
Motivational Affordances and Personality Types in Personal Informatics

Yamini Karanam

School of Informatics & Computing
Indiana University
Indianapolis, IN 46202 USA
ykaranam@iupui.edu

Leslie Filko

School of Informatics & Computing
Indiana University
Indianapolis, IN 46202 USA
lfilko@iupui.edu

Lindsay Kaser

School of Informatics & Computing
Indiana University
Indianapolis, IN 46202 USA
lnkaser@iupui.edu

Hanan Alotaibi

School of Informatics & Computing
Indiana University
Indianapolis, IN 46202 USA
haalotai@iupui.edu

Elham Makhsoom

School of Informatics & Computing
Indiana University
Indianapolis, IN 46202 USA
emakhsoo@iupui.edu

Stephen Volda

School of Informatics & Computing
Indiana University
Indianapolis, IN 46202 USA
svolda@iupui.edu

Abstract

Personal informatics applications have been gaining momentum with the introduction of implicit data collection and alert mechanisms on smart phones. A need for customized design of these applications is emerging and studies on tailoring UI design based on the personality traits of users are well established. This poster investigates how various affordances in gamified personal informatics applications affect motivation levels to track and achieve goals for users with different personality types. We conducted a study to examine how user personality traits relate to (1) motivational affordances in behavior tracking applications and (2) the specific behaviors users prefer to track.

Author Keywords

Personal informatics; Persuasive mechanisms; Motivational affordances; Gamified self-trackers; Personality based UI

ACM Classification Keywords

H.5.m. Information interfaces and presentation, Design, Human factors, Miscellaneous.

Introduction

People strive to understand themselves better in order to achieve a host of physical, mental, emotional and

social goals [11]. "Knowing oneself" has been emphasized often in beliefs grounded in spiritualism like Buddhism, Hinduism, and Taoism. This general interest gave rise to a new field of study of systems that enable personal data collection called *personal informatics* [8]. But paper-, desktop- and web- based personal informatics systems are used in limited contexts like clinical treatment, or by highly motivated individuals. The advent of ubiquitous systems exposes more people to the possibility of collecting, analyzing, and reflecting upon personal data, as well as attempting to change behaviors and habits.

Ian Li proposed a five-stage model of personal informatics consisting of preparation, collection, integration, reflection and action [8]. Data collection using a mobile device requires that individuals allow the device to collect real-time data (e.g., walking distance) or that they consistently record that data themselves (e.g., calories consumed). If a user fails to perform these actions, she has no way of engaging in reflection. One of the barriers to collecting data is the lack of motivation to do so [8]. We investigate how personal informatics systems could be designed to minimize this barrier.

Persuasive Mechanisms in Technology

Persuasive computers are defined as "the computing systems, devices, or applications intentionally designed to change a person's attitudes or behavior in a predetermined way" [4]. Some approaches to persuasive design include just-in-time persuasion, simulating experiences, personalizing information services, recommendations, monitoring and tracking, competition and recognition [2]. These approaches could be conceptualized through design in numerous

ways, such as gamification, loyalty programs, choice architecture, and decision support systems [5]. Across all of these approaches, gamification can be seen either as an underlying concept manifested in different ways, or as a stand-alone approach. Research suggests that the successful implementation of gamification in persuasive design could lead to increased commitment towards goals [5]. This study takes a closer look at gamification as a stand-alone approach to persuasive design, as well as the atomic elements that comprise gamifying behavior-logging applications.

Motivational Affordances in Gamification

Gamified systems employ the use of motivational affordances in an effort to invoke positive, intrinsically motivating "gameful" experiences that can result in altered behaviors [6]. Hamari and colleagues divided these motivational affordances into ten categories: points, leaderboards, achievements/badges, levels, story/theme, clear goals, feedback, rewards, progress and challenge.

This prior research also suggested that engagement by gamification may depend on factors such as user motivations or qualities, including personality differences [6]. A study by Codish and Ravid examined the personality traits of extroverts, based on the Big Five Model, in conjunction with individual perceptions of different game mechanisms in a classroom-based gamification setting [3]. They found several significant differences between extroverts and introverts and their preferences for various mechanisms. These results suggest that there is an opportunity to further examine individual personality traits and their relationships to the perceived usefulness of the aforementioned motivational affordances.

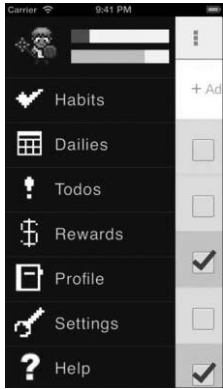


Figure 1. Screenshot of the *HabitRPG* app's main menu

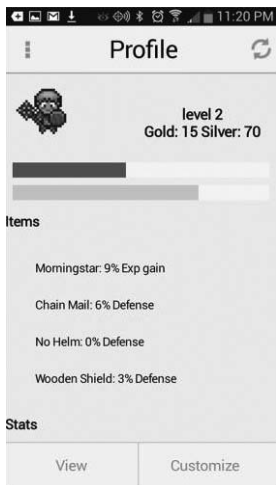


Figure 2. *HabitRPG*'s display of a user's progress toward accomplishing specified goals.

Additionally, studies on personality-based UI design show that personality traits such as conscientiousness and introversion affect user participation [9, 10]. These studies stress the need to tailor design features to fit certain attributes of personality. This approach could be seen as a new way of customizing content to fit individual user needs and preferences. Although these studies used intrusive methods such as psychometric questionnaires to gauge the attributes of the users' personalities, the authors suggest non-intrusive ways like mining user profile information [9].

Based on these findings, we hypothesize that users with different personality types are motivated by and respond to different motivational affordances used in gamified self-behavioral tracking applications. The following are our research questions:

- R1** Which motivational affordances motivate users with each personality type to consistently track self-behaviors using gamified behavior-tracking applications?
- R2** Is there a correlation between behaviors reported and motivational affordances?
- R3** What types of behaviors do persons with each personality type prefer to report/track more often?

Method

35 graduate students and university employees (13 female, average age = 29.4 years) took part in our study. We asked participants to (1) take the Big-Five personality test to assess their personality type, the results of which included the following traits on a 1–5 scale: extraversion, conscientiousness, neuroticism, agreeableness, and openness; (2) set three daily habits (in categories such as mood, health & fitness, diet, sleep, anxiety/stress, mental health, social or other)

that they would like to inculcate as goals in the application *HabitRPG* [7] and track them for five days; (3) use the application for five days and complete a survey at the end of each day; and (4) complete an exit survey following the five days of data collection.

Results

We used one-way ANOVAs to examine correlations between (1) Big Five traits, types of behaviors tracked (*R3*), and preferences for each affordance (*R1*); and between (2) types of behaviors tracked and preferences for each affordance (*R2*).

R1 The users who scored higher on conscientiousness [$F(1,56)=11.943, p=.001$] and openness [$F(1,56)=4.060, p=.049$] showed a greater preference for rewards, while users who scored higher on extraversion [$F(1,56)=8.025, p=.006$] and openness [$F(1,56)=11.532, p=.001$] showed a higher preference for challenges/quests.

R2 We found significant correlations between the motivational affordances and categories of tracked behaviors (Table 2).

R3 We found agreeableness to be negatively correlated with the decision to log diet-related behaviors ($r=-.461, p=.027$); openness to be negatively correlated with logging mood ($r=-.561, p=.005$) and online presence ($r=-.536, p=.008$); and neuroticism to be positively correlated with logging online presence ($r=.452, p=.031$).

Reflection and Implications

Users who tracked behaviors related to physical health (diet, health/fitness) also tracked mental health-related

Motivational Affordance	Game Feature
Points system	Coins
Achievements	Levels, armor
Rewards	Rewards
Story/Theme	8-bit game theme
Clear goals	Dailies
Feedback	Hit-points
Levels	Character levels
Progress	Experience bars
Challenges	Dailies Tracking

Table 1. Mapping motivational affordances [6] to features in *HabitRPG*.

Motivational Affordance	Behavior
Feedback	Anxiety [$r=.645, p=.001$]
Story/Theme	Mood [$r=.631, p=.001$]
Achievements	Mood [$r=.596, p=.003$]
Feedback	Mood [$r=.593, p=.003$]
Challenges	Health/Fitness [$r=.586, p=.003$]
Progress	Diet [$r=.556, p=.006$]

Table 2. Significant correlations between motivational affordances and categories of tracked behaviors.

metrics (anxiety/stress), and users who tracked online presence also monitored mood- and sleep-related behaviors.

Current personal informatics applications are often delivered as stand-alone trackers of atomic behaviors rather than providing a comprehensive understanding of correlated behaviors. This study shows an emerging need to design and develop personal data trackers to log bundles of correlated behaviors so that users can obtain meaningful and practical inferences from the data.

Our results (*R2*) clearly show that affordances and, thereby, visualization mechanisms should vary by category of tracked behaviors. Our participants reported that they preferred simple feedback visualizations about their goals to complicated graphs in order to motivate them to log their behaviors.

Combining these results (*R1 & R3*), we could infer that because user profiles for different categories of behavior trackers vary, the subset of motivational affordances used in these applications should be focused towards the anticipated or empirically determined personality types of the users.

Conclusion

Our study suggests that the design of gamified systems intended to facilitate behavioral changes can be tailored to suit the needs of users possessing various personality traits. We have shown that there are significant correlations between specific personality traits and the types of motivational affordances these individuals prefer to use. Applications designed to accommodate multiple experience tracks for different

personality traits could contribute to the sustained use of the application and enable users to better meet their personal goals.

References

- [1] Batson, C.D., Shaw, L.L., and Oleson, K.C. Differentiating affect, mood and emotion: Toward functionally-based conceptual distinctions. In Clark, M.S. (Ed.), *Emotion*. Sage: Newbury Park (1992), 294–326.
- [2] Cheng, R. *Persuasion strategies for computers as persuasive technologies*. Department of Computer Science, University of Saskatchewan (2003).
- [3] Codish, D. and Ravid, G. Personality based gamification - Educational gamification for extroverts and introverts. In *Proc. 9th Chais Conf. for the Study of Innovation and Learning Technologies: Learning in the Technological Era* (2014), 36–44.
- [4] Fogg, B.J. Persuasive Technologies. *Communications of the ACM*, 42, 5 (1999), 26–29.
- [5] Hamari, J. and Koivisto, J. Social motivations to use gamification: An empirical study of gamifying exercise. In *Proc. ECIS* (2013).
- [6] Hamari, J., Koivisto, J., and Sarsa, H. Does gamification work?—A literature review of empirical studies on gamification. In *Proc. HICSS 2014*.
- [7] HabitRPG. <https://habitrpg.com/static/front>.
- [8] Li, I., Dey, A., and Forlizzi, J. A stage-based model of personal informatics systems. *Proc. CHI* (2010), 557–566.
- [9] Nov, O., Arazy, O., López, C., and Brusilovsky, P. Exploring personality-targeted UI design in online social participation systems. *Proc. CHI* (2013), 361–370.
- [10] Nov, O. and Arazy, O. Personality-targeted design: Theory, experimental procedure, and preliminary results. *Proc. CSCW* (2013), 977–984.
- [11] Superbetter. <https://www.superbetter.com>.