester 2, 2014 and this recruitment process will be repeated in semester 1 and semester 2 2015. From this pool of participants, the most commonly occurring signature strengths will be identified and compared with the results of Karris and Craighead (2012) who found that US college students most reported signature strengths were humor, love, kindness, honesty, and social intelligence.

The research design is shown in Figure 3. Analysis of this data will lead to a distribution of signature strengths for the 18-21 year old group under consideration. In the pilot phase, the university sector will be targeted, following the other employment or study sectors. The outcome of this phase will be the frequency distribution of the character strengths for the target population of emerging adults between 18-21 at university. This distribution will lead to the identification of the most common signature strengths in the target population.
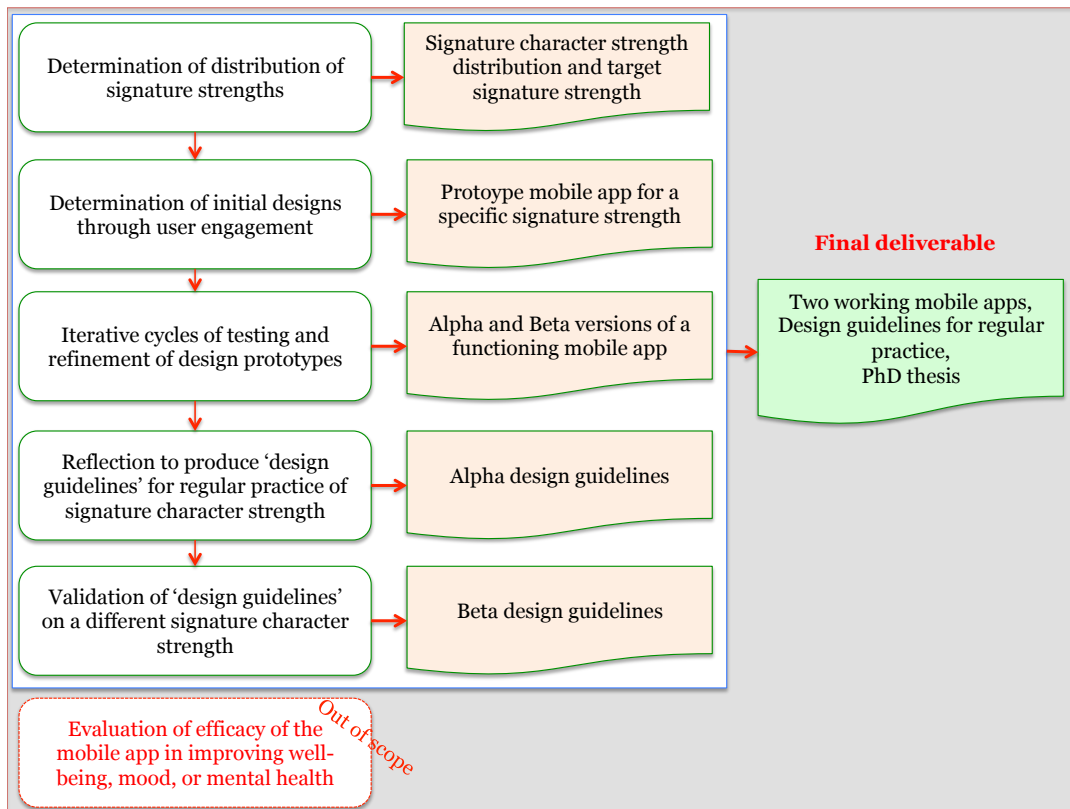


**Figure 3. Research Design**

The next phase of the research is participant selection for the application design. In this phase of the research, between 8 to 10 participants having the identified signature strength will be recruited for each prototype engagement. In a process of co-evolution, different designs will be tested in an iterative fashion by observing the participants in their interaction with various prototypes. This will lead to the identification of the mobile application feature set and the elements encouraging regular practice for that target signature strength. The outcome of this research phase is the generation of a set of design guidelines encouraging regular practice of the identified signature strength.

This will be followed by a testing phase, in which the effect of the resultant beta-version app will be evaluated in terms of the frequency of regular practice. This testing phase may reveal additional guidelines for designing a mobile app for the identified signature strength.

The final phase of this research is a validation phase, during which the derived guidelines for regular practice of that signature strength will be applied to develop an new mobile application for that target population for the second most common signature strength of that population. This phase may reveal a two level of design guidelines: 1. Design guidelines that are specific to signature strength, and 2. Design guidelines that are generic across signature strengths.

## Conclusions, Limitations and Future Work

This research program commenced with the need to address youth mental health issues. The literature review revealed a need to improve mental health outcomes for emerging adults in particular, and identified the role of positive psychology in increasing happiness, wellbeing, and the reduction of depression. The concept of signature strengths was discussed and the need for their regular practice in novel ways was identified as crucial in achieving the desired outcomes. The potential of the use of mobile apps in medical health was described and its application to positive psychology was discussed. This background led to the articulation of the research question: *How can one develop a mobile app that encourages the regular practice of a signature strength in a novel way?* The Design Science Research Method was identified as a suitable means of conducting this research, where the output of the research would be a set of design guidelines leading to regular practice of a signature strength. The use of design thinking and human centered design methods was central to the co-evolution of the artifact and their application was discussed, actively involving users in the target community to test prototypes co-evolved with this community.

The research design involves four phases:

1) Determining the frequency distribution of character strengths for the target community and selection of the most common signature strength for mobile app development;

2) Design of a mobile app encouraging regular practice;

3) Testing efficacy of the mobile app in terms of frequency of practice;

4) Validation of the derived design guidelines through the development of a second mobile app encouraging regular practice of another signature strength.

The final outcome of this research is a set of design guidelines to be used in developing further applications for character strength development.

This research program will be continued after the discovery of these design guidelines through the application of these guidelines to other signature strengths, generating a set of mobile apps addressing each of the character strengths.

Limitations of the research include the focus on emerging adults between 18-21 and the experiments involving between 8-10 participants for each experiment. Further work is required to see if these design guidelines are a function of age group, with older emerging adults engaged (between the ages of 22-25, and 26-29) and younger people (aged between 15-17). Further work is required to test the efficacy of such mobile apps in increasing happiness and well being and decreasing depression in the target group of emerging adults.

## Acknowledgements

## REFERENCES

Access Economics 2009. The economic impact of youth mental illness and the cost effectiveness of early intervention, Australia.

Allan, B. A., and Duffy, R. D. 2013. "Calling, Goals, and Life Satisfaction: A Moderated Mediation Model" *Journal of Career Assessment* published online 5 August 2013 DOI 10.1177/1069072713498574

Alturki, A., Bandara, W., and Gable, G. G. 2012. "Design science research and the core of information systems," *in Design Science Research in Information Systems: Advances in Theory and Practice*, K. Peffers, M. A. Rothenberger, and B. Kuechler, Eds., ed Berlin Heidelberg: Springer, pp. 309-327.

Arnett, J. J. 2000. "Emerging adulthood: A theory of development from the late teens through the twenties," *American Psychologist*, vol. 55, pp. 469-480.

Arnett, J. J. 2001. "Conceptions of the transition to adulthood: Perspectives from adolescence through midlife," *Journal of Adult Development*, vol. 8, pp. 133-143.

Arnett, J. J. 2003. "Conceptions of the transition to adulthood among emerging adults in American ethnic groups," *New Directions for Child and Adolescent Development*, vol. 100, pp. 63-75.

Arnett, J. J. 2004. "Emerging adulthood: The winding road from the late teens through the twenties. USA:" Oxford University Press.

Arnett, J. J. 2005. "The developmental context of substance use in emerging adulthood," *Journal of Drug Issues*, vol. 35, pp. 235-253.

Arnett, J. J. 2006. "Emerging adulthood: Understanding the new way of coming of age," in *Emerging adults in America: Coming of age in the 21st century*, J. J. Arnett and J. L. Tanner, Eds., ed Washington, DC, US: American Psychological Association , pp. 3-19.

Arnett, J. J. 2007a. "Emerging adulthood: What is it, and what is it good for?," *Society for Research in Child Development*, vol. 1, pp. 68-73.

Arnett, J. J. 2007b. "Suffering, selfish, slackers? Myths and reality about emerging adults," *Journal of Youth Adolescence*, vol. 36, pp. 23-29..

Arnett, J. J. 2011. "Emerging Adulthood(s) - The cultural psychology of a new life stage," in *Bridging cultural and developmental approaches to psychology: New syntheses in theory, research, and policy*, L. A. Jensen, Ed., ed New York, USA: Oxford University Press, , pp. 255-275.

Beautrais, A. L. 2000. "Risk factors for suicide and attempted suicide among young people," *Australian and New Zealand Journal of Psychiatry*, vol. 34, pp. 420-436.

Birleson, P., and Vance, A. 2008. "Developing the "youth model" in mental health services," *Australasian Psychiatry*, vol. 16, pp. 22-26.

Botella, C., Riva, G., Gaggioli, A., Wiederhold, B. K., Alcaniz, M., and Baños, R. M. 2012. "The present and future of positive technologies," *Cyberpsychology, Behavior, and Social Networking*, vol. 15, pp. 78-84.

Brdar, I., and Kashdan, T. B. 2010. "Character strengths and well-being in Croatia: An empirical investigation of structure and correlates," *Journal of Research in Personality*, vol. 44, pp. 151-154.

Brown, T. 2008."Design Thinking," *Harvard Business Review*, vol. 86, pp. 84-92.

Buhl, H. M. and Lanz, M. 2007."Emerging adulthood in Europe: Common traits and variability across five European countries," *Journal of Adolescent Research*, vol. 22, pp. 439-443.

Cheung, A. H., and Dewa, C. S. 2007. "Mental health service use among adolescents and young adults with major depressive disorder and suicidality," *The Canadian Journal of Psychiatry*, vol. 52, pp. 228-232.

Compton, W. C. 2005. *Introduction to positive psychology*, USA: Thomson/Wadsworth.

Cosgrave, E. M., Yung A. R., Killackey, E. J., Buckby, J. A., Godfrey, K. A., and Stanford, C. A. 2008. "Met and unmet need in youth mental health," *Journal of Mental Health*, vol. 17, pp. 618-628.

Facio, A., and Micocci, F. 2003. "Emerging adulthood in Argentina," *New directions in child and adolescent development*, vol. 2003, pp. 21-31.

Fergusson, D. M. Beautrais, A. L., and Horwood, L. J. 2003. "Vulnerability and resiliency to suicidal behaviours in young people," *Psychological Medicine*, vol. 33, pp. 61-73.

Forest, J., Mageau, G. A., Crevier-Braud, L., Bergeron, E., Dubreuil, P., and Lavinge, G. L. 2012. "Harmonious passion as an explanation of the relation between signature strengths' use and well-being at work: Test of an intervention program" *Human Relations* published online 22 May 2012.

Galambos, N. L., Barker, E. T., and Krahn, H. J. 2006. "Depression, self-esteem, and anger in emerging adulthood: Seven-year trajectories," *Developmental Psychology*, vol. 42, pp. 350-365.

Gander, F., Proyer, R. T., Ruch, W., and Wyss, T. 2012. "Strength-based positive interventions: Further evidence for their potential in enhancing well-being" *Journal of Happiness Studies*.

Goldstein, L. A., Connolly Gibbons, M. B., Thompson, S. M., Scott, K., Heintz, L., Green, P., Thompson, D., and Crits-Christoph, P. 2011. "Outcome assessment via handheld computer in community mental health: consumer satisfaction and reliability," *The Journal of Behavioral Health Services and Research*, vol. 38, pp. 414-423.

Griffin, A., and John, R. H. 1993. "The Voice of the Customer," *Marketing Science*, 12, 1, (Winter), 1-27.

Handel, M. J. 2011. "mHealth (Mobile Health) - using apps for health and wellness," *Explore*, vol. 7, pp. 256-261.

Harrington, R. 2001. "Depression, suicide and deliberate self-harm in adolescence," *British Medical Bulletin*, vol. 57, pp. 47-60.

Harris, M. G., Henry, L. P., Harrigan, S. M., Purcell R., Schwartz, O. S., and Farrelly, S. E. 2005. "The relationship between duration of untreated psychosis and outcome: an eight-year prospective study," *Schizophrenia Research*, vol. 79, pp. 85-93.

Hernan, A., Philpot, B., Edmonds, A., and Reddy, P. 2010. "Healthy minds for country youth: help-seeking for depression among rural adolescents," *The Australian Journal of Rural Health*, vol. 18, pp. 118-124.

Hevner, A. R. 2007."A three cycle view of design science research," *Scandinavian Journal of Information Systems*, vol. 19, pp. 87-92.

Stanwick, J., Lu T., Karmel, T., and Wilbrow, B. 2013. How young people are faring 2013: The national report on the learning and earning of young Australians.

Jorm, A. F. 2009. "Australian young people's awareness of headspace, beyondblue and other mental health organisations.," *Australas Psychiatry*, vol. 17, pp. 472-474.

Karris, M. A., and Craighead, W. E. 2012. "Differences in Character Among U.S. College Students" *Individual Differences Research* (10:2) pp 69-80.

Kelly, C. M., Jorm, A. F., and Wright, A. 2007. "Improving mental health literacy as a strategy to facilitate early intervention for mental disorders," *Medical Journal of Australia,* vol. 187, pp. S26-30.

Kelly, T. M. 2004."Positive psychology and adolescent mental health: false promise or true breakthrough?," *Adolescence*, vol. 39, pp. 257-278.

Kessler, R. C., and Walters, E. E. 1998. "Epidemiology of DSMIIIR major depression and minor depression among adolescents and young adults in the national comorbidity survey," *Depression and Anxiety*, vol. 7, pp. 3-14.

Kessler, R. C., Aguilar-Gaxiola, S., Alonso J., Chatterji S., Lee S., and Ormel J. 2009. "The global burden of mental disorders: an update from the WHO World Mental Health (WMH) Surveys," *Epidemiologia e Psichiatria Sociale*, vol. 18, pp. 23-33.

Kuechler, W., and Vaishnavi, V. 2012. "A framework for theory development in design science research: Multiple perspectives," *Journal of the Association for Information Systems*, vol. 13, pp. 395-423.

Lehto, T. 2012. "Designing persuasive health behavior change interventions," in *Critical Issues for the Development of Sustainable E-health Solutions*, ed: Springer New York, pp. 163-181.

Liu, C., Zhu, Q., Holroyd, K. A., and Send, E. K. 2011."Status and trends of mobile-health applications for iOS devices: a developer's perspective," *The Journal of Systems and Software*, vol. 84, pp. 2022-2033.

Luxton, D. D., McCann, R. A., Bush, N. E., Mishkind, M. C., and Reger, G. M. 2011."mHealth for mental health: integrating smartphone technology in behavioral healthcare," *Professional Psychology: Research and Practice*, vol. 42, pp. 505-512.

Macek, P., Bej ek, J., and Vaní  kavá, J. 2007. "Contemporary Czech emerging adults: Generation growing up in the period of social changes," *Journal of Adolescent Research*, vol. 22, pp. 444-475.

Madden, W., Green, S., and Grant, A. M. 2011. "A pilot study evaluating strengths-based coaching for primary school students: Enhancing engagement and hope." *International Coaching Psychology Review*, (6:1), 71-83.

Masten, A. S., Burt, K. B., Roisman, G. I., Obradovi , J., Long, J. D., and Tellegen, A. 2004. "Resources and resilience in the transition to adulthood: Continuity and change," *Development and Psychopathology*, vol. 16, pp. 1071-1094.

McDougall, T. 2011. "Mental health problems in childhood and adolescence," *Nursing Standard*, vol. 26, pp. 48-56.

Milnes, A., Pegrum, K., Nebe, B., Topfer, A., Gaal, L., Zhang, J., and Hunter, N. 2011. "Young Australians: Their health and wellbeing 2011." *Australian Institute of Health and Welfare*, Canberra, Australia.

Mongrain, M., and Anselmo-Matthews, T. 2012. "Do positive psychology exercises work? A replication of Seligman et al.." *Journal of Clinical Psychology*, (68:4).

Rosenberger, N. 2007. "Rethinking emerging adulthood in Japan," *Child Development Perspectives*, vol. 1, pp. 92-95.

Nelson, L. J. and Chen, X. 2007. "Emerging adulthood in China: The role of social and cultural factors," *Child Development Perspectives*, vol. 1, pp. 86-91.

Nelson, L. J., Badger, S., and Wu, B. 2004. "The influence of culture in emerging adulthood: Perspectives of Chinese college students," *International Journal of Behavioral Development*, vol. 28, pp. 26-36.

Nielsen, J., and Landauer, T. K. 1993. "A mathematical model of the finding of usability problems." *Proceedings ACM/IFIP INTERCHI'93 Conference* (Amsterdam, The Netherlands, April 24-29), 206-213.

Oinas-Kukkonen, H., and Harjumaa, M. 2008. "Towards deeper understanding of persuasion in software and information systems," in *Advances in Computer-Human Interaction* , pp. 200-205.

Park, N., and Peterson, C. 2008."Positive psychology and character strengths: Application to strengths-based school counseling"," *Professional School Counselling*, vol. 12, p. 85-92.

Park, N., and Peterson, C. 2009a. "Character Strengths: Research and Practice," *Journal of College and Character*, vol. 10, pp. 1-10.

Park, N., and Peterson, C. 2009b. "Strengths of character in school," in *Handbook of positive psychology in schools*, M. J. Furlong, R. Gilman, and E. S. Huebner, Eds., ed New York, USA: Routledge.

Park, N., and Peterson, C. 2009c. "The cultivation of character strengths," in *Teaching for Wisdom*, ed Netherlands: Springer, pp. 59-77.

Park, N., Peterson, C., and Seligman, M. E. P. 2004."Strengths of character and well-being," *Journal of Social and Clinical Psychology*, vol. 23, p. 2004.

Patel V., Flisher, A. J., Hetrick S., and McGorry P. D. 2007. "Mental health of young people: a global public-health challenge," *The Lancet*, vol. 369, pp. 1302-1313.

Peterson, C. 2006. *"A primer in positive psychology"*. New York, USA: Oxford University Press.

Peterson, C., and Seligman, M. E. P. 2004. *"Character strengths and virtues."* New York: Oxford University Press,

Peterson, C., Park, N. and Seligman, M. E. P. 2005a. "Assessment of character strengths," in *Pyschologists' Desk Reference* G. P. Koocher, J. C. Norcross, and S. S. Hill, Eds., Second ed New York, USA: Oxford University Press.

Peterson, C., Park, N., and Seligman, M. E. P. 2005b." Orientations to happiness and life satisfaction: The full life versus the empty life," *Journal of Happiness Studies*, vol. 6, pp. 25-41.

Peterson, C., Park, N., and Seligman, M. E. P. 2006. "Greater strengths of character and recovery from illness," *The Journal of Positive Psychology*, vol. 1, pp. 17-26.

Prociow, P. A., and Crowe, J. A. 2010. "Towards personalised ambient monitoring of mental health via mobile technologies," *Technology and Health Care*, vol. 18, pp. 275-284.

University of Pennsylvania, 2014. "Authentic Happiness Survey" available at http://www.authentichappiness.sas.upenn.edu/Entry.aspx?rurl=http://www.authentichappiness.sas.upenn.edu/tests/SameAnswers_t.aspx?id=310

Reid, S. C., Kauer, S. D., Hearps, S. J., Crooke, A. H., Khor, A. S., Sanci, L. A., Patton, G. C. 2011. "A mobile phone application for the assessment and management of youth mental health problems in primary care: a randomised controlled trial," *BioMed Central Family Practice*, vol. 12, pp. 131-143.

Rosenberger, N. 2007. "Rethinking emerging adulthood in Japan," *Child Development Perspectives*, vol. 1, pp. 92-95.

Seligman M. E. P., and Csikszentmihalyi, M. 2000. "Positive psychology: an introduction," *American Psychologist,* vol. 55, pp. 5-14.

Seligman, M., Steen, T. A., Park, N., and Peterson, C. 2005. "Positive psychology progress - empirical validation of interventions," *American Psychologist*, vol. 60, pp. 410-421.

Simon, H. A. 1996. *"The sciences of the artificial"* Third ed. Cambridge, MA: MIT Press,

Stanford D:school (2014) http://dschool.stanford.edu last accessed February 2014.

Stanwick, J., Lu, T., Karmel, T,. and Wilbrow, B. 2013. "How young people are faring 2013: The national report on the learning and earning of young Australians,".

Steger, M. F., Hicks, B. M., Kashdan, T. B., Krueger, R. F., and Bouchard Jr, T. J. 2007. "Genetic and environmental influences on the positive traits of the values in action classification, and biometric covariance with normal personality" *Journal of Research in Personality,* vol. 41, pp. 524-539.

United Nations Population Fund (UNFPA). 2011."State of the world population 2011: people and possibilities in a world of 7 billion" New York, USA

Vaishnavi, V., and Kuechler, B. 2004. "*Design Science Research in Information Systems*". Available: http://desrist.org/design-research-in-information-systems/ (last accessed November 5, 2013).

VIA Institute of Character 2014. "VIA Survey" available at https://www.viacharacter.org/www/

Wyn, J., and Woodman, D. 2006. "Generation, youth and social change in Australia," *Journal of Youth Studies*, vol. 9, pp. 495-514.