Designing Goal-Oriented Systems:
How Competition and Automation Foster Motivation and Results

by

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Abstract

People often turn to goal-oriented systems to improve their lives and modify their behavior. With the rise of the Quantified Self movement, there are now a plethora of these systems and their related products available. For instance, the Nike+ FuelBand helps users be more active, and Mint.com helps individuals manage their personal finances. However, these services and products offer user experiences that rely too heavily on data management and neglect to correctly harness the power of competition among users. This often leads to high attrition rates, as many users become discouraged and overburdened within days after starting.

In order to reduce user attrition and increase results, this thesis establishes a system of guidelines that can be used to develop goal-oriented systems using automation (between systems and their physical artifacts) and competition (among groups of similar individuals). Any system created by these guidelines will be able to develop artifacts that are capable of modifying an end-user's behavior on a subconscious and emotional level with the overall purpose of enhancing and improving human lives by helping users reach their goals.

For demonstration purposes, this study will demonstrate the development of a weight loss and fitness system and the methods with which it can motivate users.

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Chapter 1: Introduction

1.1 Problem Statement

Many services and systems exist today that allow users to track and monitor their activities and progress within goal-oriented scenarios. However, most of these systems are too heavily reliant on the user's direct management of data and fail to properly harness the power of competition among users. The problem with systems like these is that they assume that, since an individual was motivated enough to join the system, he or she will maintain the motivation and self-efficacy required to achieve his or her goal. This raises the question: Can a system of guidelines and methods be developed that will help designers create effective goal-oriented systems using automation provided by the emergence of wearable technology and the motivating factors of competition?"

1.2 Need for Study

If instructions to create a goal-oriented system like the one described above could be outlined and documented, scores of individuals would be able to increase their potentials and various fields of academia, finance, nutrition, time-management, etc. would benefit greatly. This study has the potential to raise academic performances, increase personal financial responsibility, help curb the obesity epidemic, and increase productivity. All of this can be accomplished by freeing users from the burdens of cumbersome data management and introducing a competitive nature to the system in order to drive and sustain motivation.

The purpose of this study is to create a system of guidelines, suggestions, and methods that will be used in order to create goal-oriented systems that relegate the management of data and other burdensome tasks to a physical artifact and introduce a form of competition into the

process in order to drive a user forward. Specifically, this study addresses the following research questions:

- Does emotional attachment to a system promote greater results in goal-oriented scenarios than traditional progress-tracking systems reliant on numerical data entry?
- Can the behavior of a user be modified through a physical artifact with which he or she has constant, involuntary interaction?
- What physical aspects can influence the user? Color? Form? Motion? Sound?
- How can this system be applied to various fields such as academia, finance, nutrition, time-management, etc?
- How effective is competition as a motivating factor? If it is, then how does one properly harness the motivation it provides without damaging the psyches of the competitors?

1.3 Objectives of Study

- To develop an approach and guidelines that can be used to develop various systems in order to create artifacts that have the ability to assist end users to meet their goals without the need for micro-management of data.
- To study the effects of artifacts on goal-oriented users who dislike or do not relate with large amounts of data and micro-management.
- To identify what stimuli effectively lead to positive behavior modification and apply them to the system.
- In order to demonstrate the developed approach, the created artifacts must connect to the end users on emotional and subconscious levels in order to create lasting behavioral modifications.

1.4 Definition of Key Terms

Android – an open source, Linux-based operating system developed by Google in conjunction with the Open Handset Alliance for touchscreen mobile devices (Janssen, 2013).

Application ("App") – a self-contained program or piece of software designed to fulfill a particular purpose; an application, especially as downloaded by a user to a mobile device ("App," n.d.).

Artifact – an object made by a human being, typically an item of cultural or historical interest ("Artifact," n.d.).

Behavior – the way in which one acts or conducts oneself, especially toward others ("Behavior," n.d.).

Behavior Modification – the alteration of behavioral patterns through the use of such learning techniques as biofeedback and positive or negative reinforcement ("Behavior Modification," n.d.).

Biofeedback – the use of electronic monitoring of a normally automatic bodily function in order to train someone to acquire voluntary control of that function ("Biofeedback," n.d.).

Bluetooth – a standard for the short-range wireless interconnection of cellular phones, computers, and other electronic devices ("Bluetooth," n.d.).

Captology – a field of study that focuses on the design, research, and analysis of interactive computing products created for the purpose of changing people's attitudes or behaviors. It describes the area where technology and persuasion overlap. (Fogg, 2003, p. 5)

Color Theory – a field of study that attempts to define which colors work together or what emotional responses are evoked by particular colors (Mohr, 2011).

Database – a structured set of data held in a computer, especially one that is accessible in various ways ("Database," n.d.).

Feature Phone – a mobile phone that incorporates features such as the ability to access the Internet and store and play music but lacks the advanced functionality of a smartphone ("Feature Phone," n.d.).

Feedback – the modification or control of a process or system by its results or effects, e.g., in a biochemical pathway or behavioral response ("Feedback," n.d.).

Fitbit Inc. – a product design company headquartered in San Francisco, CA that makes wireless-enabled, wearable, activity trackers (Fitbit, n.d.).

Fitbit Flex – a wrist-worn activity tracker made by Fitbit Inc.

Gamification – the process of game-thinking and game mechanics to engage users and solve problems. (Zichermann and Cunningham, 2011, p. xiv)

Goal-Oriented System – a system designed to help a user progress towards a specified goal with the use of guidelines, restrictions, rewards, and various other forms of feedback.

Instrumental Conditioning – a learning process in which behavior is modified by the reinforcing or inhibiting effects of the resulting consequences ("Instrumental Conditioning," n.d.).

iOS – a mobile operating system developed by Apple, Inc. It currently runs on iPads, iPhones, and iPod Touches.

iPad – a touchscreen tablet computer designed by Apple, Inc.

iPhone – a touchscreen smartphone produced by Apple, Inc.

iPod Touch – a touchscreen smart device produced by Apple, Inc.

Jawbone – a product design company headquartered in San Francisco, CA that develops and sells wearable technology and portable audio devices (Jawbone, 2013).

Jawbone UP – an activity tracker made by Jawbone that allows users to track their sleep, eating habits, and daily activity including steps taken and calories burned (Jawbone UP, 2013).

Micro-management – to manage especially with excessive control or attention to details ("Micromanagement," n.d.).

Nike+ FuelBand – an activity tracker made by Nike Inc. that allows its wearers to track their physical activity, steps taken daily, and amount of calories burned (Bishop, 2012.)

Operant – an item of behavior that is initially spontaneous, rather than a response to a prior stimulus, but whose consequences may reinforce or inhibit recurrence of that behavior ("Operant," n.d.).

Operant Conditioning – conditioning in which an operant response is brought under stimulus control by virtue of presenting reinforcement contingent upon the occurrence of the operant response. ("Operant Conditioning," n.d.).

Personal Digital Assistant (PDA) – a palmtop computer that functions as a personal organizer but also provides e-mail and Internet access ("PDA," n.d.).

Positive reinforcement – A stimulus which increases the frequency of a particular behavior using pleasant rewards ("Positive Reinforcement," 2013).

Quantified Self Movement – a movement to incorporate technology into data acquisition on aspects of a person's daily life in terms of inputs (e.g. food consumed, quality of surrounding air), states (e.g. mood, arousal, blood oxygen levels), and performance (mental and physical) (Ramirez, Wolf, & Kelly, 2013).

Self-Tracking Device – a wearable piece of technology that uses sensors to collect data about its wearer's activity.

Smart Device – An electronic device generally connected to other devices or networks via different protocols such as Bluetooth-NFC-WiFi-3G-etc. that can operate to some extent interactively and autonomously ("Smart Device," 2013).

Smartphone – a cellular phone that is able to perform many of the functions of a computer, typically having a relatively large screen and an operating system capable of running general-purpose applications ("Smartphone," n.d.).

Subconscious – of or concerning the part of the mind of which one is not fully aware but which influences one's actions and feelings ("Subconscious," n.d.).

User – a person who uses or operates something, esp. a computer or other device.

Wi-Fi – a facility allowing computers, smartphones, or other devices to connect to the Internet or communicate with one another wirelessly within a particular area ("Wi-Fi," n.d.).

1.5 Literature Review

1.5.1 Current State of Interaction Design

In today's world, interaction design is more ubiquitous and technologically-advanced than ever before. According to Löwgren and Stolterman (2004) "Interaction design is the source of an increasing number of products that make up people's everyday lives" (p. 12). What exactly is interaction design, though? In the words of the late Bill Moggridge (2007), "Interaction design is using your technical knowledge to make it useful for people, to delight someone, to make someone get excited about the new technology they're using... interaction design is making technology fit people" (p. 293). Deeply dependent on technological advancements, interaction design relies heavily upon information technology, known commonly as I.T., for the artifacts that it creates. As Löwgren and Stolterman (2004) state, "Design of information technology is not only one of many design processes today, but one of the most prominent" (p. xi).

The user's experience is what interaction designers are ultimately trying to develop. More and more disciplines are moving towards approaches that are interdisciplinary for an integrated, holistic user experience. IDEO co-founder David Kelly believes that "the number of instances where it is important to design the complete experience is growing and represents a significant shift for design education and practice" (Moggridge, 2007, p. 301). Part of this holistic experience is requiring that the design be tightly constructed. If there is any aspect that is weaker than its other parts, the experience will be hampered. Understanding both the context of the interaction and the users that will be experiencing it are crucial to a design's success. According to Löwgren and Stolterman (2004), "Thoughtful interaction design is built on a thorough

understanding of the design process, design ability, the designed product, and design as part of a larger context" (p. 2).

Although many great user experiences already exist and the field of interaction design continues to grow at a rapid pace, there sometimes exists a disconnect between the user's end goals and the products with which he or she chooses to accomplish them. This disconnect can be caused by requiring users to micro-manage their progress and interact with large, and often times confusing, amounts of data. Feedback for a user might become partially diminished by the system's over-reliance on the user to perform the tedious chore of managing large amounts of data to make substantial progress.

As of this writing, this is how a majority of goal-oriented systems operate. The problem with these systems is that they are fundamentally based on the concept that conscious interaction with the system is the only and best way for a user to interact with them. For instance, why must a weight-loss system require users to input nutritional information from every single item of food they eat? What is to keep a user who does not excel at mathematics and information technology from becoming discouraged with such a system? If a design is controlled by a foundation that is difficult to learn, then it will be hard to design it correctly for the beginner (Moggridge, 2007, p. 36).

1.5.2 Subconscious Behavior

Users' subconscious relationships with goal-oriented designs should be considered in order to reach those who might have a problem with systems that demand micro-management of data. Current systems and products seem to neglect the automatic processes of an individual's subconscious. Recent developments in the field of motivational science have shown that many

kinds of social behaviors are performed in an almost automatic, spontaneous fashion, without conscious awareness (Forgas, 2005, p. 1).

Forgas states that:

> Even more intriguing are a growing number of findings suggesting not only that social actors are frequently unaware of the real motivational reasons for their behaviors, but more strikingly, that when questioned, they often come up with clearly incorrect or mistaken causal explanations for their actions. (p. 1)

Is it possible that social interaction within a designed system can create subconscious behavioral modifications? It certainly seems plausible.

1.5.3 Artifacts and Automation

A potential solution would be to develop a system that uses elements of behavioral psychology to influence the users to make progress towards their goals without the need for tedious micro-management of large amounts of data. As Moggridge (2007) states, “Intuitive interaction minimizes the burden of conscious thought needed to operate the system, leaving us to concentrate on our goals” (p. xvi). The primary purpose of such a system would be to create a tangible artifact that relegates data management to the background in order to enable a user to connect emotionally and subconsciously to the system without becoming overburdened with work.

As stated, the system’s ultimate goal should be to create some form of artifact with which an individual can interact in a goal-oriented system. As Goodwin (2009) states:

> "Visualizing concrete solutions is the essence of design. These solutions could be tangible products, such as buildings, software, consumer electronics, or advertisements, or they could be services that are intended to provide a specific sort of experience" (p. 3).

The artifact that the system creates will have three primary functions: to provide automated motivation, emotional investment, and positive reinforcement. Automated motivation can be provided in a variety of methods including, but not limited to, color changes, kinetic motion, and audible noises. When these methods are used in combination with each other, a tangible and emotional connection between the user and his or her progress towards a goal will be established.

To state the obvious, in order for an individual to progress towards a goal, he or she must modify his or her behavior. Since the system will be concerned with analyzing and modifying human behavior, it needs to be backed by research in the field of behavior, which is defined as "the field of psychology concerned with analyzing and modifying human behavior" (Miltenberger, 2012, p. 5). Behavior, according to Miltenberger, is an action that can be observed, described, and recorded by others or the person engaging in the act (p. 2). Some dimensions in which behavior can be measured are frequency, duration, intensity, and latency (p. 2). These four dimensions will provide quantifiable results to show progress and/or success in any methods undertaken.

The goal of behavior modification is to identify events in the immediate environment that are functionally related to the behavior to be changed (Miltenberger, 2012, p. 5). If human behavior is truly controlled by events in the immediate environment, then a system needs to be able to create designs that can affect these events in order cause a change in behavior of the various end users. "Successful modification procedures alter the functional relationships between

the behavior and the controlling variables in the environment to produce a change in the behavior" (Miltenberger, 2012, p. 5). It is possible that color, audio cues, and reward systems can be employed to bring about these necessary changes.

Ambient color can provide instant and effortless feedback to users just by being in close quarters with them. By emitting light, the artifact can give both subtle and important messages to the users about their current progress and how they must work to achieve their goals. Color theory can also be implemented to distinguish multiple factors such as positive or negative movement, urgent messages, achievements, etc.

Back in 2007, Moggridge proposed that "products will be smart enough, or integrated enough, that they will be able to react to us; that the product will know what's going on with us and will be able to do the right thing" (p. 299). Smart products like the ones described in that statement are already coming to the consumer marketplace. The Nest learning thermostat is one such example. The machine's data management and software is pushed into the background, and the user only experiences the benefits of the system's intelligence. While the Nest is aimed at providing an improved experience for the user, any system this study creates should be focused on creating effective automation and improvement within the users themselves.

Under this type of proposed system, data management will still exist in software form, but it will be largely relegated to the background. The primary function of this data management software will be to provide users an access point with which to manage various settings, manage light amounts of data entries, and interact socially with other users and/or family and friends. Even though the system will enable users to make progress without dealing directly with large amounts of confusing and overwhelming data, it will still be necessary to have some form of

management software that will allow users to change settings, information, goals, and correct any errors that might occur.

1.5.4 Understanding Design Theory

In order to create an entirely new user experience, a designer must understand and employ design theory. Design theory is an understanding of the context of tradition, practices, the design process, and the nature of design thinking and how they all apply to a design. Whether or not a design can overcome these oppositions is determined by the strength of its theory and research supporting it. Löwgren and Stolterman (2004) add that "design theory is also knowledge focused on creating new conditions for design, different patterns of thinking and acting, new design examples, and a general understanding of the conditions for creative and innovative work" (p. 8). Using design theory will help a created artifact be more than just art. "In order for a design to be design and not art, it must serve human needs and goals. Good design helps humans accomplish something in an efficient, effective, safe, and enjoyable way" (Goodwin, 2009, p. 4).

However, a design will not only be judged on the designer's intentions, but also on the expectations brought to it by the users and the environment in which the design is presented. Löwgren and Stolterman (2004) agree, stating that "the good of a particular digital artifact also has to be judged in relation to the intentions and expectations present in the specific situation" (p. 4). One expectation of present day interactive design is that an artifact will use the most modern of technologies. This presents a problem for designers because technology continues to develop and improve at a rapid pace. "The technology constituting our design material is changing so rapidly that there never seems to be time for reflection or for a more thoughtful approach" (Löwgren and Stolterman, 2004, p. 3). For this reason, it would be wise for an

interactive designer to create systems and artifacts for more stable and popular software ecosystems such as Android, iOS, Microsoft Windows, and OS X. Developing for these operating systems will allow a designer more time to reflect upon their design and make necessary changes if they are needed.

In addition to its perceived expectations, a design is always created within a specified context. A concept's design situation is defined as the reason for the design process's initiation and the context within which the design work is carried out (Löwgren and Stolterman, 2004, p. 6). "Design always happens within certain constraints. There is no such thing as unconstrained design" (Goodwin, 2009, p. 4). Each artifact that a system creates needs to have its own design situation, including the assignment of ethical values.

> "Every design process is a combination of actions, choices, and decisions that affects people's lives and possible choices for action. As such, design is deeply influenced by values and ideals" (Löwgren and Stolterman, 2004, p. 10).

The system itself, how it is created, and how it impacts the people who interact with it must be as well-established as possible before pursuing the creation of the artifact.

1.5.5 Competition as a Behavior Modifier

While it's true that many of today's goal-oriented systems contain some element of competition, most fail to harness its potential properly. The performance-boosting effects of competition within an online community are most potent when users can remain anonymous, compete in groups of similar others, and form rivalries from repeated interactions.

Most services, Nike+ and Jawbone UP especially, suffer from a lack of user anonymity. Connections between users are encouraged, if not outright forced, to be formed between real-life

friends and acquaintances, and there are few, to no, incentives or methods for discovering completely random, yet similar, strangers to compete against. A 2009 study of a prominent Internet weight loss community revealed that "members appreciated the option to remain anonymous" (Hwang, et. all, 2009, p. 10). This anonymity allows users to discuss sensitive topics openly and honestly while creating a non-judgmental environment (Hwang et. all, 2009, p. 10). This type of supporting atmosphere will be essential to forming a compatible and effective goal-oriented team.

Team-based competition is a more effective motivator than competition between individuals because a team has an inherent, built-in support network. Research performed as recently as 2013 shows that "shared group membership functions as an implicit performance booster" (Rees et al, 2013, p. 402) and that "intergroup ("us-versus-them") dynamics are known to have a powerful impact on motivation and behavior" (Rees et al, 2013, p. 401). The same study also demonstrates that performance feedback "is more impactful when it comes from an ingroup member" (p. 403). These findings ought to have a profound impact on how a goal-oriented system should be structured and make a very strong case for including team-based competition as an integral part of a system's motivation and support features.

While group-based competition is certainly a powerful motivation tool, its effectiveness can be amplified even further by harnessing the power of rivalry. Rivalry is a subjective, psychologically amplified form of competition that exists in the mind of competitors (Kilduff, Elfenbein, and Staw, 2010, p. 946). A study on rivalry by Kilduff, Elfenbein, and Staw (2010) found that rivalries can be directly "associated with increased performance on an effort-based task" (p. 961) and are formed by three key factors: proximity, relative characteristics, and history

of interaction (p.947). It is important to understand that geographic proximity was an important factor since their study was focused on NCAA basketball teams. An Internet-based system can nullify that contributing factor. This boils the contributing factors necessary to initiate an Internet rivalry down to similarity between users and their history of competitive interaction. With this in mind, a goal-oriented system should be structured to foster and nurture friendly rivalries and reap the motivating and performance-increasing benefits that they provide.

1.5.6 Conclusion

Taken together, this research indicates that there is a need for a system that provides guidelines regarding how to create an effective user experience that gives users a way to reach their goals through competition with similar others and automation of data collection through a physical artifact. Going forward, more research needs to be done on the impact of emotional attachment to objects and the motivational forces of human psychology. User trials could be helpful in establishing results that demonstrate the system's success. Financial, educational, nutritional, and time-management fields, among many possible others, are all possible fields in which this system could be applied. However, only one of these fields, specifically weight loss, will be explored and developed fully in order to demonstrate the success of the study.

1.6 Assumptions of Study

This study hypothesizes that goal-oriented systems will become more effective if the task of managing data and progress is automated between an artifact and its system. It also assumes that users of these systems relate better to tangible artifacts rather than intangible data.

In order for this study to be done effectively, it is important to hold the belief that people generally wish to improve themselves, but often do not meet their goals because the systems they use are not effective in modifying their behavior.

Finally, this study will assume that any information gathered from individuals surveyed or otherwise questioned is both reliable and truthful.

1.7 Scope and Limits

This study is focused on the creation of a system of guidelines and rules that will assist in the creation of goal-oriented systems and their corresponding artifacts. While it is intended for this system is to be applicable in many various fields of study and professions, for the sake of time constraints and conciseness, the final example included in this thesis will be focused on weight loss goals. Specifically, any test users included in this study will be individuals who have struggled or are currently struggling with losing weight.

As always, time is an important limitation. This study was conducted over a three-semester period from the fall of 2012 to the end of summer 2013. All experimentation, research, and implementation took place during this span, which might lead to the need for further research in order to improve and expand upon the results garnered by this study.

1.8 Anticipated Outcome

This study will attempt to show that automated data management and competition between similar people can be effective behavior-modifying tools in goal-oriented systems. Individuals will be more persistent in their efforts to reach their goals when the chore of micro-managing data is removed from the process and when they have similar others to compete against. Their motivation to succeed will come from an emotional investment in their achievements and progress rather than a statistical analysis of their work.

The study will deliver a typed copy of the guidelines and necessary to implement the system in context to the developers' field of application. An artifact specific to a chosen field (e.g. education, finance, etc.) is produced in coherence with the parameters of the developed system in order to demonstrate its effectiveness. The following is a list of the previously stated deliverables for concise reference:

1. Typed copy of system guidelines and instructions
2. A system, artifact and service, shaped by the guidelines and instructions.
3. Written Thesis

The long range consequences of this study are broad and many. By improving results in goal-oriented systems, users' quality of life will improve and the attrition rate of users in goal-oriented systems will significantly decrease. The end goal of this study is to create a system that can be used to create products and services in various fields of application. If it is successful, the products created will have the potential to considerably enrich users' lives.

Chapter 2: Research

2.1 Introduction to the Self-Monitoring Trend

In order to create an automated, goal-oriented system, one will need to make use of various tracking and sensor technologies. While these devices are not exactly new, advances in technology have led to their miniaturization, and a new realm of product possibilities. Brad Kittredge, Manager of Platform for the Jawbone UP, claims that "sensors are now powerful, small, and affordable enough to build compelling products that can be made available to the mass market" (Rock Health, 2011). Also, according to Rock Health (2011), there will be a $4 billion health sensor market with around 400 million active devices in 2014. With this future looming on the horizon, the questions designers must ask are "How did we get here?" and "What will we do with this new wave of products?"

2.1.1 A Brief History of Self-Monitoring

Primitive forms of self-monitoring, such as journaling, have existed for centuries. These methods were intended primarily for reflection, introspection, correction, and archival purposes and focused on the emotional and mental state of the writer. In the 1970s, advancements in technology led to the beginning of the modern age of self-tracking. An early example of this persuasive technology is the Body Awareness Resource Network, or BARN, that was created in the late 1970s in order to influence teenager's behavior towards smoking, exercise, drugs, etc. (Fogg p.1). As hardware continued to get smaller and more sophisticated, more consumer products began to hit the market. In the 1980s and 1990s a plethora of exercise products began including heart rate monitors in their designs (Burke, 1998). This changed how users could

approach their exercise routines, allowing them to see how effective their activities were affecting their heart beat. The focus of their workouts was able to switch from time to biometrics.

When the Internet began to arrive in households around the world, a whole new category of self tracking services came with it. Calorie counting and fitness logging Web sites like MyFitnessPal.com and personal finance tracking sites like Mint.com (See Figure 1),

Figure 1: MyFitnessPal.com (Randall, 2012) and Mint.com (Chartier, 2008)

allow users a more secure, more comprehensive, and easily accessible method of tracking personal statistics. Access to self-tracking Web sites became even easier when smartphones brought Internet browsing and mobile apps to the market around 2007 and 2008. Harnessing the

combination of a ubiquitous Internet connection and constant proximity to the user, self-tracking mobile apps have had great success and popularity, but the apps were just the beginning. Developers have realized the power of pairing mobile apps and Web services with specialized products to create an increasingly popular social movement known as the Quantified Self.

2.1.2 The Quantified Self Movement

While the Quantified Self, or QS, movement has certainly been active and growing for the better part of the last decade, its namesake, "Quantified Self," was proposed by writers Gary Wolf and Kevin Kelly around 2007 (Goetz, 2012). Their website, QuantifiedSelf.com, has become a major hub of those interested in self-monitoring and tracking services and devices. Through the site, visitors are able to present their own studies, research, and experiments as well as view and participate in conversations and other members' studies. There is also an active forum where users can ask questions, conduct surveys, compare techniques, etc.

The site encourages visitors to join Meetup groups, so they can share their methods and passions with other members in person. Currently, there are 144 groups with over 24,000 members in 108 cities and 35 countries (Quantified Self Meetup Groups, 2013). The largest and original group is based in San Francisco and was started in 2008 by Gary Wolf and Kevin Kelly themselves (Quantified Self, 2013). With almost 3,500 members at the time of this writing, the group describes itself as a "show and tell for people taking advantage of various kinds of personal tracking... to gain more knowledge about themselves" (Quantified Self Meetup Groups, 2013).

During one of these Meetup sessions, Kelly described the quantified self movement as a "self-propelled" and "user-defined" movement that is helping to change how science is done and

answer new questions posed by the plethora of new tools now available to users through the advancement of technology (Carmichael, 2012). Its emphasis is on the self, rather than a population, and how an individual quantifies and measures the activities, interests, and statuses of that which he or she cares about. Kelly goes on to make the claim that people in the movement "are redefining, expanding, augmenting, leveraging, amplifying, and certainly altering the sense of self... and that is... we don't know where we begin and others end" (Carmichael, 2012). This new way of understanding the self through quantification is central to the QS movement.

The Quantified Self movement can be viewed as a natural development from the proliferation of smaller, more affordable, and more intelligent tracking and monitoring technology available on the consumer market. Tracking hardware, such as accelerometers and GPS chips, have become increasingly inexpensive and minuscule in size, and communication technologies such as Bluetooth 4.0 and wireless standard 802.11n have made significant strides in reducing power consumption and increasing connectivity. This potent combination of smart technology has enabled individuals to automate data collection from an astonishingly large number of activities and processes (See Figure 2). As Kelly stated, "Anything that you can possibly think of measuring, somebody in the world is tracking it right now" (Goetz, 2012).

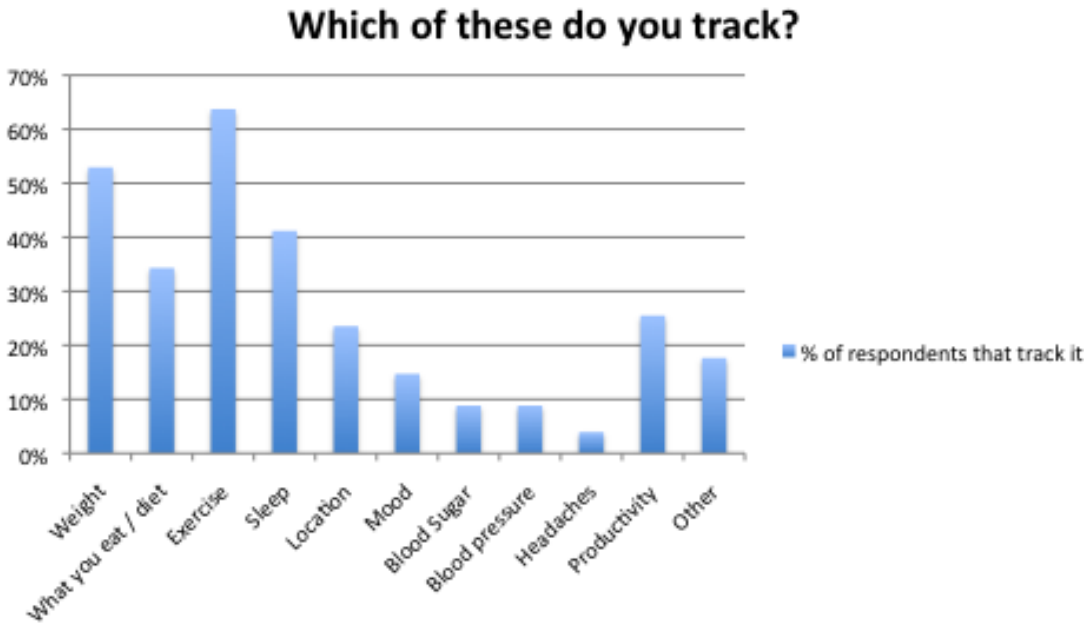


Figure 2: Survey Result from New York City QS Meetup Group (Paulus, 2013)

Perhaps more exciting than what the QS movement is currently doing is what it will be able to do in the near future. In an interview, Kelly compared the current state of the Quantified Self movement to the beginning of the personal computing era (Goetz, 2012). It is in its infancy, being promoted and experimented with by concentrated groups of passionate hobbyists. Just as it took the arrival of the Internet for personal computers to reach their true potential and popularity, the QS movement needs a spark of innovation or technology to help it move to the next level. Kelly appears to believe that jump might happen with the abstraction or reinterpretation of the numerical data collected by self-tracking products:

> I think, in the long term, we'll probably want to bury the numbers. I think the quantification aspect of it, in terms of data coming out, will remain, but... we're just not evolved to deal with numbers. (Goetz, 2012)

Wolf seems to agree and adds that:

> The big story is all the different meanings people make from these new senses and these new signals that the systems are generating, and I think, in the end... even the biometrics become something else. (Goetz, 2012)

By abstracting or repurposing collected data into user experiences that allow people to live more healthy, fulfilled, and informed lives, designers can help build a whole new category of behavior modifying products and services that users can relate to on emotional and subconscious levels rather than the statistical and quantified manner present in the products available as of this study.

2.2 Related and Contributing Fields of Study

While the Quantified Self movement is certainly a main reason why self-tracking devices are becoming so popular, there are many other influences on this new generation of products. This section focuses on three such fields of study, captology, gamification, and psychology and attempts to show how they are relevant to the design of a goal-oriented system.

2.2.1 Captology

Captology is the study of "computers as persuasive technology" (Fogg p.5). According the foremost expert on the subject, B.J. Fogg, captology is concerned with "design, research, and analysis of interactive computing products created for the purpose of changing people's attitudes or behaviors," or, in other words, the "area where computing technology and persuasion overlap" (See Figure 3) (Fogg p. 5).

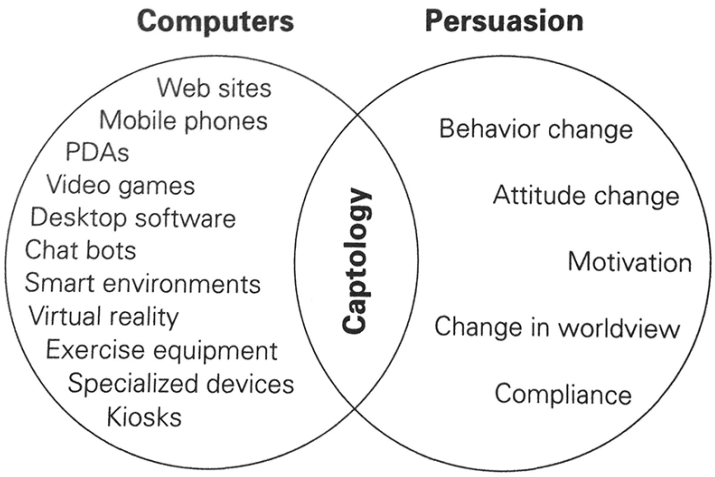


Figure 3: Captology Illustrated (Fogg, 2003, p. 5)

Since this study, and the system of guidelines it helps establish, deals with the creation of artifacts that individuals will use for feedback and interaction with a service, it is important to understand how technology can be used to persuade its users. Fogg (2003) presents seven type of persuasive technology principles that can be used as tools to influence users' behaviors and attitudes: Reduction, tunneling, tailoring, suggestion, self-monitoring, surveillance, and conditioning (p. 32).

Tool	Description
Reduction	"Using computing technology to reduce complex behavior to simple tasks increases the benefit/cost ration of the behavior and influences users to perform the behavior" (p. 33).
Tunneling	"Using computing technology to guide users through a process or experience provides opportunities to persuade along the way" (p. 36).
Tailoring	"Information provided by computing technology will be more persuasive if it is tailored to the individual's needs, interests, personality, usage context, or other factors relevant to the individual" (p.38).
Suggestion	"A computing technology will have greater persuasive power if it offers suggestions at opportune moments" (p. 41).
Self-monitoring	"Applying computing technology to eliminate the tedium of tracking performance or status helps people to achieve predetermined goals or outcomes" (p. 45).
Surveillance	"Applying computing technology to observe others' behavior increases the likelihood of achieving a desired outcome" (p. 47).
Conditioning	"Computing technology can use positive reinforcement to shape complex behavior or transform existing behaviors into habits" (p. 53)

Table 1: Fogg's Seven Persuasive Technology Principles (Fogg, 2003)

While this study doesn't have the space to cover all the principles and strategies within the field of captology, Fogg's highly influential book *Persuasive Technology* (2003) is an informative and insightful read for a designer looking to use technology to influence and modify people's behavior.

2.2.2 Gamification

Zichermann and Cunningham (2011) define gamification as "the process of game-thinking and game mechanics to engage users and solve problems (p. xiv). It can be an effective tool for modifying human behavior, so much so that businesses and marketing departments have

begun to use it in their attempts at user and consumer engagement. This is made evident by the proliferation of gamified smartphone apps such as Foursquare and Fitocracy, gamer achievements in the current generation of console gaming machines, and others.

To understand why gamification is a successful motivating strategy, one must first understand why people play games. There are four underlying reasons why people play games: for mastery, to destress, to have fun, and to socialize (Zichermann and Cunningham, 2011, p. 20). Richard Bartle's (1996) well-referenced study states that players can be split into four player types: Killers, Achievers, Socializers, and Explorers (see Figure 4). Understanding how these player types have fun and implementing ways to provide it for them is essential to creating a successful game.

Figure 4: Bartle's Player Types (Caron, 2011)

One key aspect of gamification is in the act of recognizing a player's achievements publicly, and likewise it is one of the most frequently utilized in gamified designs (Zichermann

and Cunningham, 2011, p. 88). Common forms of achievement awards include leaderboards, stickers, badges, banners, and trophies. Xbox Live, for example, uses pop-up achievement banners to instantly reward the player for completing a specified task (See Figure 5). This reward is then logged in his or her player profile as a badge for others to see (See Figure 6).

Figure 5: Xbox Live Notification Banner (IGN, 2012)

Figure 6: Xbox Live Profile with Archived Achievements (Geekorb, 2012)

Public recognition is not only an intrinsic motivator of individuals, but it can also motivate groups as well (Fogg, 2003, p. 205). Because players understand that their performances will be reported and recognized publicly, they will become even more motivated to perform better (Hwang, et al., 2009, p. 10).

While badges and trophies are the most common forms of recognition in games, "kudos" systems are also effective in providing positive feedback from either other players or the system itself (Zichermann and Cunningham, 2011, p. 89). These congratulatory feedback mechanisms are normally less permanent than trophies and badges, and serve to provide instant gratification to a player for completing a task or achieving a milestone. They can be given by the system itself or from other players as a form of "karma point" (Zichermann and Cunningham, 2011, p. 89) and help to create a feedback loop to reengage the user and show that his or her efforts are achieving progress.

Having said all of this, it is important to use gamification strategies wisely and genuinely. Over-rewarding players for every single insignificant action can defeat the entire purpose of using gamification and turn players off of the system all together. Zichermann and Cunningham (2011) call this phenomenon "badgenfruede," or the rendering of "all badges vapid at best and patronizing at worst" (p. 56). When all is said and done, gamification should add fun to the experience, and, if it does not, then it is not being applied effectively.

2.2.3 Psychology

Behavioral psychology plays a large role in efforts to modify a person's behavior (Miltenberger, 2012, p. 2). Having established gamification as an effective way to influence behaviors and encourage individuals in their pursuits, it is important to understand the

psychology behind its various strategies. Also, since most of the services connected to modern self-monitoring devices have a social aspect built into them, a designer should understand how to use social media to influence behavior effectively and appropriately. Being so, this section will explore the psychology behind the success of achievements in games, the science involved when using online communities to modify behavior, and six universal principles of social influence.

First, the psychology behind the recent popularity of gamification strategies in social media is actually fairly old. In 1946, psychologist Abraham Maslow illustrated his theory of a human life requirements hierarchy (see Figure 7) (Lane, 2011). This model claims that once the basic requirements for sustaining life have been met, the brain then begins to seek satisfaction of higher needs such as friendship, love, esteem, and achievement (Lane, 2011) Because of this structuring of human psychology, gamification trophies and badges cater to our natural desires for accomplishment and self-esteem.

These same badges and trophies, given in a way to encourage continued behavior change, can also be viewed as a operant conditioning, a type a behavior modification defined by psychologist B.F. Skinner in the 1940s as "changing of behavior by the use of reinforcement which is given after the desired response" (McLeod, 2007). His famous experiment of training a pigeon to turn around counter-clockwise to receive food is the most widely-known example of this approach to behavior modification. Like the pigeon experiment, gamification can use positive reinforcement, badges and trophies instead of food, to keep the players playing (Lane, 2011), and, in a goal oriented system, this can lead to better and faster results.

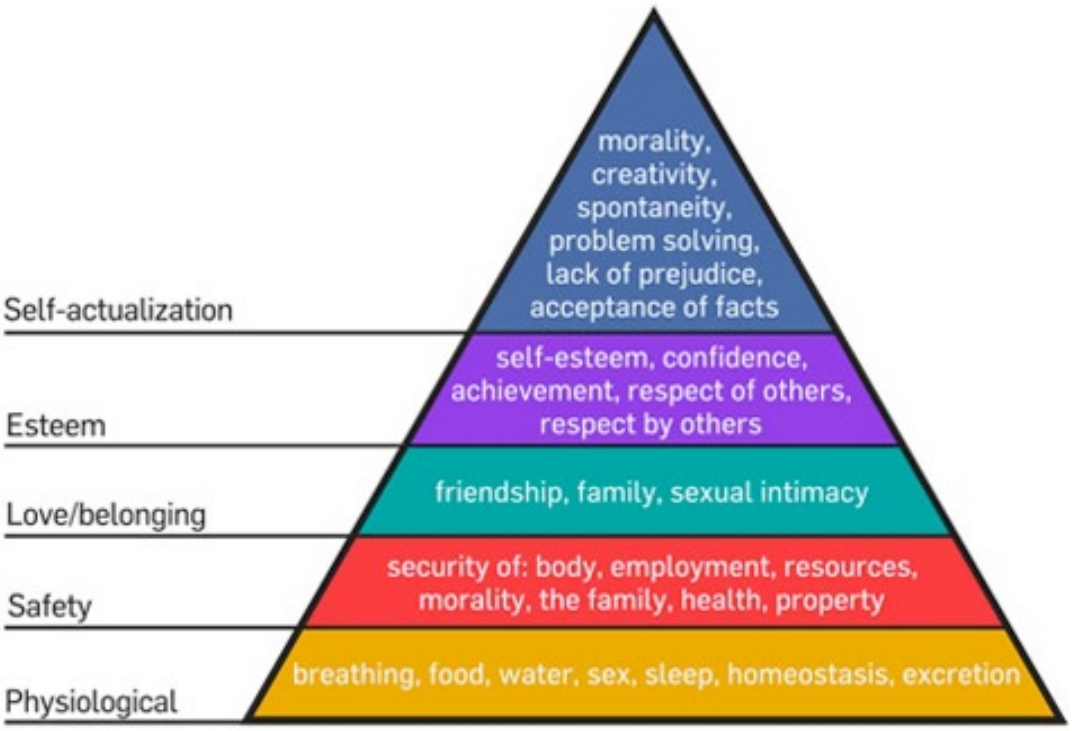


Figure 7: Maslow's Human Life Requirements (Lane, 2011)

Second, the social aspect of a goal-oriented, self-monitoring system plays an important psychological role in the progression of users towards their goals. According to UCLA behavioral psychologist Sean Young (2013):

> Although social media and online communities might have been developed for people to connect and share information, recent research shows that these technologies are really helpful in changing behaviors (Young, 2013).

Young (2013) goes on to state that members of online communities have five psychological needs that must be addressed by social media in order to produce behavior change:

1. The need to trust
2. The need to fit in
3. The need for self-worth
4. The need to be rewarded for good behavior
5. The need to feel empowered

These same needs are echoed in a survey (Hwang, et al., 2009) to members of Sparkpeople.com, an online weight loss community. Member describe feeling like they belong to a team or a family and "receive encouragement and motivation to persist with the lifestyle changes, recover from mistakes, and overcome barriers" (Hwang, et al., 2009, p. 8). By fulfilling these six psychological needs of its members, a social online service can healthily and effectively motivate them towards their goals.

Third, in order to persuade individuals to make decisions, one should understand and harness the six universal principles of social influence (See Table 2). Defined by Robert Cialdini (2011), Professor Emeritus of Psychology and Marketing at Arizona State University, these principles capture the majority of possible persuasion strategies. By understanding and applying these principles, a designer will be able to create a more effective system for modifying behavior.

Principle	Description	Example
Reciprocity	The desire for all of us to give back to someone who has given to us.	If someone gives you a free sample, you feel obligated to at least listen to what they have to say.
Scarcity	The desire to have those things that are rare or hard to obtain.	A company emphasizes how rare and uncommon its product's features are.
Commitment	The desire to be consistent with what we've already said and done. To be congruent with our internal values.	A voter who tells a pollster that they are going to vote will be more likely to vote.
Consensus	The idea that people want to follow the lead of similar others.	Hotel guests will be more likely to reuse their towels if a sign is posted that reads "The majority of guests reuse their towels.
Liking	The desire to say yes to individuals or companies to the degree that one knows and likes them.	Companies or individuals that have genuine similarities or parallels between themselves and their customers/users.
Authority	The desire to be persuaded by someone who has the credentials and knowledge on a topic.	A speaker might list his or her credentials before giving a speech to be taken more seriously (Thompson, 2009).

Table 2: The Six Universal Principles of Social Influence (Cialdini, 2011)

2.3 Popular Technologies and Services

There are numerous self-tracking products and services available to consumers thanks to the boom of the Quantified Self movement and technological advances. This section will focus on three similar, popular products in the fitness tracking market: the Nike+ Fuelband, the Jawbone UP, and the Fitbit Flex (See Table 3) and their respective apps and Web sites. By comparing the features and approaches of each of these products, this study can glean insight on how to create a more effective self-tracking device.

	Nike+ FuelBand *(Nike+ FuelBand, 2013)*	**Jawbone UP** *(Jawbone UP, 2013)*	**Fitbit Flex** *(Fitbit Help, 2012)*
Launch Date	February 2012	November 2011	Spring 2013
Price	$149.00	$129.00	$99.95
Colors	Black, Black Ice, Clear	Black, Red, Blue, White, Brown, Silver	Black, Slate, Pink, Navy, Tangerine, Teal
Sensors	Accelerometer, Ambient Light	Accelerometer	Accleromenter
Weight	27g – 35g	19g – 23g	13.4g – 14.6g
Thickness	6.9 mm – 8.0 mm	5 mm – 8 mm	2 mm – 10 mm
Display	20 color red/green LED, 100 white LED	1 blue LED, 1 green LED	5 white LED indicators
Sleep Tracking	No	Yes	Yes
Diet Tracking	No	Yes	Yes
Sync Method	Wireless via Bluetooth	3.5 mm jack	Wireless via Bluetooth
Connectivity	Bluetooth 2.1 + EDR, USB plug	3.5 mm jack, USB adaptor	Bluetooth 4.0
Battery Life	Up to 7 days	10 days	5-7 days
Mobile App	Yes	Yes	Yes
Web Site	Yes	No	Yes
Supported Mobile OSes	iOS	iOS, Android	iOS, Android
Third-Party App Integration	Limited, but more coming	Yes	Yes
Materials	TPE, PP, Magnesium, Stainless Steel	TPU Rubber	Silicone, Plastic
Water-Resistant	Yes	Yes	Yes
Waterproof	No	No	No

Table 3: Comparison of the Nike+ FuelBand, Jawbone UP, and Fitbit Flex

2.3.1 Nike+ FuelBand

Figure 8: Nike+ FuelBand (Sullivan, 2013)

The FuelBand (See Figure 8) is a wearable physical activity tracking wristband created by Nike, a prominent athletic apparel design company. It is a multi-function band that tracks daily step totals, calories burned, and points, called NikeFuel. It has a single button that toggles what is displayed on the bank of white LEDs next to it. The band can display calories, steps, NikeFuel, and the current time. Below these white LEDs there is also a separate row of colored LED lights that gradate from red to green as a user accumulates more "NikeFuel." Unlike the Jawbone UP and the Fitbit Flex, the FuelBand does not track users' sleep.

Nike claims that the FuelBand has a battery life of up to four days and takes between three to four hours to fully charge (Nike+ FuelBand, 2013). There is a USB plug on one end of the band that is cleverly concealed into the interior when the band is connected. In order to charge the FuelBand, a user simply has to unclasp the band and plug the USB end into a standard

USB port (See Figure 9). Having USB for charging is wise because USB-supporting devices are numerous and, unlike the Jawbone UP and Fitbit Flex with their proprietary charging cables, should not lead to a situation where charging is impossible for lack of an adaptor.

Figure 9: Charging the FuelBand (Running Supplement, 2012)

The FuelBand's mobile app (See Figure 10) adds a lot to the user experience. By syncing the band's collected data via Bluetooth, a user can view a progress graph that illustrates the amount of NikeFuel earned for the day, week, month, or even year. Users can even see their average NikeFuel earned per day, total step count, calories burned, distance traveled, and time they've been active. The graphs generated by the app are informative and attractive, but unfortunately, they leave any interpretation of the data up to the user. Achievement are built into the app in the form of "trophies" that a user can earn by completing certain tasks like surpassing a daily goal by a large percentage or meeting daily goals for multiple days in a row.

Figure 10: Nike+ FuelBand iPhone App (Robertson, 2013)

One can also sync their data with the FuelBand Web site (See Figure 11) via his or her computer's USB port. Accessing the website opens up even more features and options for the user. There are accumulating day counters that show how many days a user has reached their goal and his or her current streak of days with reached goals in a row. An activity graph nearly identical to the one present in the app takes center stage, and beneath it is chart of how the user compares to other members in the Nike+ online community.

Nike chose to build a social element into the FuelBand app and Web site by allowing users to build a "team" of other FuelBand owners. Users can find friends, family members, and acquaintances via their Facebook accounts or by searching for names, email addresses, or usernames. They can also ask non-users to join the experience by sending an email invitation.

Figure 11: Nike+ FuelBand Web Site (Kanter, 2012)

Finally, there are some extra features that can be accessed from within the app. Within the settings menu, users can change their daily NikeFuel goal and what features, meaning the clock, NikeFuel, calories, and steps, appear on the band. This allows for some level of customization, allowing the user more control over his or her user experience. Oddly enough, there is no option to set an alarm like the Jawbone UP, even though the FuelBand possesses a clock and the UP does not.

Overall, the Nike+ is an attractive, if not a little bit bulky, product available for consumers looking for a health-related, self-tracking device. When used in conjunction with its smartphone app and/or Web site, it creates a unique user experience by abstracting daily physical activity into points with which to reach goals and earn achievements. Additional features, such as alarms and stopwatches, are oddly absent from a wrist-worn object with a clock on it. Finally, while the app makes an attempt to create social interaction and competition among users, it does so by connecting users with their real-life contacts instead of anonymous, similar others. This leads to a drastic reduction in the pool of social connections and inherently mutes the true potential that competition can deliver to the user experience.

2.3.2 Jawbone UP

Figure 12: The Jawbone UP Wristband (Pierce, 2012)

The UP (See Figure 12) is a wearable fitness and sleep tracking wristband created by Jawbone, a product design company based in San Francisco, California. It is a dual-function band that tracks both daily step totals and sleep quality. To toggle between these two tracking modes, a user simply presses and holds the metal button at the end of the band until the band vibrates and the LED indicator lights (See Figure 13) shine to indicate the switch (a green sun for step tracking and a blue moon for sleep). A reputable tech site described having to remember to manually engage sleep mode as "a little frustrating" (Pierce, 2012), but at least the UP band recognizes when you begin moving around after waking up and automatically switches from sleep to its step-tracking mode.

Figure 13: UP's Tracking Mode LED Indicators (Woodcox, 2011)

The UP's battery life is substantial, lasting a claimed ten days and only needing eighty minutes to fully charge (Jawbone UP, 2013). Jawbone chose an interesting method of charging by using the band's 3.5mm headphone plug and a USB to 3.5mm converter wire (See Figure 14). Using USB for charging is a wise choice since USB-supporting devices are numerous, but the

uniqueness of the charging cord presents an inherent problem. If a user misplaces the wire, it will most likely be hard to find another one before the band's charge runs out.

Figure 14: UP's Charging Adaptor (Bennett, 2013)

On the topic of the 3.5mm connection, this is also how the band syncs its collected data with Jawbone's mobile app. Unlike the FuelBand and Flex, the UP does not use wireless technology to send its data to a service. A user simply has to remove the cap protecting the plug and insert the band into his or her phone's headphone jack. The app detects the band's presence and automatically begins syncing the data. When the syncing completes, the user can then view and analyze the data on the smartphone.

Jawbone's UP mobile app (See Figure 15) is where a majority of the user experience takes place. It adds diet and mood tracking into the mix, allowing users to track their caloric

intake, dietary habits, and feelings during or after performing certain activities. The graphs generated by the app are informative and attractive, but unfortunately, they leave any interpretation of the data up to the user. There is no abstraction of data happening in this app; it deals directly with the quantified data collected, albeit in an attractive way.

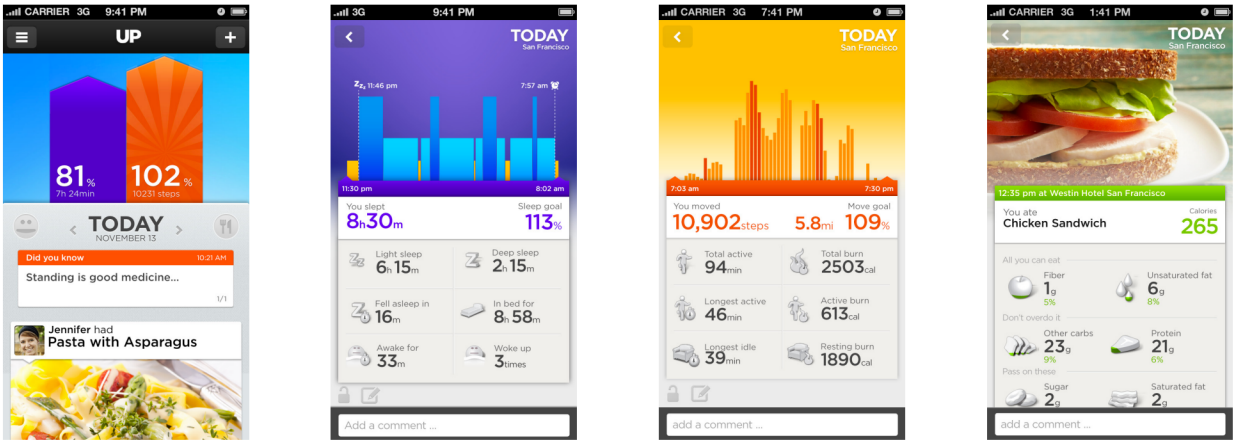


Figure 15: Jawbone UP iPhone App (Feil, 2013)

Like the FuelBand, Jawbone built a social element into the UP app by allowing users to build a "team" of other UP band owners. Users can find friends, family members, and acquaintances via their Facebook or Twitter accounts or by allowing the app to access their phone's contacts. They can also search for other users via a search field at the top of the screen, but, as of this writing, searching is limited to names and email addresses only.

Finally the band has some extra features that users can access and set from within the app (See Figure 16). First, an alarm clock feature can be set to vibrate the band before a specified time when the user is in light sleep. Secondly, the "idle alert" feature can be set to vibrate the band when its wearer hasn't moved in a user-determined period of time. Thirdly, a "power nap" setting lets the user set how long a nap alarm will wait until the band vibrates to wake him or her

up. Lastly, a stopwatch can be activated with a specific button press pattern and will run until the user holds the button down until the green sun glows again. The timed data will then be synced and available for viewing when the band is plugged into the smartphone. While this feature isn't ideal for measuring track lap or mile times, it can be helpful for tracking how long an activity, such as a strength training session, lasted. Unfortunately, the UP's necessity to be configured through its smartphone app does promote some friction in the product's ease-of-use.

Figure 16: The UP App's Extra Features (Lykins, 2013)

Overall, the Jawbone UP is an attractive product available for consumers looking for a health-related, self-tracking device. When paired with its smartphone app, it allows for the tracking of steps, sleep, diet, and mood. Additional features, such as alarms and stopwatches, add value and incentive for a user to keep wearing it, but the necessity of physically connecting the band to the phone to activate or calibrate them creates friction in the user experience. Finally, while the app makes an attempt to create competition among users, it focuses on connecting users with their real-life contacts instead of anonymous, similar others therefore leading to a drastic decrease in the pool of available users to connect with and inherently muting the true potential that competition can deliver.

2.3.3 Fitbit Flex

Figure 17: The Fitbit Flex (Schumacher, 2013)

The Flex (See Figure 17) is a fitness-tracking product released by Fitbit, a health and fitness product company based in San Francisco, California. Despite its unified appearance, the Flex is actually two components: a thimble-sized, plastic tracking device and the elastomer band in which the tracker is housed. It is a dual-function tracking device that tracks both daily step totals and sleep quality. To toggle between these two tracking modes, a user taps repeated on the translucent, plastic display window until the lights change and blink (two separated lights for sleep mode and all five lights for active mode). Unlike the UP band, the Flex does not automatically switch from sleep mode to active mode when you start moving in the morning.

The Flex's battery lasts for a claimed three to five days and takes "up to three hours" to charge completely (Fitbit Help, 2013). A custom USB cable is provided to charge the Flex (See Figure 18). Using USB for charging is a wise choice since USB-supporting devices are numerous, but the uniqueness of the charging cord presents an inherent problem. If a user misplaces the wire, it will most likely be hard to find another one before the battery dies.

Figure 18: Flex's Charging Method (GadgetMac, 2013)

The Flex uses Bluetooth 4.0 technology to wirelessly sync its collected data to either the Fitbit mobile app or a computer with a Fitbit USB wireless sync dongle plugged into it. By using Bluetooth 4.0, the Flex is able sync its data to the Fitbit mobile app in real-time without draining the smartphone's nor the tracker's battery. When the syncing completes, the user can then view and analyze the data on their smartphone or on the Fitbit.com website.

Figure 19: Fitbit iPhone App (Kelly, 2013)

Fitbit takes a two-tier approach with its products, offering both a smartphone app (See Figure 19) and a website (See Figure 20) as access points for their users. Accessing the app or website adds distance walked, active minutes, calories burned, weight tracking, calories eaten, calories left to eat, and water consumed for the user to view and configure. The graphs generated

by the app are informative and attractive, but unfortunately, they leave any interpretation of the data up to the user. There is no abstraction of data happening in the app or on the Web site; they both deal directly with the quantified data collected, albeit in an attractive way.

Figure 20: Fitbit Web Dashboard (Finch, 2013)

Like the Nike and Jawbone, Fitbit has built a social element into their app by allowing users to connect with other owners of Fitbit trackers. Users can find friends, family members, and acquaintances via their Facebook accounts or by allowing the app to access their phone's contacts. They can also send invitations to other people by email. At the time of this writing, there is no method of easily finding other, anonymous, similar users.

Finally, the Fitbit app and Web site allow users to configure and manage more complicated settings and goals and control a number of more advanced features. Daily fitness goals, such as step totals, distance traveled, calories burned, and minutes active, weight loss goals, a vibrating alarm similar to the UP's, and even the units used for measurements can all be managed from within both the app and the Web site. Oddly absent is the ability to set a sleep goal like the Jawbone UP allows.

Overall, the Fitbit Flex is an unimposing product available for consumers looking for a health-related, self-tracking device. When paired with its smartphone app or Web site, it allows for the tracking of activity, sleep, and diet. An alarm clock adds value and incentive for a user to keep wearing it, but, unlike the UP, it lacks a stopwatch feature. Finally, it allows users to find other Fitbit product owners to befriend by connecting users with their real-life contacts instead of anonymous, similar others therefore leading to a drastically reduced competition pool.

2.3.4 Others

There are numerous other goal-oriented services available for smartphones and computers. While these services don't necessarily have their own correlating products, in a way, smartphones themselves serve as the tracking device. While this study does not have the space or

the resources to explore every offering presently available, this section will give a quick overview of three popular services, MyFitnessPal, Mint and Lift.

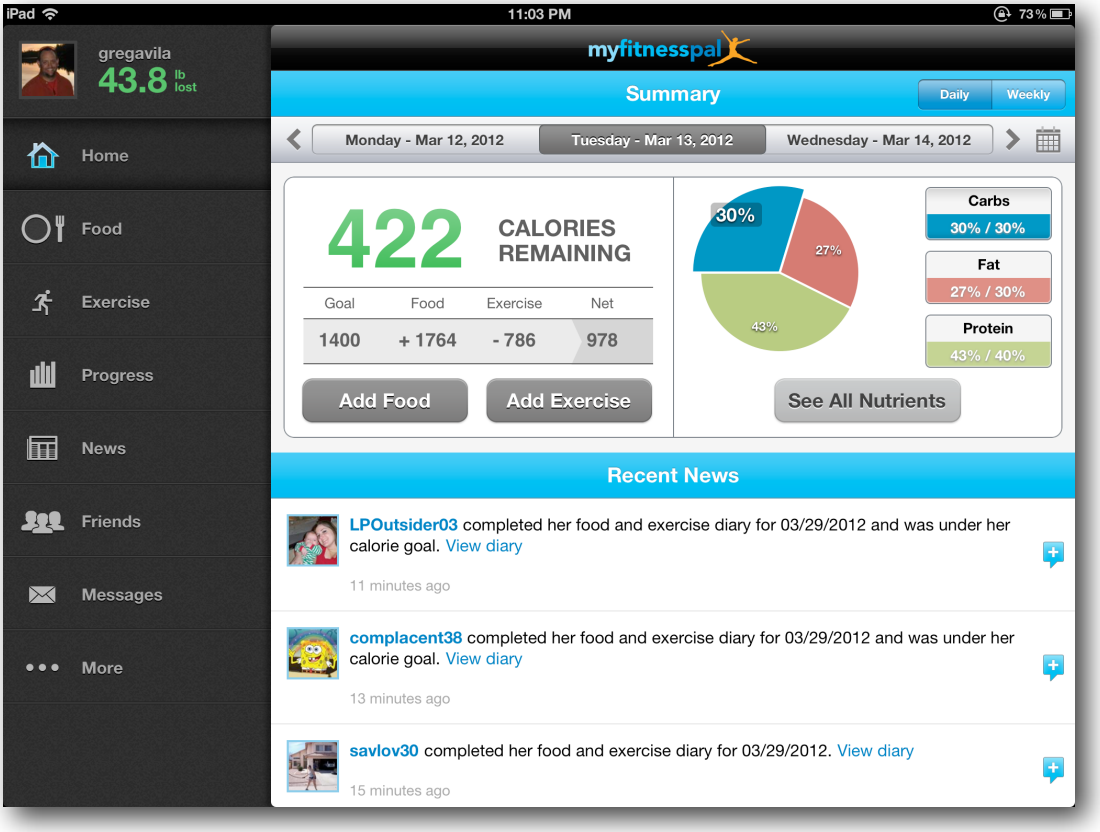


Figure 21: MyFitnessPal iPad App (Avila, 2012)

MyFitnessPal (see Figure 21) is an online service that allows users to track their daily calories consumed and burned through either their mobile app or Web site. The service has an extensive, user-created food database and allow members to create and save typical meals for easier access in future loggings. When users log into the service, they are greeted with a screen that represents the current day. As users log food that they have eaten and exercise that they have performed into the system, various graphs and tables begin to fill with the provided nutrition information in order to let the users see how well they are eating and how much more they can

eat for the day while staying on course with their weight loss goal. These features have made MyFitnessPal a very popular service. So much so, in fact, that FitBit and Jawbone have allowed their customers to integrate the service into the FitBit and UP smartphone apps to use in place of the apps' built-in nutrition tools. This third-party support benefits all parties involved, especially the users.

Secondary to the calorie counting service is their online community. First, a forum provides a place for members to offer and receive encouragement, motivation, and advice. Second, specialized groups allow users to join fitness challenges, share in common interests, and learn about the latest tips and trends. Third, personal blogs allow members to share personal thoughts, struggles, and successes with others in a diary-like fashion. Finally, member searching allows for members to find similar others to befriend and share in the experience. While not all members take advantage of MyFitnessPal's community services, it is clear that having these services benefits those who do use them.

Mint (See Figure 22) is a popular personal finance Web service and smartphone app that allows users to see analysis of their expenditures, create budgets, and set financial goals. It works by receiving access to a user's various financial accounts. Now, when the user spends money from any of those accounts, Mint will automatically recognize what type of category the spending falls into (food, entertainment, medical, etc.) and log it as such. Then when the user logs into the app or Web site, he or she is greeted with an overview page that shows a quick

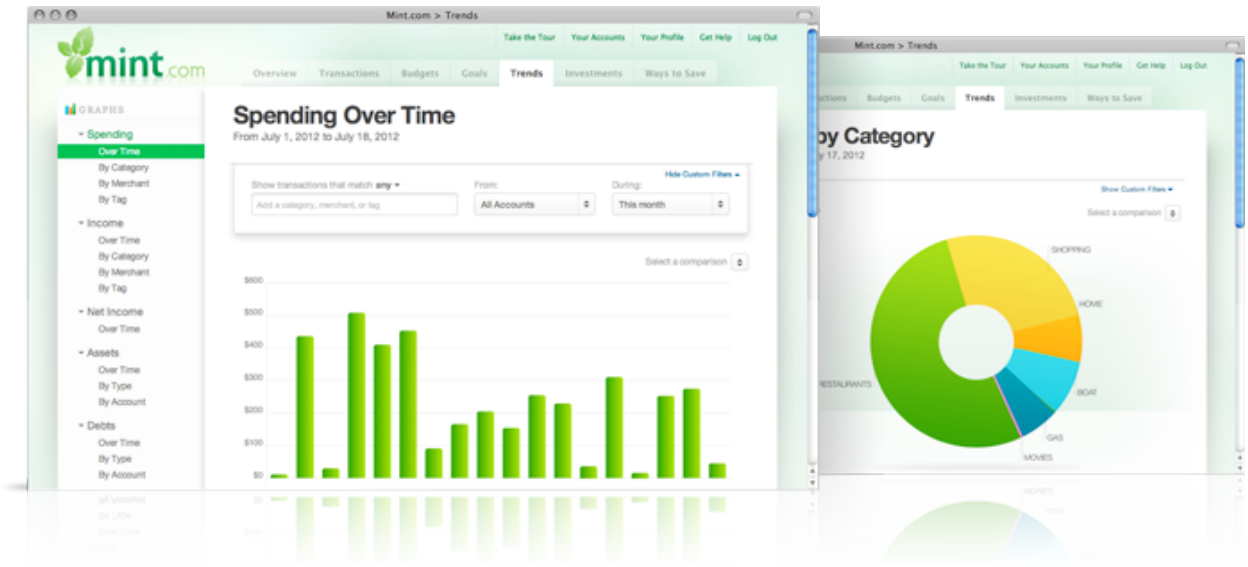


Figure 22: Mint.com (Mint, 2013)

breakdown of their financial habits, status, and trends. From here a user can decide to set a budget to help curb frivolous spending or create a goal, such as saving up for a car or paying off loans, and Mint will adjust its recommendations and graphs accordingly. Even though there are some quirks, for example, some transactions are left uncategorized and must be manually set by the user, Mint is extremely successful at helping users understand and manage their financial lives by using automation to create useful and comprehensible data.

Lift (See Figure 23) is an iPhone app and Web service that allows users to set goals and tasks publicly. When users first sign up with Lift, they choose what goals they want to accomplish, either from a pre-made list of popular tasks or as a custom task the users create. Next, they can search for and add other Lift users to their friends list. Each day as users complete each of their tasks, they then check off that they have completed it. This posts the completed task onto a public feed for other users to see, comment on, or give "props." Lift also shows completion history of individual tasks and goals for users to reflect upon and see how well they

are doing. Overall, while Lift's concept and design might seem simplistic, it has helped many users learn new abilities, reach new goals, and get tasks done.

Figure 23: Lift iPhone app (IBNLive, 2012)

2.4 Problems with Current Services and Products

As nice and successful as these products have been, there are some obvious problems with their current implementations. This study focuses on the three most prominent issues. First, they rely too heavily on sustained self-efficacy. Second, they place too low an emphasis on anonymous competition. Third, they place too much of an emphasis on hard, numerical data rather than abstracting it into something more meaningful for the users. By addressing these problems, a more effective goal-oriented system can be developed.

2.4.1 Over-reliance on Sustained Self-Efficacy

The first problem with current services and products is that they seem to assume that simply inserting oneself into their system is enough to keep a user motivated to the completion of their goal. While a state of high motivation is inherent to a user's decision to enter into a goal-oriented system, motivation hardly ever stays constant, and some even believe motivation naturally hovers at a low level (Fogg, 2012). B.J. Fogg (2012) illustrates the relationship between motivation levels and the difficulty of accomplishing tasks with his "Motivation Wave" (See Figure 24). Looking at the model, one can see that the more motivation that an individual has, the easier it is to accomplish harder tasks. With this established, Fogg suggests that systems should have users complete harder tasks when they are more motivated in order to help them continue progressing when their motivation is low. This is called "harnessing the wave" (Fogg, 2012).

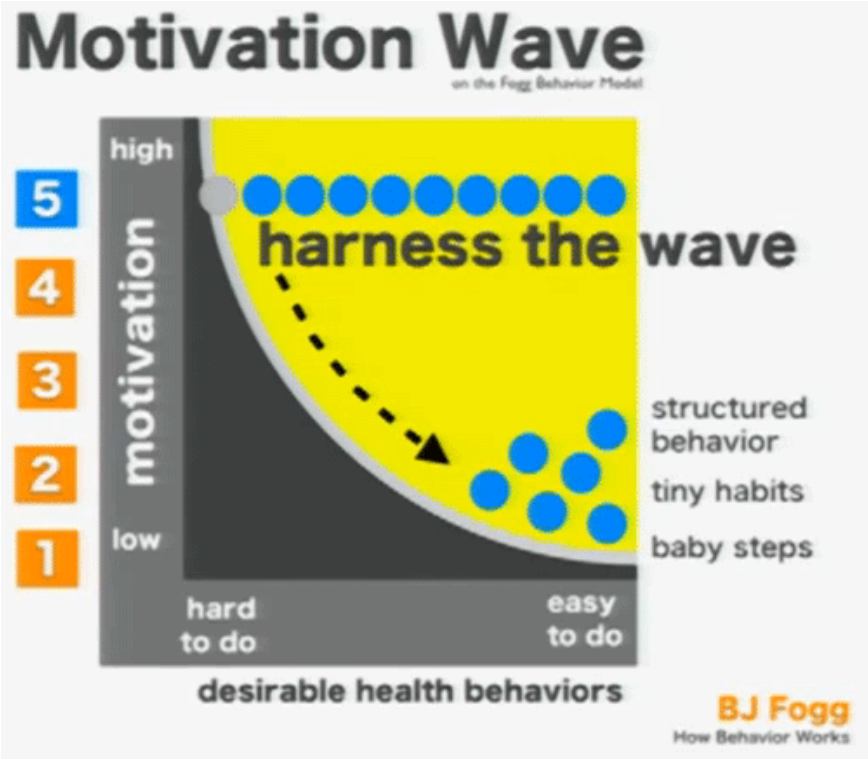


Figure 24: Fogg's Motivation Wave (Fogg, 2012)

So, how good of a job are current systems doing at keeping users engaged and progressing? According to a survey conducted by the Consumer Health Information (2011), 74% of smartphone health app users stop using them by the tenth use, and even traditional goal-oriented systems, such as workplace weight loss initiatives struggle with high attrition rates (Brownell, et al., 1984, p. 1283). Knowing all of this, it is foolish for a designer to assume that just because highly-motivated users buy self-monitoring products and insert themselves into goal-oriented systems that they will stay motivated throughout the entire process. It is the designer's responsibility to provide the proper motivational triggers at the appropriate times, a captology principle known as "kairos" (Fogg, 2003, p. 188).

2.4.2 Low Emphasis on Anonymous Competition

The second major flaw of goal-oriented, self-tracking products available today is the lack of heavy emphasis on anonymous competition between users. The Nike+ FuelBand, Jawbone UP, and Fitbit Flex all insist on the user finding and connecting with existing, real-world friends and family members. They even encourage users to sign up with their Facebook accounts, leading to their real names being used instead of anonymous avatars or screen names. This is an unfortunate mistake, as anonymity is a powerful, inherent quality of interacting with computers (Fogg, 2003, p. 8).

By restricting users to real-life acquaintances, the current generation of goal-oriented tracking products is trapping users on metaphorical islands of familiarity and established identity instead of allowing them to flourish in the freedom that anonymity provides. A 2009 study by Hwang, et al. focused on the social support provided by an Internet weight loss community and found that members received support in the form of "encouragement and motivation,

information, and shared experiences" (p. 10). These support types are shaped by "unique characteristics of convenience, anonymity, and non-judgment" (p. 11). It is apparent that allowing anonymous interaction between users allows for discussion of sensitive issues (Hwang, et al., 2009, p. 6) while simultaneously opening up a much larger pool of users with which to interact.

Towards that point, consider if a goal-oriented system dealt with sensitive information such as a person's weight, school grades, or embarrassing habits. It is easy to see how an individual would be more open to sharing this information with other like-minded individuals under the protection of anonymity rather than openly with family and friends. This line of thought is supported by the aforementioned study's finding that the online weight-loss community members "appreciate the option to remain anonymous. The anonymity gives members the freedom to discuss sensitive topics in an honest fashion. The anonymity also creates an environment in which interactions are non-judgmental" (Hwang, et al., p. 10). The power of anonymity is obvious and should play a vital role in a Internet-based, goal-oriented system.

2.4.3 Low Emphasis on Group Competition

The third major problem with current goal-oriented, self-tracking products is the over-emphasis of competition between individuals. While competition among individuals is a valid and powerful motivating force (Fogg, 2003, p. 205), "intergroup ("us-versus-them") dynamics are known to have a powerful impact on motivation and behavior" (Rees, et al., 2012, p. 401) as well. A recent study by Rees, et al. (2012) looked for ways that a competitor could snap out of a downward performance spiral. They ran two experiments involving blindfolded students

throwing darts at a modified dartboard. After being given bogus bad scores for their first throws, each contestant was given feedback, either positive or negative reinforcement, from two groups of participants dressed in sweatshirts of the dart thrower's university or that university's biggest rival. The results (See Figure 25) show that "explicit performance feedback—whether encouraging or discouraging—is more impactful when it comes from an ingroup member" (Rees et al., 2012, p. 403).

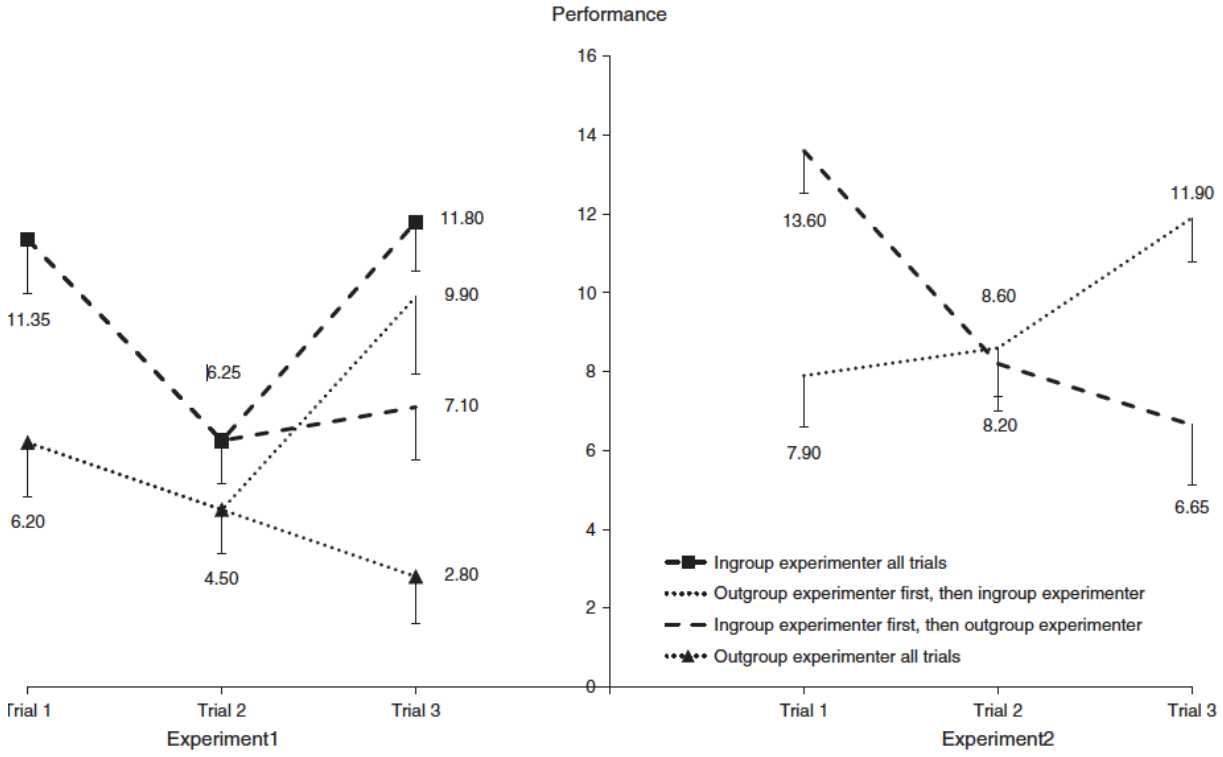


Fig. 1. Performance across trials in Experiment 1 (left panel) and Experiment 2 (right panel). Error bars indicate standard errors.

Figure 25: Effects of Ingroup vs. Outgroup Performance Feedback (Rees, et al., 2012, p. 402)

Overall, the results of the study show that:

> Downward performance spirals are not inevitable; they can be reversed by harnessing a combination of ingroup influence and intergroup competition—by not only willing us to be right, but also them to be wrong. (p. 403)

With this knowledge, one must ask why the current generation of self-tracking products seems to treat competition as an afterthought and completely ignores the implicit performance boosting power of shared group membership (Rees, et al., 2012, p. 402). The next generation of goal-oriented, Internet-connected services should put intergroup dynamics at the forefront of the user experience instead of focusing so heavily on the raw, collected data of the individual.

2.4.4 Over-Emphasis on the Data Over User Experience

The final problem with current systems this study addresses is the over-emphasis of the pure, numerical data instead of using that data to create strong, emotional connections between the users and their efforts. For this emerging category of products to reach its true potential, tracking products and services must move beyond simply being fancier version of former products. Instead of making a Bluetooth-connected pedometer, a designer should strive to craft new, holistic user experiences. This can be achieved by emphasizing the artifact as a tangible and real-time connection to the immaterial service and by abstracting collected data into useful metaphors.

Self-tracking devices inherently serve as extensions of their companion Internet services. To their credit, the FuelBand, UP, and Flex do an acceptable job of carrying over their respective brand languages and aesthetics from their apps, web services, and related products. However,

where they fall short is in their effort, or lack of effort, to serve as tangible, real-time correspondents between their services and their users.

For example, none of the three most popular self-tracking services provide real-time competition ranking information on the physical product itself. The Jawbone UP's wristband provides no visual cues of a user's activity status or ranking amongst his or her teammates, and, while the Fitbit Flex uses its five LEDs to show one's daily step-total progress, it offers no other reports concerning ranking, nutrition, etc. The FuelBand, however, is slightly ahead of its competition by not only showing a user's progress on the wristband itself, but also caloric intake information synced from its Web site or mobile app. Unfortunately, it too lacks any form of competitive ranking indication. Unless the user makes a conscious effort to access the apps or website, he or she receives little to no positive feedback for his or her efforts. This makes it very easy for one to forget or completely ignore the system altogether. By serving primarily as silent data collectors, the current generation of devices is creating friction in their user experiences that is not necessary and can have a negative impact on a user's motivation and ultimately his or her success from a lack of feedback.

Finally, most of the current generation of self-tracking products present data in its raw, numerical state. This includes, but is not limited to, steps taken, calories eaten, and hours slept. Even the FuelBand, the only one of the three fitness bands compared that attempts to create a metaphor with its data, abstracts its numerical activity data into a numerical point system. A designer should ask him or herself how useful are all these numbers to a user? How does knowing they took 10,000 steps or earned 5,000 NikeFuel points in a day help users see their progress towards their goals? The simple answer is that it does not. This is made painfully

evident by the extremely high attrition rate of users of health and tracking apps (Consumer Health, 2011).

So how does a designer make this data useful and effective to the user? The answer is to abstract the collected data into something that makes more sense within the system. Like Kevin Kelly said, the numbers need to be buried even though the quantification will remain (Goetz, 2012). By moving the numerical data to the background, goal-oriented, self-tracking systems can create meaningful and useful metaphors that inform users of where they stand in the system and how far they've progressed towards their goal.

One example of a good data-driven metaphor is the 2010 Ford Fusion Hybrid instrument cluster (See Figure 26). Its design goal is to encourage a driver to drive in a more fuel-efficient manner. Instead of just displaying the miles per gallon, Ford designers included what they dubbed the "SmartGuage", complete with a graphical representation of "Efficiency Leaves" (Roy, 2009). An article written by Rex Roy (2009) describes the "SmartGuage" nicely:

> What you'll see when you look through the steering wheel is a set of green leaves. The "Efficiency Leaves" are a graphical indication of a pilot's driving style; more leaves mean greener, more efficient driving. Rapid acceleration and hard braking cause leaves to drop from the vines. Leaves grow when the driver accelerates gently, coasts, and brakes smoothly to help recharge the hybrid's batteries.

It is with meaningful metaphors like this that designers can change users' behaviors through an emotional connection and a better understanding of the consequences of their own actions.

Figure 26: 2010 Ford Fusion's SmartGuage with Efficiency Leaves (Roy, 2009)

2.5 Conclusion of Research

Considering the current state of self-tracking consumer products and the findings of this research, it is this study's conclusion that better, more effective, goal-oriented systems can be designed with the establishment of a system of guidelines and recommendations to help create better user experiences through the integration of group-based, anonymous competition, metaphorical abstraction of numerical data, and artifacts that create a more tangible and real-time connection to the service itself. Goal-oriented systems that incorporate these three approaches as integral components should be able to successfully assist users to reach their goals.

Chapter 3: Proposed Guidelines and Recommendations

3.1 Components of the Proposed System

A goal-oriented, self-tracking system shaped by the research in this study will have three distinct components: the user, the artifact, and the service (See Figure 27). Firstly, the user is any motivated individual who voluntarily places himself or herself into the system. Secondly, the artifact is a tracking device constantly worn by, or in close proximity to, the user. Lastly, the service is an access point, most likely a Web site, smartphone app, or combination of both, with which the user and artifact interact.

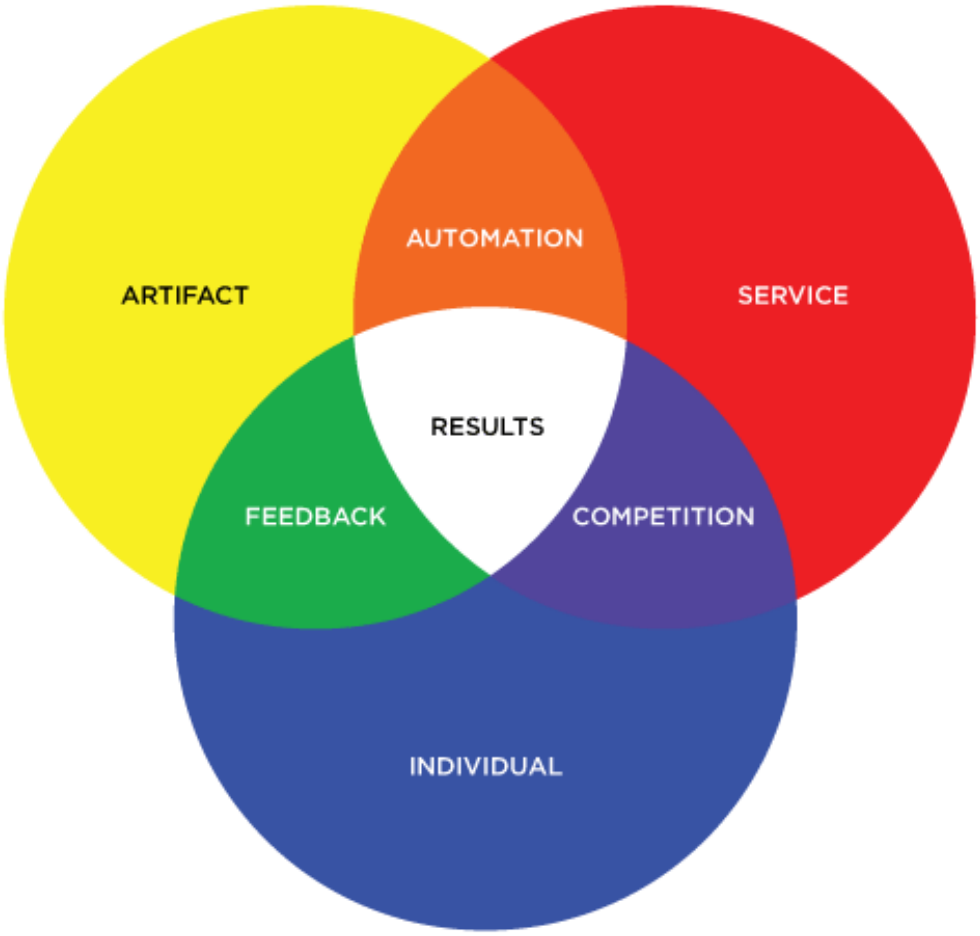


Figure 27: The Three Components of a Goal-Oriented, Self-Tracking System

3.1.1 Introduction to the System's Guidelines

With the three necessary components established, the following is a list of guidelines that this study has found to be necessary for creating a successful goal-oriented system design. It is up to the designer to decide how to incorporate them into a unique system. There is an abbreviated list of these guidelines in the appendix for easier reference.

3.1.2 Guidelines for the Artifact

As described above, an artifact is a self-tracking device that is always in close proximity to the user. An artifact properly designed for a goal-oriented system design will:

1. *Serve as a real-time link between a user and the service:*

   The primary role of the artifact should be that of a reporter rather than a statistician. While more complex tasks should be handled by the service, whether it be a Web site, mobile app, or combination of the two (Fogg, 2003, p. 192), the artifact should provide its user with feedback such as notifications, status updates, and progress without becoming too bogged down with more permanent and complicated features such as user settings, social network leaderboards and comparisons, and data interpretation.

   Since the artifact will be with the user at all times, this makes it a prime candidate for leveraging the kairos principle, the idea that "mobile devices are ideally suited to... [offer] suggestions at opportune moments to increase the potential to persuade" (Fogg, 2003, p. 188). A designer should consider ways for the artifact to

provide appropriate motivation nudges based on a user's location, the time of day, specified goals, daily routine, or current activity.

2. *Provide tangible and/or observable status indication:*

Public recognition of achievements and status is a powerful intrinsic motivator (Fogg, 2003, p. 205). An artifact should provide the user with tangible and/or observable status indication. This provides a real-world connection between the immaterial service and the user. Whether this is achieved subtly, through methods like color changes, or more drastically, perhaps with the alteration of the artifact's form, is up to the designer. These tangible feedback mechanisms can serve as ranking indicators within the system, similar to belts in Karate or rankings in the military, or specialized achievements worthy of public recognition, similar to merit badges in the Boy Scout of America (Zichermann and Cunningham, 2011, p. 48).

3. *Have an appropriate form-factor for its purpose and use:*

"A designer must develop something of lasting quality in the most suitable and creative way given the existing conditions" (Löwgren and Stolterman, 2004, p. 12). With that established, a designer must analyze the purpose and use of the artifact to craft it appropriately. First, the environment in which the artifact will be used should play a large role in its formation. For example, an appropriate form for a fitness product will most likely be very different from that of a personal finance product.

In addition, the artifact should be designed in a way that enhances the existing experience, not complicates it. If friction is created by adding the artifact to the user's efforts, it is unlikely that the he or she will continue using it. In contrast, if the artifact presents a frictionless experience that actually enhances the user's efforts and creates a better sense of understanding and progression, then the user will be more likely to continue using it.

4. *Consider the most current technologies and the possibilities they present:*

Technology is always changing and advancing (Löwgren and Stolterman, 2004, p. 3). A designer must consider how new and current technologies can be combined in ways to create a great user experience and be aware of upcoming technology as it might have the potential to vastly improve that experience. For example, the arrival of Bluetooth 4.0 has allowed for the creation of constantly connected devices that use significantly less power (Bluetooth SIG, 2013). The implications of this, and many future technologies to come, can drastically shape the effectiveness and strategy of an artifact's design. A designer should be aware of what technologies are currently available and what will soon be arriving and plan accordingly.

5. *Use abstractions and metaphors to present data in useful and meaningful ways:*

Prominent leaders of the Quantified Self movement believe that its true potential might lie in the abstraction of collected numerical data into meaningful metaphors and experiences (Goetz, 2012). It is critical for a designer to remember

that the primary function of an artifact created by this system is to be a reporter, not a statistician. With these things in mind, the artifact should take hard, numerical data and alter it in ways that enhance the user experience and provide more meaningful feedback to its users. Some examples could include scorekeeping, progress bars, color shifts, and even altering the artifact's physical form. Ultimately, it is up to the designer to determine which method is most appropriate for his or her system.

3.1.3 Guidelines for the Service

As mentioned above, the service functions as an access point for the system. A properly designed service for a goal-oriented system design will:

1. *Establish and encourage group competition:*

   As demonstrated in the Rees, et al. (2012) study, group competition that establishes an "us versus them" mentality is a powerful motivating force. Firstly, ingroup encouragement can successfully lift team members out of downward performance spirals (Rees, et al., 2012, p. XXX). Secondly, membership in a group adds accountability and companionship that can foster motivation (Hwang, et al., 2009, p. XXX). Finally, group competition is an effective way to combat user attrition within a system (Brownell, et al., p. 1283).

2. *Use gamification strategies when, and only when, they are appropriate:*

   Gamification strategies can be used effectively to help users progress towards their goals. Achievement awards, such as trophies and badges, are excellent tools to use for marking goals (Antin and Churchill, 2011, p. 2) and providing positive

feedback (Zichermann and Cunningham, 2011, p. 77). However, it is important for the designer to implement awards in appropriate amounts and increments. Over-rewarding a user can result in what Zichermann and Cunningham (2011) call "badgenfruede," the rendering "of all badges vapid at best and patronizing at worst" (p. 56).

3. *Structure competition in a way that fosters the development of healthy rivalries:*

    Just as group competition acts as an enhancement to the motivational effects of competition, so does the development of rivalries. Kilduff, Elfenbein, and Staw's (2010) study shows that rivalry functions as an inherent performance enhancer. While rivalry is an entirely subjective state of mind (Kilduff, Elfenbein, and Staw, 2010, p. 946), it can be fostered by matching up similar players with comparable past performances for repeated competition (Kilduff, Elfenbein, and Staw, 2010, p. 961).

    It should be noted that rivalries can become heated and confrontational. Passion from rivalries can even affect those not directly involved with the competition (Kilduff, Elfenbein, and Staw, 2010, p. 961). Steps should be taken by the designer to protect users from potential harm. Using the power of anonymity and giving the user power to block and manage his or her contacts are just a couple of ways a system can protect its users.

4. *Have an area outside of the competition for user interaction:*

    In order to create a supportive and connected social community, the service should provide an area outside of the competition where users can interact with each

other. Being able to "discuss and share common goals, struggles, and experiences" can lead to the production of empathy (Hwang, et al., 2009, p. 8). Testimonies and stories of other users' success can also lead to increased motivation to succeed (Hwang, et al., 2009, p. 8). An example of a community area such as this could be, but is not limited to, Web site message boards, forums, and chat areas.

5. *Provide a more detailed look at the information gathered by the artifact:*

    Since the display area on the artifact is most likely going to be smaller than a smartphone or computer screen, and therefore limited in what it can show the user, it is wise for a designer to move more complex tasks away from the artifact and into the service (Fogg, 2003, p. 192). This includes, but is not limited to, the initial setup of the service, user preferences and settings throughout the use of the service, in-depth viewing and interpretation of data, and social interactions. Some existing products and services, like the Jawbone UP, Nike+ FuelBand, and Fitbit Flex, are already doing this quite nicely with their mobile apps and Web sites.

6. *Be as easily accessible as possible:*

    Mobile technology and the proliferation of smartphones have created a world where access to Internet browsers and Web services are consistently near the user. This environment is ideal for creating "interactive experiences that are easy to access," and, therefore, there is great opportunity to persuade individuals with constantly connected services (Fogg, 2003, p. 189). For this reason, this study recommends creating an access point to the service through whichever means is

closest and most convenient for the user. Presently, it seems that the quickest way to access a service would be a smartphone app, but it is ultimately up to the designer to judge for him or herself what access point is most appropriate for his or her service.

3.1.2 Recommendations

The following recommendations can be helpful when creating an effective self-tracking, goal-oriented system. Though they might not be necessary for every system, a designer of a system created by these guidelines should:

1. *Consider communication between and integration with other services.*

   By allowing other existing services to complement and integrate with their own, designers can reduce the amount of friction a user will encounter when entering into a new system. Open APIs and app partnerships are some of the ways in which this can be accomplished. A good example of this policy is Jawbone's decision to allow third-party apps, such as MyFitnessPal, to share their data with the UP app (Jawbone, 2013). This decision allows services with which users are already familiar and comfortable to contribute data to the UP app and expands the UP experience.

2. *Consider allowing for specialization of competition.*

   As stated earlier, rivalry can be fostered by the repeated competition of similar players (Kilduff, Elfenbein, and Staw, 2010, p. 961). However, there are some players who might be uncomfortable playing against certain others. For example, some men or women may not feel comfortable playing against players of the other

gender. If a system provided a way for them to specify that they prefer to compete only against members of their gender, then that friction can be avoided.

3. *Consider a design approach that allows for consolidation of products and software.*

If a system resembles an existing service, wearable artifact, or technological device it would be wise for the designer to include some, if not all, of the functions that its precursor provided. Firstly, if a system's artifact will be worn around the wrist, it would be wise for the designer to include a clock since wristwatches already performed this function. Secondly, a designer should take into account the situations in which the artifact will be used and include features to enhance its usefulness. For example, if the artifact will be worn by runners, a stopwatch mode would be a valid and useful feature. Lastly, this recommendation can apply to software as well. If the artifact or service is attempting to improve upon existing software designs, the designer should carefully evaluate which features and behaviors users appreciated the most and implement them into the new system if and when they are appropriate. A familiar and successful example of this approach is the original Apple iPhone. By using software to combine the features and capabilities of a computers, mobile phones, and music players into a singular device, it enjoyed immense popularity and helped change the mobile device landscape drastically.

4. *Be aware of current fashion trends and design accordingly.*

If an artifact will be worn, then it would be wise for the designer to understand the current trends in wearable tech and fashion. As of this writing, the current trend

for wearable technology is to look like Apple products (Rock Health, 2011), but trends are constantly changing. The bottom line is, if an artifact makes a user feel embarrassed while wearing the artifact or if the artifact simply clashes with current fashion, then, chances are, it won't be purchased or worn.

5. *Consider the possibility of using existing mobile devices as the system's artifact.*

Many of today's mobile devices already contain advanced, tracking technology of their own. If a designer finds the form factor and abilities of a device to be appropriate for its intended use, then he or she can choose it as the system's artifact. For example, Apple's newest phone, the iPhone 5S, has a processor chip dubbed the "M7" that is dedicated to taking the burden of collecting data from the phone's sensors off of the main processor. This allows the sensors to operate even when the phone is asleep (Talbot, 2013). Advancements like this are going to open up a whole new realm of possibilities for using mobile devices as self-tracking devices.

By using existing mobile devices as artifacts, a system can instantly gain a large potential member base without requiring users to spend their money on an additional device. This makes this approach a wise choice for systems that place affordability and ease of access as top priorities. However, it is important to remember that the artifact and system guidelines requiring physical form and status indication must still be met. These can easily be accomplished by pairing external products such as cases, bracelets, and physical badges with the existing devices.

3.1.3 Precautions

As with any attempt of changing a person's behavior, efforts must be taken to ensure the safety of the individuals involved. In order to ensure a safe environment for a system's users, a designer should:

1. *Ensure that users' identities and private information are protected.*

   While anonymity is an effective force at encouraging online interactions and competition, interacting with strangers always carries an inherent element of danger and uncertainty. It is imperative that a system protect its users' private information in order to protect them from any strangers who might mean them harm.

2. *Consider consulting with professionals in the field that the system will reside.*

   Before creating a system that exists within a certain field of work or study, it is important for the designer to consult with various professionals within that field to ensure that the methods the system will employ are safe and appropriate for the target user base.

3. *Understand that these guidelines do not guarantee results for all users.*

   The vast complexities and varieties of human personalities, interests, preferences, and psyches guarantee that, no matter the methods used, some people won't respond well to a system. If a majority of users are responding well to the system, then it is successful. However, a designer should always respectfully listen to feedback from users and analyze users' progress to determine when and what changes, if any, need to be made.

Chapter 4: Design Application

4.1 Concept Development

Since this thesis primarily uses current fitness-related products as its case studies, it seemed fitting to use a fitness-based, goal-oriented system as an example of the type of system that can be achieved with the guidelines and recommendations promoted by this study. Hopefully, by contrasting the techniques, methods, and effectiveness of current systems with the system demonstrated in this chapter, readers will be able to discern the benefits of implementing this study's guidelines when designing their own goal-oriented systems. This example system has been dubbed "GAME" and is the culmination of the findings of this thesis and the writer's studies in graphic and industrial design at Auburn University.

4.2 An Example System: GAME

4.2.1 Introduction

GAME is a team-based, competitive, fitness and weight-loss system in which users compete in weekly, virtual tug-o-war games by scoring points for their team by being active. Aside from the team-based elements, there are also features meant to help individual users specifically. User interaction with the system occurs on the GAME watch and within the GAME app on users' smartphones. The following sections cover the design of the watch, the iPhone app, the users, and how all three come together to create a positive user experience.

4.2.2 The GAME Watch

Hardware

The GAME watch (See Figure 28) serves as the system's artifact, and is worn by the user in order to automate the collection of a user's physical activity data while also serving as the tangible connection to the GAME smartphone app. The user experience it helps create will be covered in depth in Section 4.2.5. This section serves as a descriptive overview of the watch's physical characteristics including its materials, technical specifications, and aesthetics.

First, the materials used in the design of the GAME watch are suitable for the environment(s) in which it will be used. Since it will be worn during physical activity, it should be able to endure impacts, resist damage from water and sweat, and not hamper the users' movement. For these reasons, the internal electronics are housed in a durable, protective, and lightweight silicone shell. The watch's three function buttons, status indication strips, and band release latch are made of ABS plastic, allowing for a shiny contrast to the silicone body's matte finish. Lastly, the watch's glass screen is inset into the body by a stainless steel chamfer in order to protect it from impact scratches.

Second, in order for the GAME watch to fulfill its duties, it makes use of various technologies. Its screen is a 240 by 240 pixel, 220ppi, AMOLED screen. AMOLED was chosen because it allows for better battery life since black pixels don't consume power. Speaking of battery life, the watch's band contains a flexible lithium-ion battery that allows for a two-day battery life. This battery is charged via the USB plug at the end of the band (See Figure 29). Using USB as a charging method is wise since there are many USB ports are widely available;

Figure 28: The GAME Watch

however, data isn't synced via this plug. Rather, it is synced in realtime via Bluetooth 4.0. If a notification is sent to the watch via this newest specification of Bluetooth, a vibration speaker and small, internal speaker can alert the user of its arrival. Finally, an accelerometer is used for detecting steps and movement while a vibration motor is used to alert the user of notifications.

Figure 29: The GAME watch's charging method

Persistent Elements

There are several design elements that are present in two or more of the watch's display modes (See Figure 30). First, the battery indicator is positioned near the top of the screen. Second, the "tide of battle" game scoreboard graphic is present in the lower middle of the screen and shows the status of the player's current game. If the tallest bar is to the right of the midpoint indicator, the player's team is winning; if it is to the left, the player's team is losing.

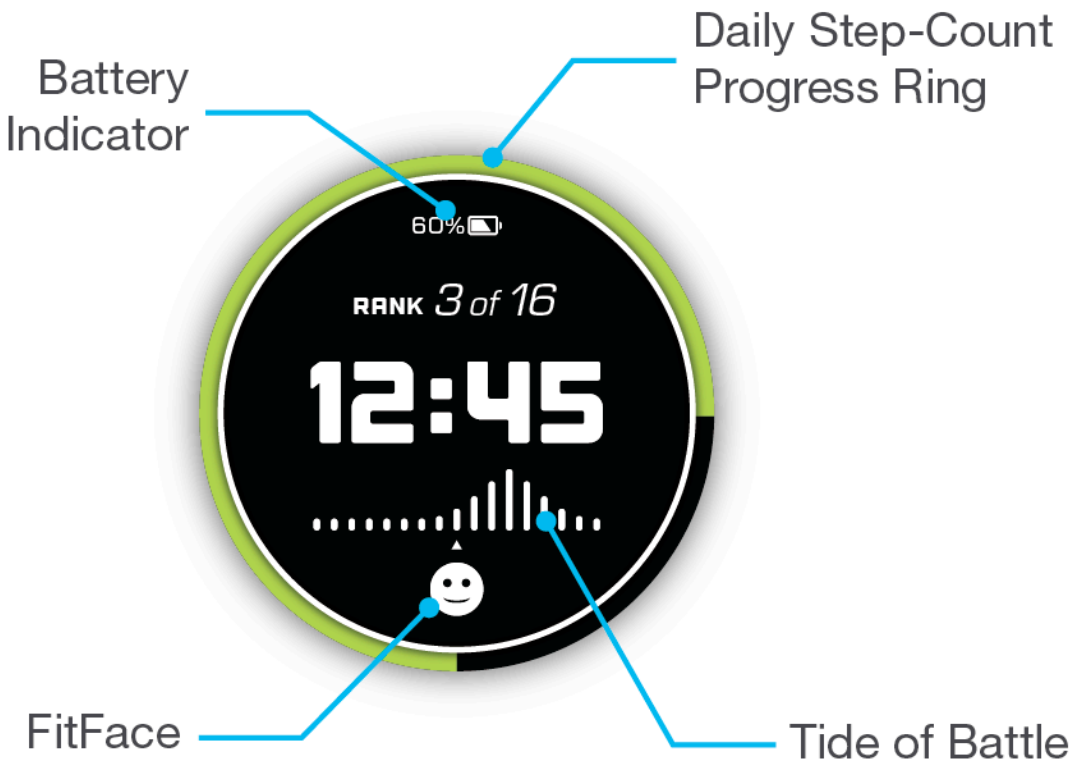


Figure 30: Persistent Elements

Third, a stylized face, called a "FitFace" sits below the tide of battle graphic. This face shows happiness if the player's team is winning, indifference if the teams are tied, and sadness if the player's team is losing. This face also shows up in several notifications on both the watch and the iPhone app. Hopefully, this technique will cause players to develop an emotional attachment to good performance and motivate them to perform better. Lastly, the daily step-count progress ring encircles the entire face. This ring fills with color clockwise from the six o'clock position as a user gets closer to 100% completion. However, in sleep tracking mode, the bar resets to 0% progress and changes to purple in order to show the user his or her progress toward the nightly sleep goal. If a user switches back from sleep tracking mode during the same day, the bar will

return to its original color and previous completion total in order to continue tracking the day's steps. Having identified these persistent elements, it will be easier to explain the three primary display modes of the GAME watch.

Display Modes

The GAME watch's user interface has three primary display modes: clock, stopwatch, and sleep tracking. To switch between these modes, a user simply has to press the mode button on the right side of the watch.

Figure 31: Clock Mode

The default display mode takes the form of a digital clock (See Figure 31). It is in this mode where users will spend the majority of their time since the GAME watch functions

primarily as a digital watch after its role as the artifact of the GAME system. The watch's two function buttons serve as up and down switches for the secondary data area above the current time. This area can show a user's realtime game rank, step-count, and steps left. Having this information at a glance should help users feel connected to the system, even when they don't have their iPhones with them.

Figure 32: Stopwatch Mode

The second display mode is stopwatch mode (See Figure 32). Since the GAME watch will be often used in situations where running and walking are concerned, it is wise to include this mode for user convenience. Function button 1 saves lap times and function button 2 starts

and stops the stopwatch. Pressing and holding function button 2 resets the stopwatch to zero. When the user finishes his or her session, the data is wirelessly synced to the GAME app for future reference.

Figure 33: Sleep Tracking Mode

The third display mode is the sleep tracking mode (See Figure 33). Unlike the clock and stopwatch modes, this mode can't be accessed by simply pressing the mode button. To avoid accidental activation, a user must press and hold the mode button for two seconds to enter sleep tracking mode. Once this mode is initiated, the watch will track its user's sleep by using the accelerometer to measure his or her body movements. A purple bar slowly fills up the ring until

the user awakens to show the amount of his or her sleep goal that was fulfilled by the night's rest. When the user wakes up, he or she can deactivate the mode by pressing and holding the mode button for two seconds again, or the watch will automatically switch back to clock mode if the accelerometer detects more than five minutes of active movement.

Notifications

Aside from the three display modes, the watch also receives various notifications in realtime from the iPhone app via Bluetooth 4.0. This takes advantage of the watch's proximity to the user and its excellent compatibility with the principle of kairos. When a user receives a notification, the GAME watch will beep and vibrate to let him or her know. Since some users will be in situations where vibration and sound are not preferred, these features can be turned off via the settings section of the iPhone app. Some examples of notifications (See Figure 34) include game victories, rank changes, new messages received, and reaching one's daily step goal.

Figure 34: Examples of Notifications

4.2.3 iPhone App

The GAME iPhone app serves as the system's service component. It allows users to complete more complicated tasks, interact with other users, track their progress, record their daily nutrition, and manage various settings and preferences. It also provides users with a more detailed look at the data collected by the GAME watch. The user experience created by the interaction between the watch and the app is covered in Section 4.2.5. This section will serve as a descriptive overview of the features and design of the app itself.

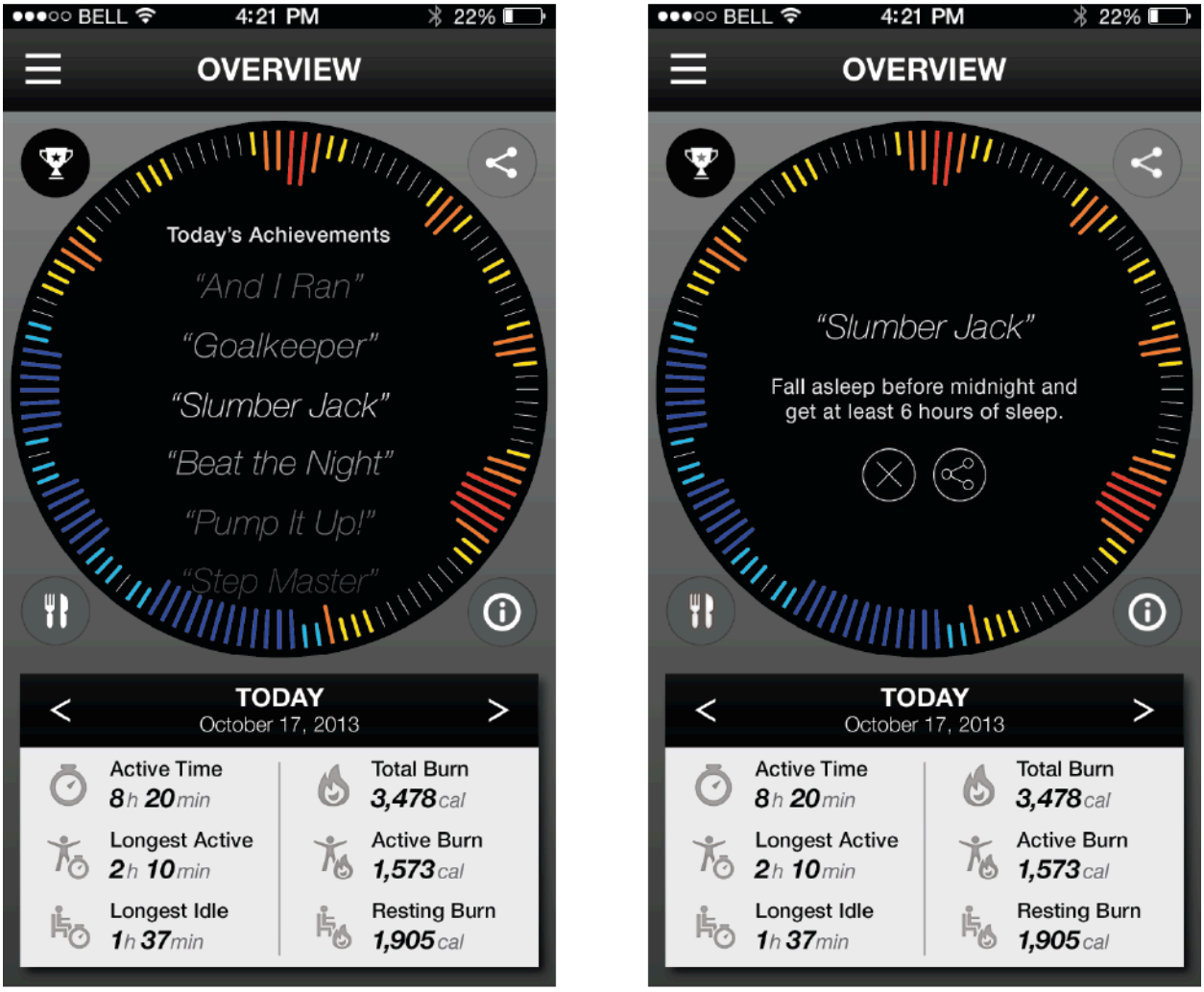
Overview Screen

The overview screen (See Figure 35) is the app's default, or home, screen at which the users arrive when they open the app. While it is by no means the only important screen within the app, it is intended to be the primary point of contact for interaction and dissemination of information. It is divided into two content areas: a large dial for displaying five distinct display modes and a table for displaying daily user statistics.

The display dial is designed to mimic the user interface of the GAME watch. This provides coherence and cohesion between the two system components even though the app's rectangular format is drastically different from the watch's small circular dial. The large dial is flanked by four toggle buttons that replace its contents with that of their respective modes. The five dial modes are as follows: default mode, achievements mode, social sharing mode, nutrition mode, and detailed information mode.

Figure 35: Overview Screen – Default Mode

Firstly, the default mode (See Figure 35) is what is shown upon opening the app and is displayed if none of the four mode toggle buttons are selected. It contains the user's daily step goal progress bar, the number of daily steps taken, the current game's tide of battle graph, and current point deficit or surplus with an accompanying FitFace. Default mode is the most similar to the GAME watch's user interface and serves mainly as an at-a-glance reference for the user's current personal and team statuses.



Overview Screen
Achievements Mode

Overview Screen
Achievement Description

Figure 36: Overview Screen – Achievements Mode

Secondly, achievements mode (See Figure 36) is a virtual trophy case for reviewing daily personal and team achievements. Upon entering achievements mode, the center dial is replaced with a scrolling, vertical list of achievements that were won during the course of the day. If a user taps on any of these titles, the app responds by showing them a description of how he or she

earned it and also provides them the option to share the achievement with various social networks. This allows a user to receive more public recognition from friends, family, and followers who might not have the GAME app while placing control of achievement sharing at the users' discretion.

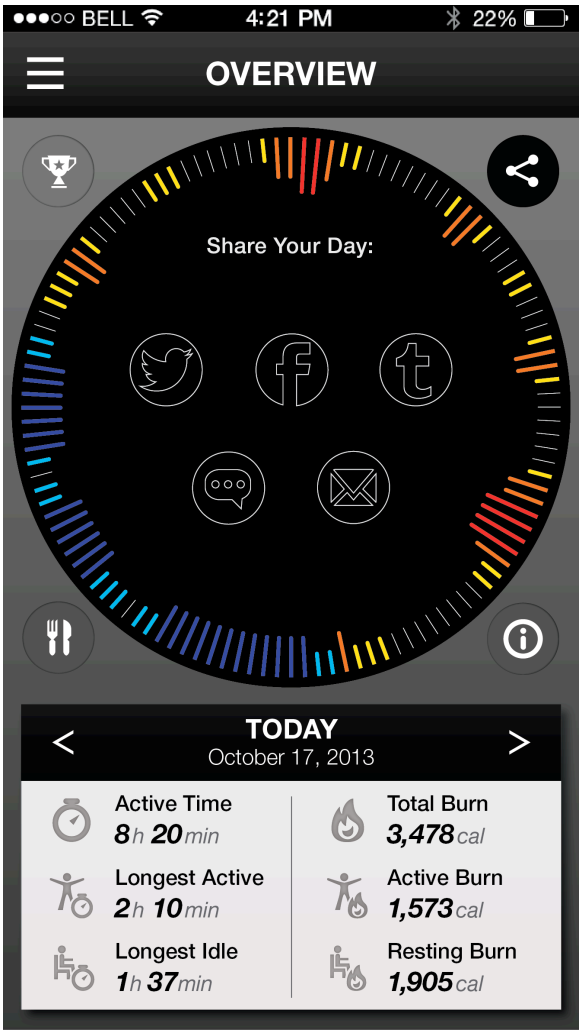


Figure 37: Overview Screen: Social Sharing Mode

Thirdly, social sharing mode (See Figure 37) continues this policy by giving users the option to share their entire day with other online social networks. When this mode's toggle

button is pressed, the center dial is filled with stylized matrix of social network icons. The user can then select with which of these networks to share his or her daily statistics. Once again, this is a completely optional decision that is up to the discretion of each user. The GAME app will never automatically share a user's information with third-party services.

Figure 38: Overview Screen: Nutrition Mode

Fourthly, nutrition mode (See Figure 38) serves as a virtual food diary. When this mode's toggle is tapped the center dial's content is replaced with a matrix of data regarding the user's

current nutritional intake for the day. If a user wants to log more food items, he or she only has to tap the plus sign at the bottom right of the dial. This brings up a list of food and drink categories from which to narrow down until the user finds their desired item. On selection, the item's nutritional information is added to the user's daily intake totals. If a user needs to remove an item from their daily log, he or she can simply do so by tapping the encircled "x" and selected the unwanted item from the ensuing list. Like social sharing mode, it is a completely optional mode that is made available for the user but not required for competition in GAME. Since there is no way to verify the legitimacy of the information a user enters, nutrition does not play a role in the scorekeeping of games.

Finally, detailed information mode (Figure 39) provides a more detailed breakdown of a user's physical activity and sleep throughout the day. Being able to evaluate a this information can help a user if he or she is looking for patterns or weaknesses in his or her daily routine. When this mode's toggle button is selected, the center dial's content is replaced with a user's current daily steps taken, time asleep, calories eaten, and calories burned. Surrounding this information is a twenty-four hour clock filled with bars of different colors and lengths. Regarding physical activity, red bars indicate intense effort, orange bars represent moderate effort, and yellow bars show light effort. Sleep-wise, purple bars indicate deep sleep and cyan bars represent light sleep. Thin, white lines indicate inactive, awake moments. Since users are are more than likely familiar with twelve hour clock faces, the app will display the time of the activity if a user places his or her finger on the corresponding bars (See Figure 39).

Detailed Information Mode
Overview

Detailed Information Mode
Time Detail

Figure 39: Overview Screen: Detailed Information Mode

Menu

In order to move to other parts of the app other than the overview screen, a user must utilize the main navigation menu (See Figure 40). This menu is accessed with a simple tap of the "hamburger" icon at the top left of the screen and slides in from the left-hand side of the screen. This allows for quick and easy movement throughout the app without losing valuable screen real-estate and is a common and well-known technique in smartphone apps as of this writing.

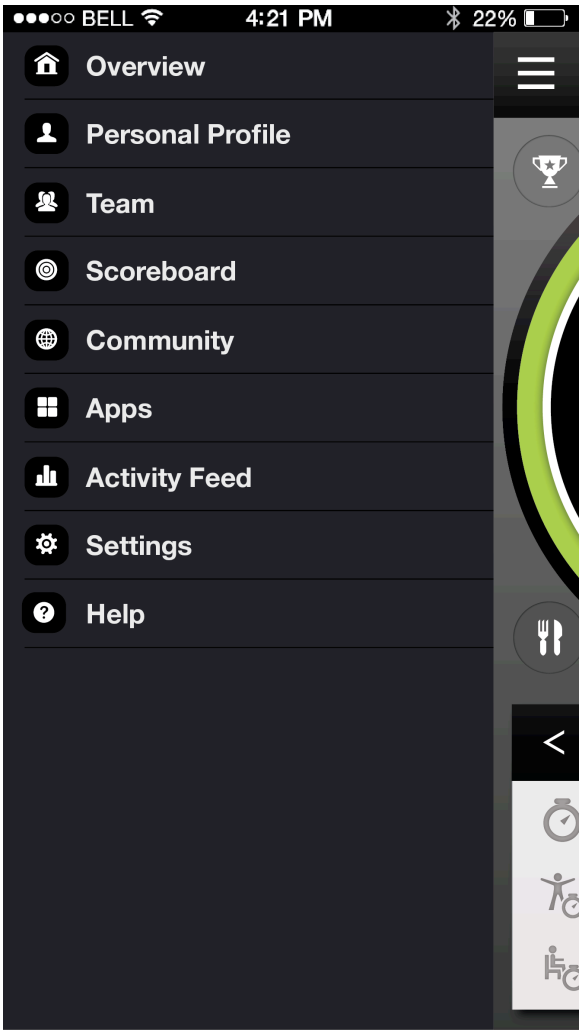


Figure 40: Main Navigation Menu

Personal Profile

The personal profile (See Figure 41) serves as a user summary page. It is on this page that users can set personal profile pictures, view their achievements, see their current skill level rankings (and progress towards the next rank), read messages from other users, and browse their personal activity feeds of their previous days and notifications. That last item, the personal activity feed, presents each day as a block of information that summarizes users' progress towards completing their daily activity, sleep, and nutrition goals. There is also a spot at the top right of each block that allows users to view that day's achievements and give kudos to another user for his or her accomplishments. In addition to the daily summary blocks, important achievements and notifications may also show up in the personal activity feed. This includes team wins, team losses, major accomplishments, ranking up, among others.

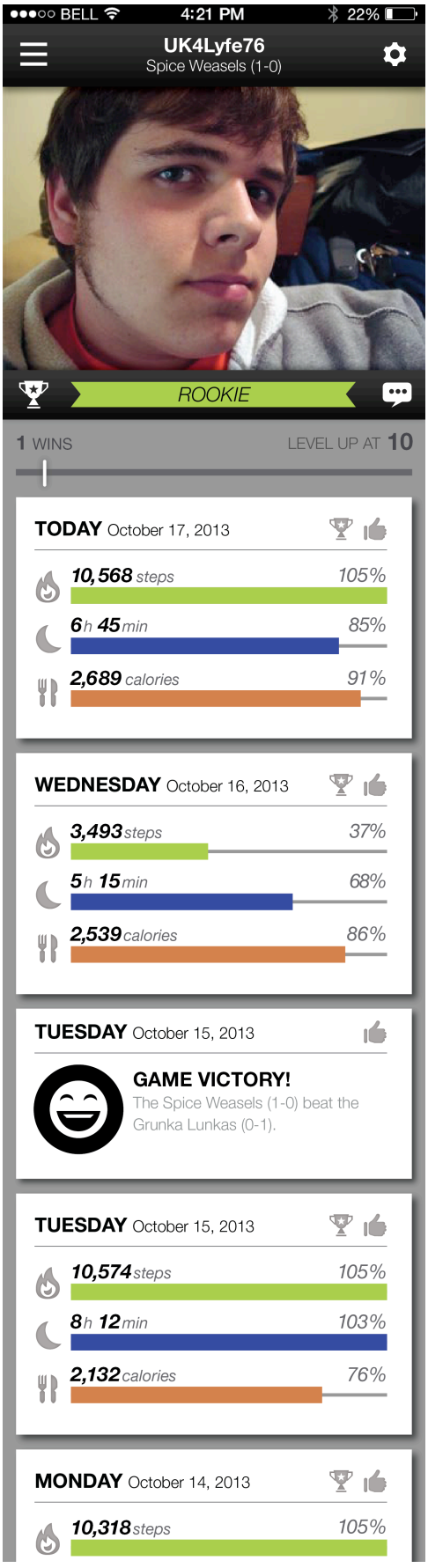


Figure 41: Personal Profile >>

Team

The team section (See Figure 42) serves as the central hub for all team-related activity. It allows users to view the current status of their teams' games, check their individual rankings among other players, review their teams' upcoming schedules, and review and manage their teams' rosters.

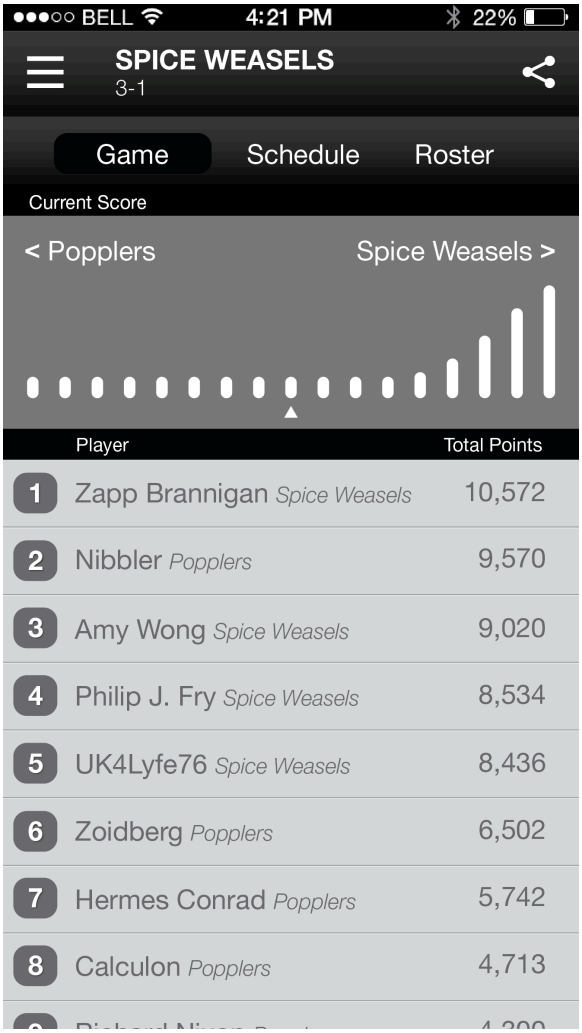


Figure 42: Team Section

Scoreboard

The scoreboard (See Figure 43) allows users to view scores from other ongoing games. The user's current game is listed first at the top of the screen, and then other games are listed below. To view details of a game, a user simply taps on that game's row. This allows them to scout out their competition and see how well their team is doing in comparison. Lastly, there is also a league-toggle button at the top right to allow users to view teams in other skill level leagues besides their own.

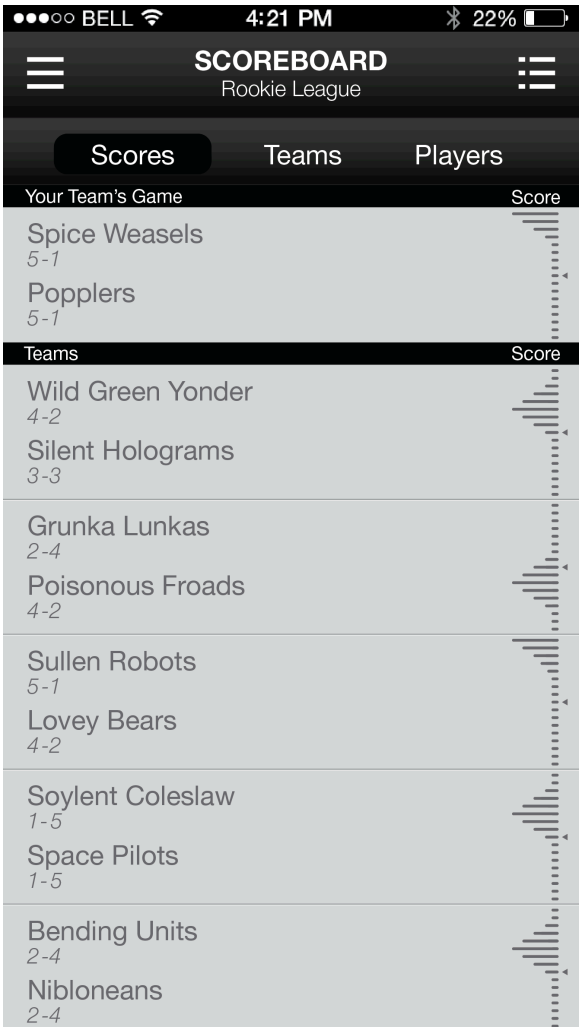


Figure 43: Scoreboard

Community

The community section (See Figure 44) serves as the heart of the GAME social community. It allows for users to socialize with other users outside of the realm of competition. Here they can browse forum topics for advice, encouragement, and conversation, join groups full of similar others, and read blogs for inspiration and information.

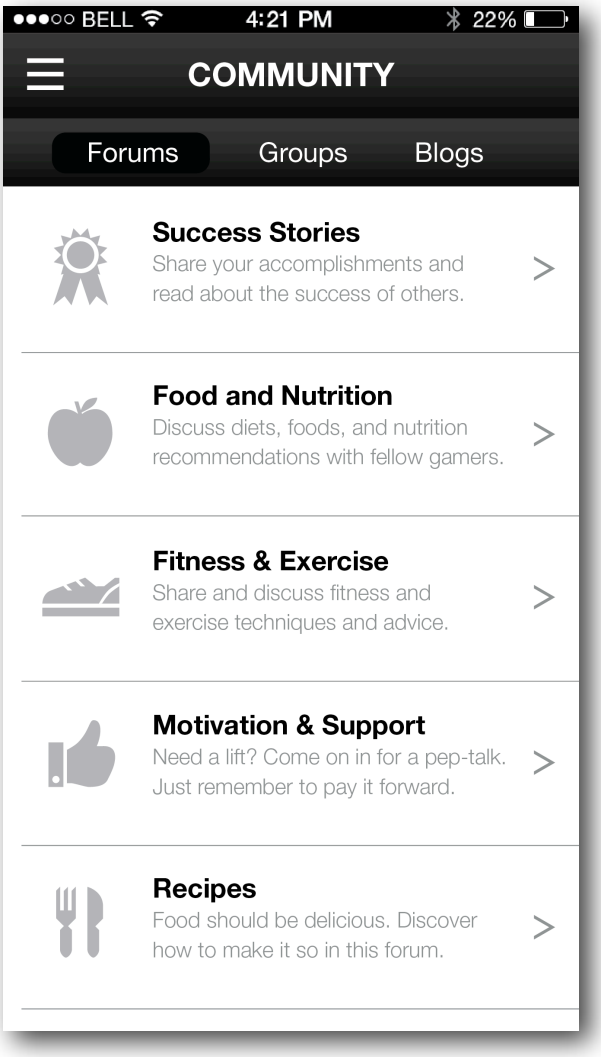


Figure 44: Community Section

Apps

The apps section (See Figure 45) allows for users to integrate other services that they might currently be using into the GAME experience. Users simply tap whichever app they want to integrate and then they are led through each app's process to complete the integration.

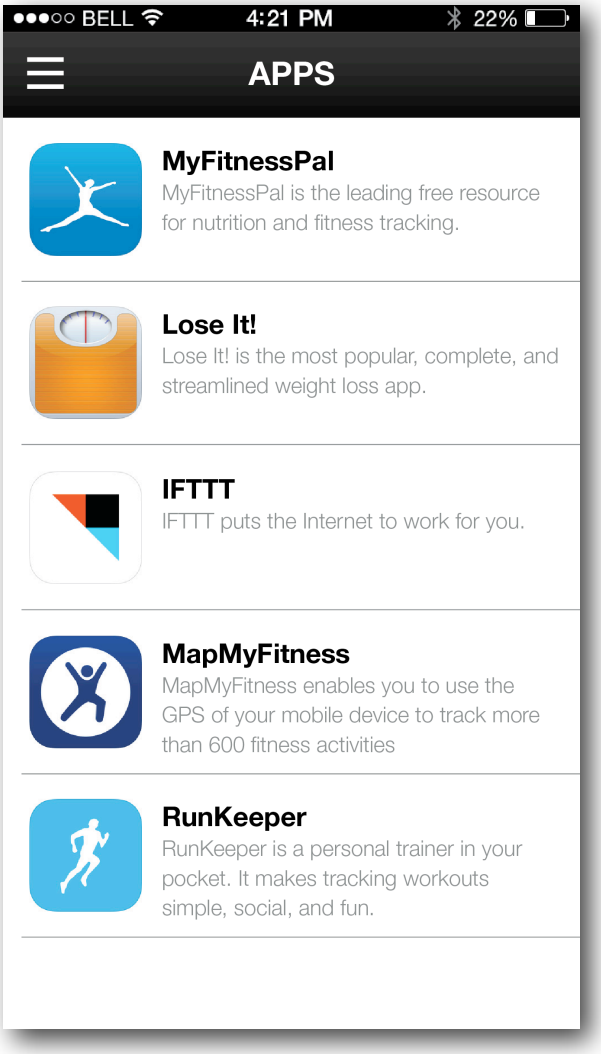


Figure 45: Apps Section

Activity Feed

The activity feed (See Figure 46) is similar to the personal activity feed found on a user's personal profile. The main difference is that it includes updates, summaries, and notifications from other users and teams. This allows users to keep up with how their teammates and competition are performing at a quick glance.

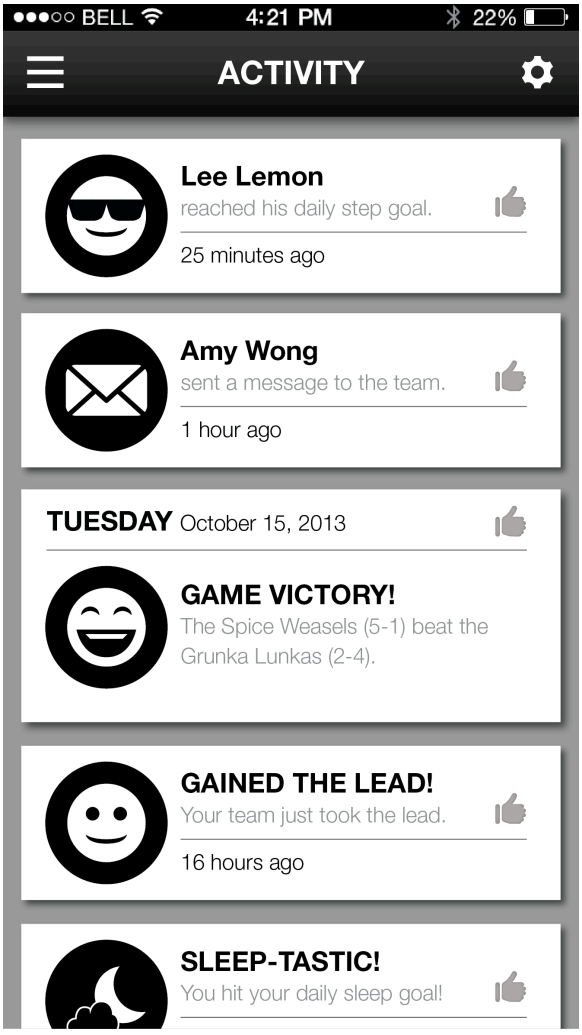


Figure 46: Activity Feed

Settings

The settings section (See Figure 47) allows users to change various preferences, behaviors, and settings on both the app and the watch. It is here that users can personalize their experiences with options such as toggling their watches' vibration or sound settings, choosing what information is displayed on their public profiles, and which users can communicate with them.

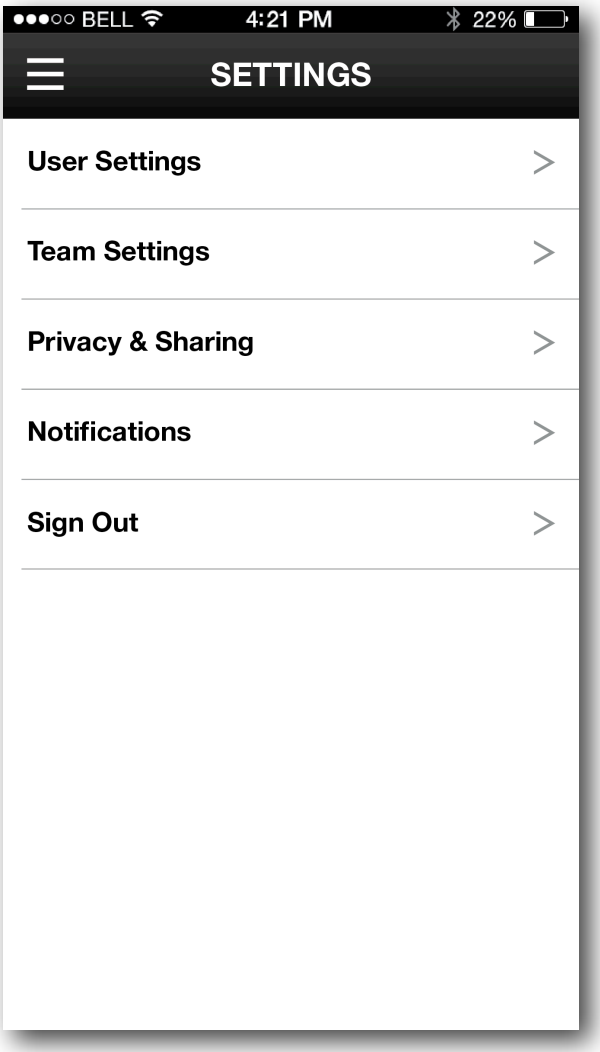


Figure 47: Settings Section

Help

The help section (See Figure 48) exists to offer assistance to any user who is struggling with using the GAME app or watch. It provides instructions for common tasks, answers to frequently asked questions, and troubleshooting for the hardware or software issues.

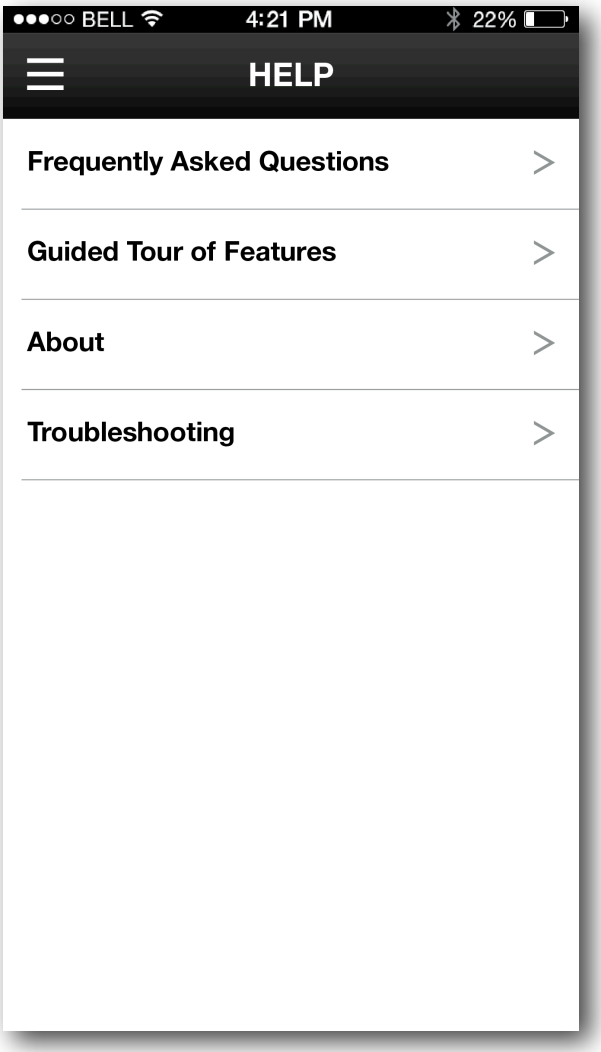


Figure 48: Help Section

Having covered the most important parts of the GAME iPhone app, it is appropriate to describe the third, and final, component of the system, the user.

4.2.4 The User

GAME is designed to be compatible with a user base with a broad range of experience, from novice to expert, in the area of physical fitness. To demonstrate how different users with different skill levels will approach the system, two personas, or hypothetical characters, have been created:

The first persona is “Wendy Smith.” She is a 36-year-old bank teller and mother of two young children who lives with her husband in the suburbs of Birmingham, Alabama. Standing at 5’ 8” tall and weighing 230 pounds, Wendy has a BMI of 35. This classifies her as obese. She became motivated to lose weight after seeing an unflattering picture of her taken at her best friend’s wedding. She learned about GAME by seeing it featured in the Apple App Store and decided to give it a shot. Wendy bought her GAME watch while grocery shopping at Target for her family.

Wendy’s goals are fairly broad and simple. She wants to lose weight, and, in the process, improve her overall health and boost her self-confidence. Unfortunately, she has several deterrents that stand in her way of achieving these goals. First, her work and family keep her occupied for the majority of the day. Second, her lack of knowledge and experience with exercise make her feel intimidated by large gyms and exercise classes. Lastly, in the past, when she has attempted to exercise, she felt like it was boring and repetitive.

GAME helps Wendy reach her weight loss and fitness goals by making exercise into a game and expanding her arena for physical activity from the gym to anywhere she is. Being on a team motivates her to walk to more places and be more active in everyday activities. The realtime notifications and progress status that the watch provides lets her know when she’s being

too inactive and where she stands in relation to others on her team. In order to meet her daily goals, she begins taking her family for evening walks around the neighborhood when she gets home from work. The watch even begins reporting that she is sleeping better at night because of her increased daily movement.

Aside from her uptick in physical activity, the GAME app also provides her with a food diary for keeping track of her caloric intake and a community of people in similar situations to which she can turn for support, feedback, and advice. This helps makes her experience with GAME feel more like a membership in an exclusive club than performing mundane, repetitive exercises in isolation. This connectedness she develops with other GAME users helps her stay committed to her goal and eventually reach it months later.

The second persona is "Kevin Thomas." He is a 21-year-old, single, college student who lives in an apartment with two roommates. Standing at 6' 1" tall and weighing 160 pounds, Kevin has a a BMI of 21.1. This classifies his weight as normal. Kevin and his roommates used to play sports together in high school and still enjoy playing in recreational and intramural leagues. He is always looking for a challenge, and works out several days a week to look good for the ladies. However, Kevin is disappointed with the slow results he's been getting from his personal workouts and has been considering hiring a personal trainer. One day, Kevin happened to see an advertisement for GAME while browsing the Internet and concluding that it would be a good way to push himself without having pay a personal trainer hundreds of dollars. He then ordered his GAME band online from the GAME website.

GAME helps Kevin reach his fitness goals by giving him an arena for competition. Since he enjoys winning, the incentive to help his team out and climbing the leaderboards by scoring

points is a great incentive for getting him to push himself harder. He also appreciates that his weekly basketball games with his friends count toward his point totals.

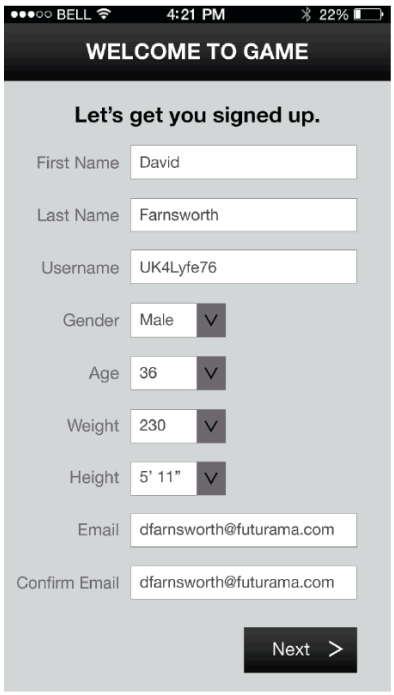
Unlike Wendy, Kevin is more comfortable and familiar with various exercise techniques, and, though he occasionally visits the forums for weight-lifting advice, his primary focus is on winning each week's game and leveling up his rank. He strives to be the top-ranked player on his team. However, because Kevin's roommates are also competitive athletes, they too buy GAME bands, and begin trying to attain a higher status rank than his. This development motivates Kevin even further to continue pushing himself, since he thrives on recognition and victory over others. Since Kevin didn't have a hard set, numerical goal when entering goal, he sees his overall improvements and achievements as success and feels that the GAME band has definitely helped him reach a higher level of fitness.

4.2.5 User Experience

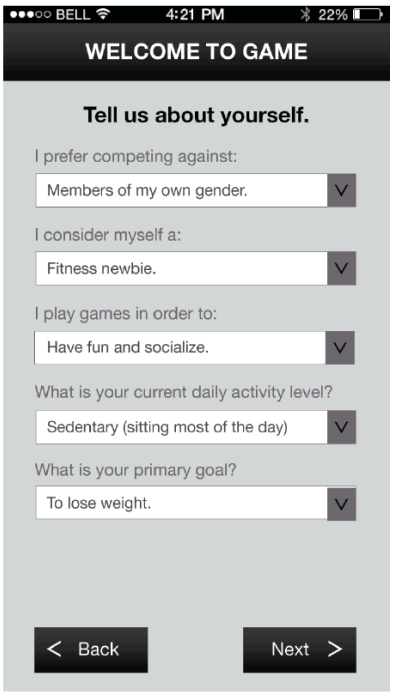
This section walks the reader through a successful user experience of a GAME user. It demonstrates how the watch and iPhone app work in tandem to create a meaningful and effective user experience. One should note that this experience is purely hypothetical for use as an illustration of how the proposed system should function.

The First Day

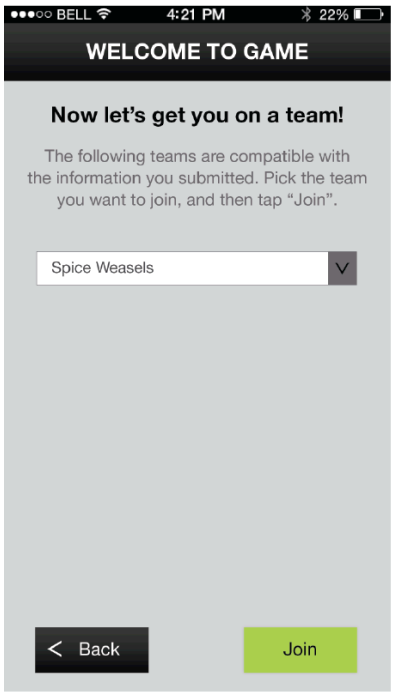
When the user first opens the app, he is met with a registration screen (See Figure 49) asking for specific personal information. This information is used for both team placement and goal setting.



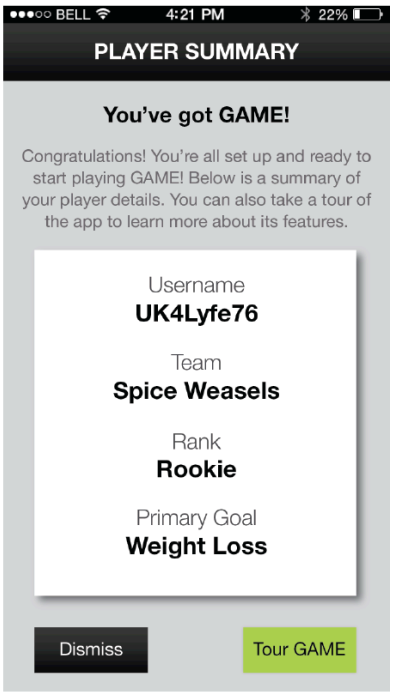
Registration
1 of 4



Registration
2 of 4



Registration
3 of 4



Registration
4 of 4

Figure 49: Registration Screen

Once the user is registered, he is ready to start his first day in the GAME system. A typical day begins with the player putting on the watch and making sure that it is switched out of sleep tracking mode. As the player moves throughout the day, he sees that the step-count progress ring has begun to fill with color and the tide of battle graphic has shifted to reflect the current score of the game (See Figure 50). Since his team is winning, the FitFace is smiling, and that makes him feel positive.

Figure 50: Change in watch face throughout a typical day

Nearing lunchtime, the watch vibrates and notifies him that his team has fallen behind by 500 points. Having seen the sad FitFace, he decides to walk to a nearby deli in order to help reduce the deficit. While eating, he logs his individual food items via the iPhone app, and happens to see that his team is now in the lead again. Walking back to work feels like an accomplishment.

At closing time he heads home and changes into some exercise clothes. He checks his phone one last time before going out the door and sees that he is only 200 steps behind the player in third place. Next, he switch the watch into stopwatch mode and starts it. Five minutes into his

jog, he feels his watch vibrate, and reads the notification that he has moved into third. This makes him feel accomplished and pushes him to finish his jog strongly.

After his jog, he gets ready for dinner by checking the app to see how many calories he has left. This allows him to chose an appropriate dinner, which he then logs into the app. He checks his watch to see that he only has 100 steps left until his daily step goal is reached, so he completes a series of household chores. While walking down a second load of laundry, his watch sends him a notification that he has hit his goal. Feeling accomplished, he finishes folding the laundry, hits the shower and goes to bed, but not before switching the watch to sleep-tracking mode.

A Week Later

One week later, the user is already feeling healthier. Unfortunately, there have been a several days where he did not reach his daily step goal. Using the app's detailed information view, the user is able to see times during his day when he is extremely inactive, and set alarms on his phone to remind him to take walking breaks during these times. Aside from his personal goals, he is trying his hardest to help his team win their first game. This first game has been very close all week. At 8:00pm that night, his watch vibrates, he slowly peeks at the display, sees the grinning FitFace, and shouts with accomplishment. Victory is sweet.

One Month Later

The user's team is now 3-2, his workload at his job has increased, and he feels like his motivation is starting to waver. His watch buzzes just as he's considering skipping his nightly run. One of his teammates has sent out a pep talk as a message. The teammate says that if they

all get in 500 steps by 8:00pm, it is very likely that they can win the game. Encouraged and determined to help his team win, the user completes his run, and his team wins the game.

Six Months Later

The user has lost 35 pounds and has ranked up from Rookie to Veteran through winning over 25 games. Every so often he meets another GAME player in passing and they remark about his red clips on his watch. This gives him motivation and gives the system a tangible connection to the real world. He and his team have formed a close bond, and, even though they may lose a game here or there, they appreciate that the competition is driving their personal results.

One Year Later and Beyond

The user has reached his goal by losing 75 pounds. This qualifies him for the rank of All-Star. Other GAME members that he meets recognize his high status from his watch's color bars and come to him for advice, and, with his experience, he is able to give it. He takes this newfound role seriously and begins to help other members with their struggles in the forums. He even starts a blog about his experiences and success. While he certainly could quit the system at anytime since he has accomplished his goal, the relationships he has built with his teammates and his new role as a mentor and advisor to newer members motivates him to continue and maintain his new level of fitness.

4.2.6 Guidelines, Recommendations, and Precautions Checklist

The following tables show how the GAME system meets this study's proposed guidelines , recommendations, and precautions.

Table 4: Guidelines, Recommendations, and Precautions Checklist

Artifact Guidelines	Method
Serve as a real-time link between a user and the service	– Bluetooth 4.0 – Notifications and messaging – Real-time data on watch
Provide tangible and/or observable status indication.	– Color changing daily step-count ring – Colored clips for ranking indication
Have an appropriate form-factor for its purpose and use.	– Durable materials for active use – Not too heavy or large
Consider the most current technologies and the possibilities they present.	– Bluetooth 4.0 – AMOLED screen – Flexible battery
Use abstractions and metaphors to present data in useful and meaningful ways.	– "Tide of battle" graph – FitFace – Daily step-count progress ring – Steps as scorekeeping method

Service Guidelines	Method
Establish and encourage group competition.	– Compete in teams against other teams
Use gamification strategies when, and only when, they are appropriate.	– Achievements – Notifications – Colored clips for ranking indication
Structure competition in a way that fosters the development of healthy rivalries	– Player rankings – Teams organized by similar goals and abilities – Repeated competition
Have an area outside of the competition for user interaction.	– Community Section – Forums – Groups – Blogs – Messaging
Provide a more detailed look at the information gathered by the artifact	– Detailed Information Overview Screen – Personal Activity Feed
Be as easily accessible as possible	– iPhone app – Always near user – Always connected to internet

Recommendations	Method
Consider communication between and integration with other services.	– Third-party app integration
Consider allowing for specialization of competition.	– Gender-specific competition option is available during registration
Consider a design approach that allows for consolidation of products and software.	– Watch – Stopwatch
Be aware of current fashion trends and design accordingly	– Black silicone – Bright accents – Not too aggressive
Consider the possibility of using existing mobile devices as the system's artifact.	– Not implemented in this system

Precautions	Method
Ensure that users' identities and private information are protected.	– Avatars used instead of real names – Personal information not shown on profiles
Consider consulting with professionals in the field that the system will reside.	– Approaches discussed with nutritionists and personal trainers
Understand that these guidelines do not guarantee results for all users.	– Understood.

Chapter 5: Conclusion

5.1 Recommendations for Future Study

Due to time constraints and lack of resources, this study was not able to run any user trials with the GAME system. If a future study could perform a trial run of a system created by this study's guidelines and recommendations, the results could be very helpful in determining their effectiveness. A trial system could also determine if any additional guidelines or recommendations are necessary.

5.2 Implications and Applications of Study

With the Quantified Self movement and mobile devices growing steadily in popularity, it is crucial for designers to understand how to harness the power of both to meet and exceed users' expectations. This study's system of guidelines, recommendations, and precautions lay down a framework with which a designer can create an effective goal-oriented, self-tracking system by harnessing the power of automation between a service and an artifact and competition among the service's users.

It is the hope of the writer that designers will use this study to usher in the next generation of self-tracking devices and services. If this hope comes to fruition, then individuals will be more persistent in their efforts to reach their goals, and, in effect, quality of life will increase for scores of people.

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Appendix

List of Guidelines

Guidelines for the Artifact

An artifact is a self-tracking device that is always with in close proximity with to the user. An artifact properly designed for a goal-oriented system design will:

1. Serve as a real-time link between a user and the service.
2. Provide tangible and/or observable status indication.
3. Have an appropriate form-factor for its purpose and use.
4. Consider the most current technologies and the possibilities they present.
5. Use abstractions and metaphors to present data in useful and meaningful ways.

Guidelines for the Service

The service serves as an access point for the system. A properly designed service for a goal-oriented system design will:

1. Establish and encourage group competition.
2. Use gamification strategies when, and only when, they are appropriate.
3. Structure competition in a way that fosters the development of healthy rivalries.
4. Have an area outside of the competition for user interaction.
5. Provide a more detailed look at the information gathered by the artifact.
6. Be as easily accessible as possible.

List of Recommendations

The following recommendations can be helpful when creating an effective self-tracking, goal-oriented system. Though they might not be necessary for every system, a designer of a system created by these guidelines should:

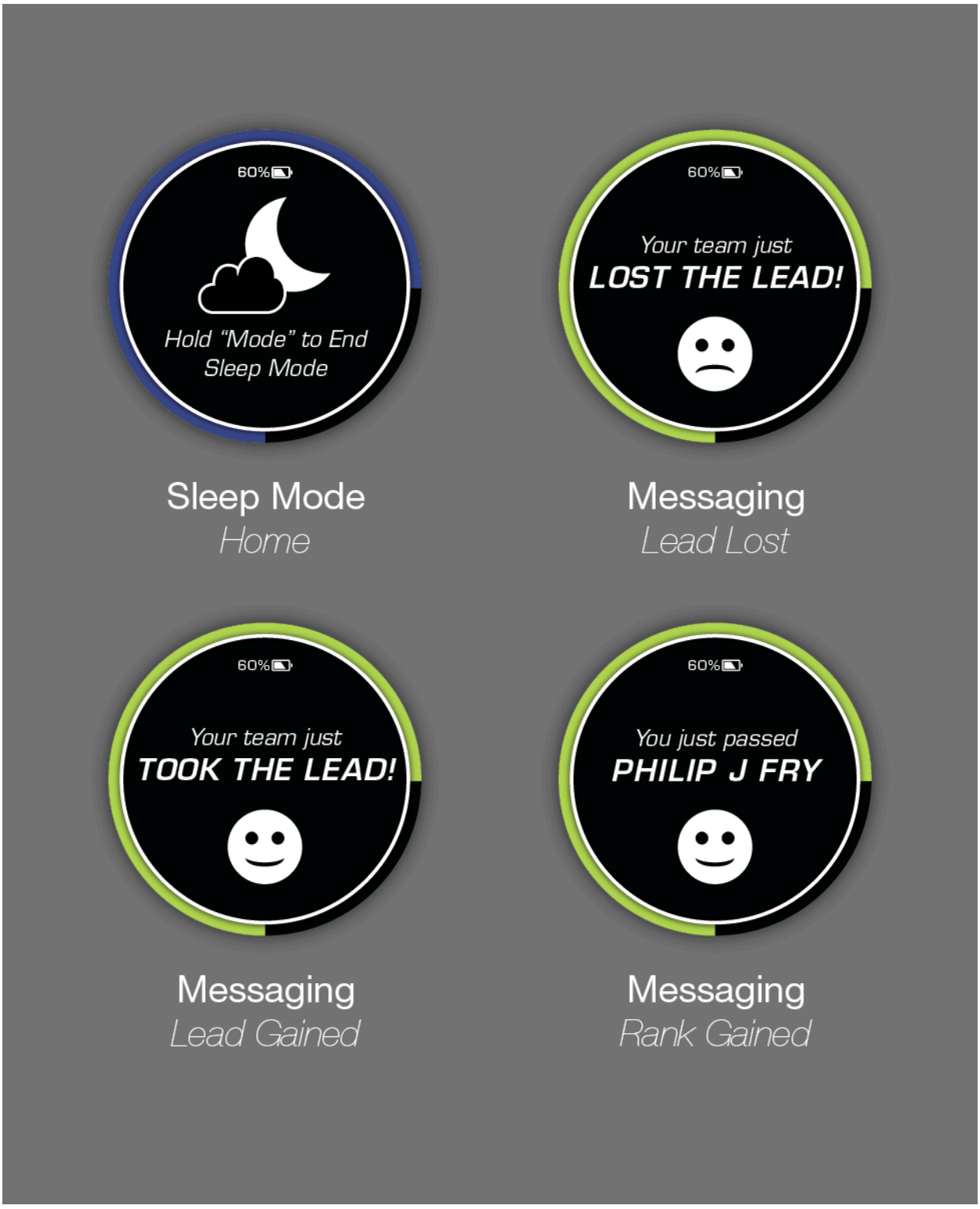
1. Consider communication between and integration with other services.
2. Consider allowing for specialization of competition.
3. Consider a design approach that allows for consolidation of products and software.
4. Be aware of current fashion trends and design accordingly.
5. Consider the possibility of using existing mobile devices as the system's artifact

List of Precautions

As with any attempt of changing a person's behavior, efforts must be taken to ensure the safety of the individuals involved. In order to ensure a safe environment for a system's users, a designer should:

1. Ensure that users' identities and private information are protected.
2. Consider consulting with professionals in the field that the system will reside.
3. Understand that these guidelines do not guarantee results for all users.

GAME Watch User Interface Screens


60%
Hold "Mode" to End Sleep Mode
Sleep Mode
Home
60%
Your team just
LOST THE LEAD!
Messaging
Lead Lost
60%
Your team just
TOOK THE LEAD!
Messaging
Lead Gained
60%
You just passed
PHILIP J FRY
Messaging
Rank Gained

Messaging
Rank Lost

Messaging
Game Lost

Messaging
Game Won

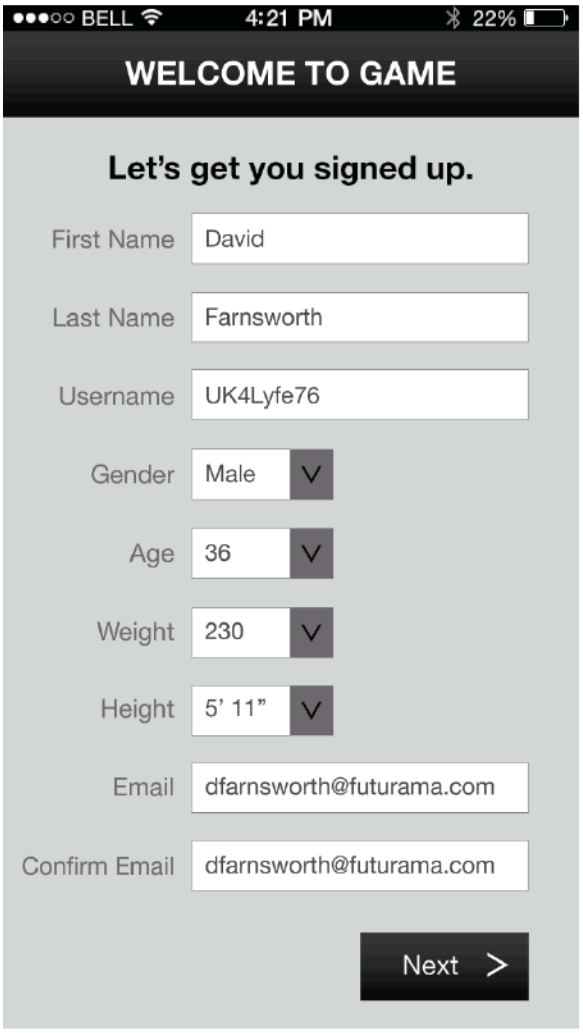
Notification
Daily Goal Reached

Notification
Pep Talk

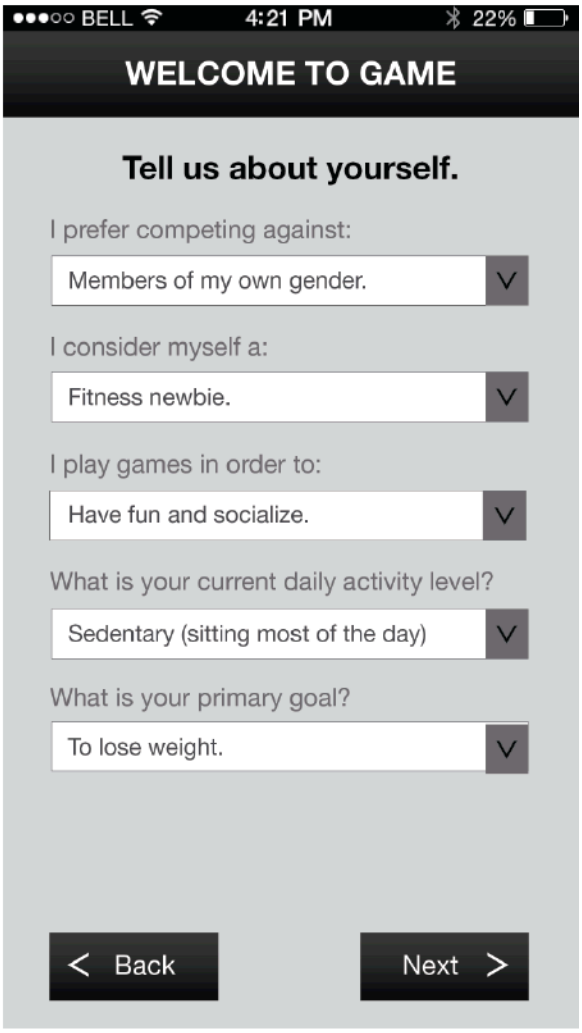
Notification
Low Battery

Notification
Message Received

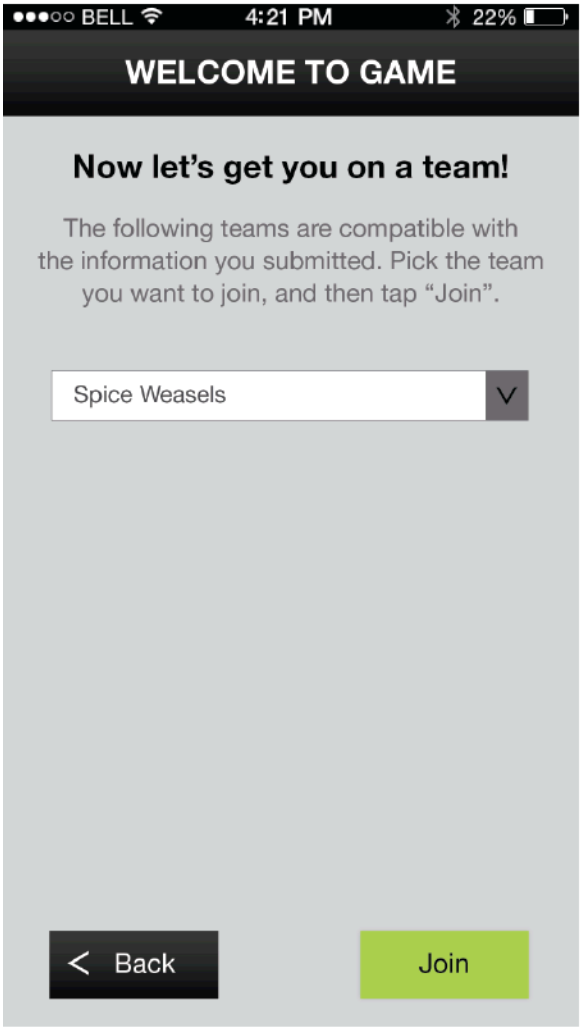
GAME iPhone App User Interface Screens



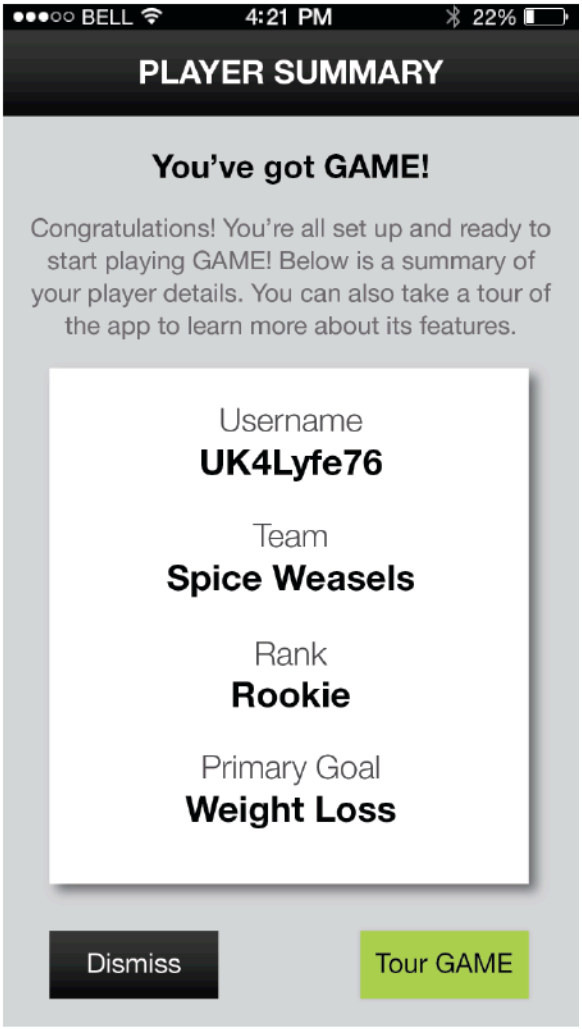
Registration
1 of 4



Registration
2 of 4



Registration
3 of 4

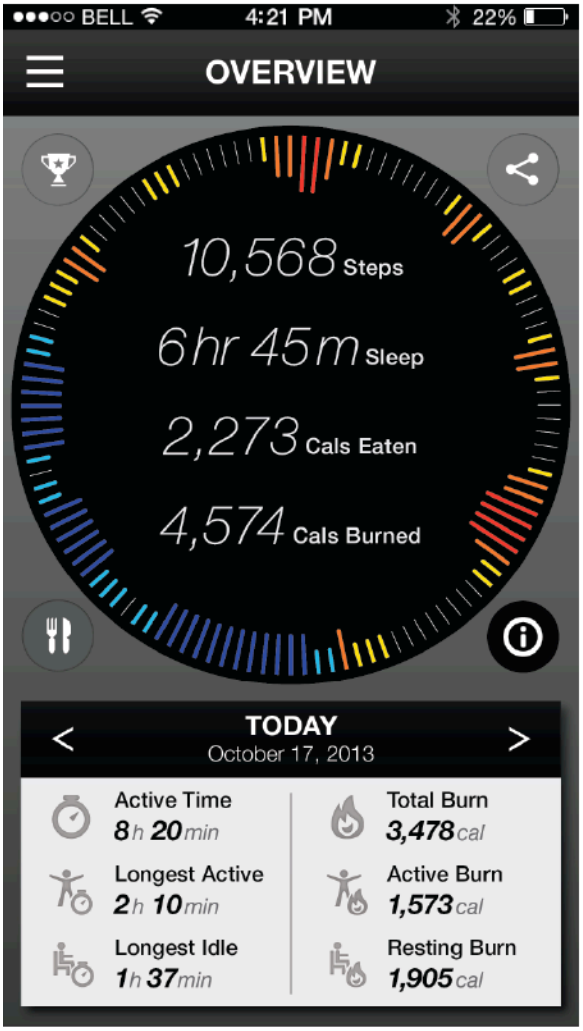


Registration
4 of 4

Splash Screen

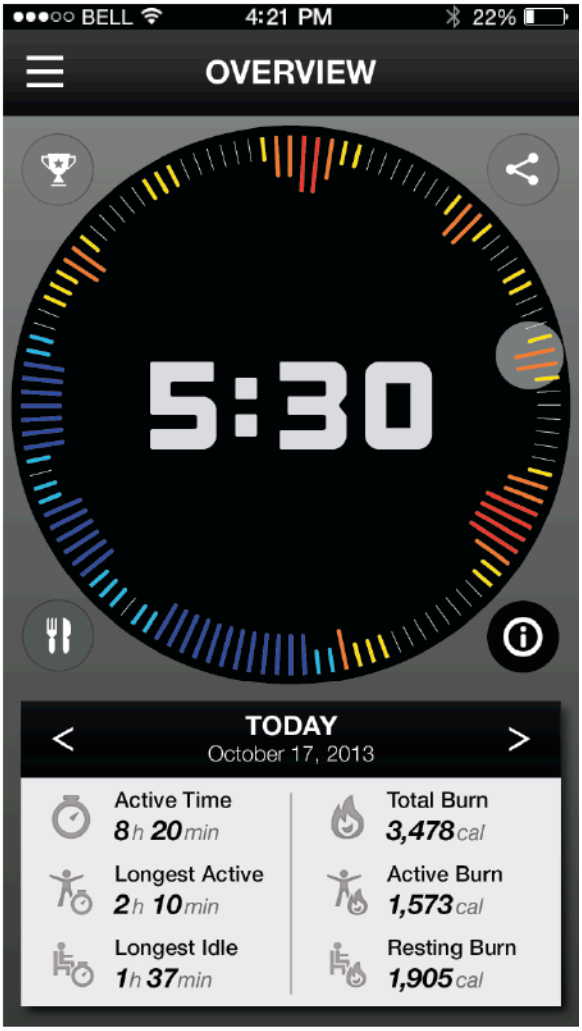
Overview Screen

Home



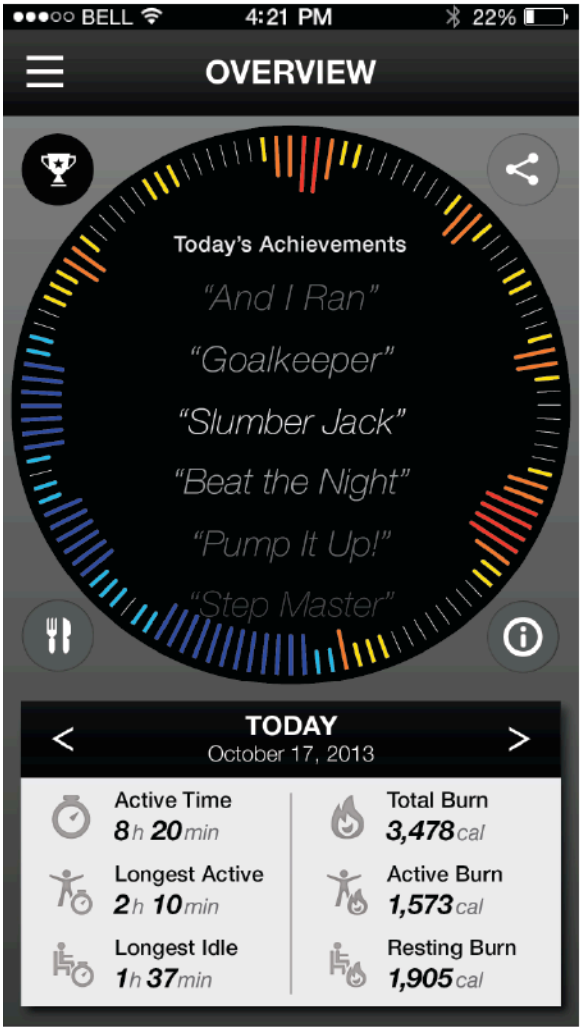
Detailed Information Mode

Overview

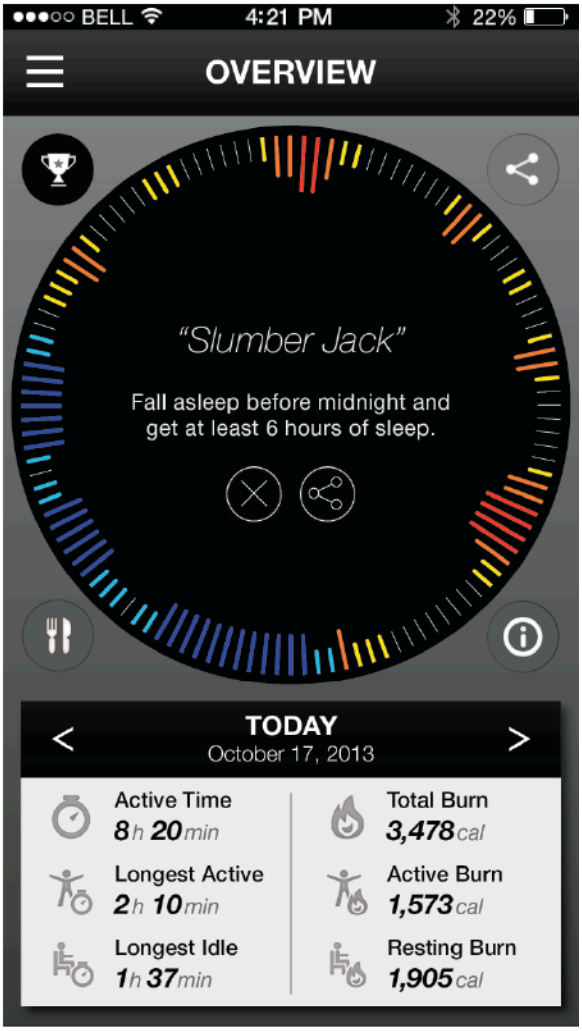


Detailed Information Mode

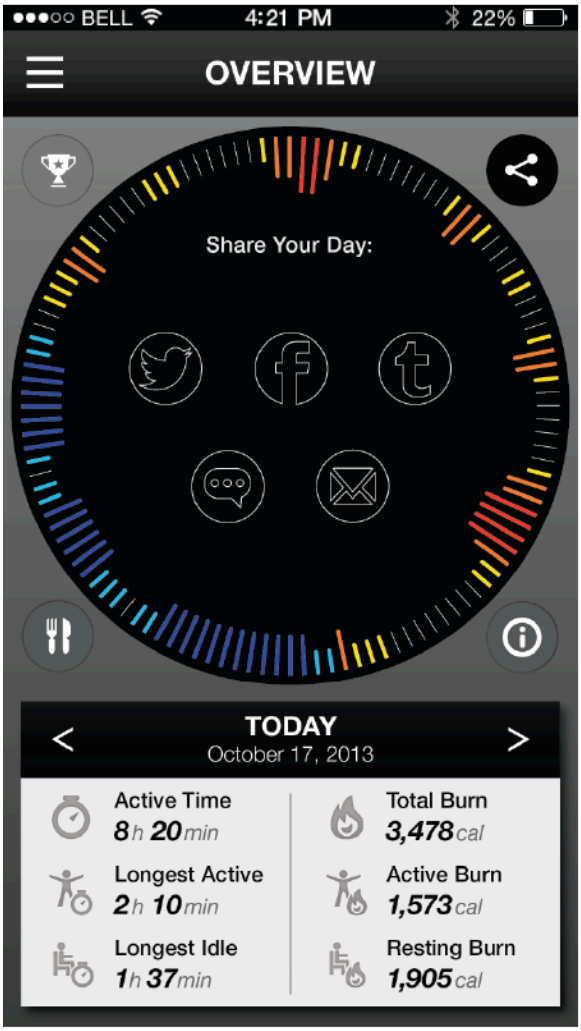
Time Detail



Overview Screen
Achievements Mode



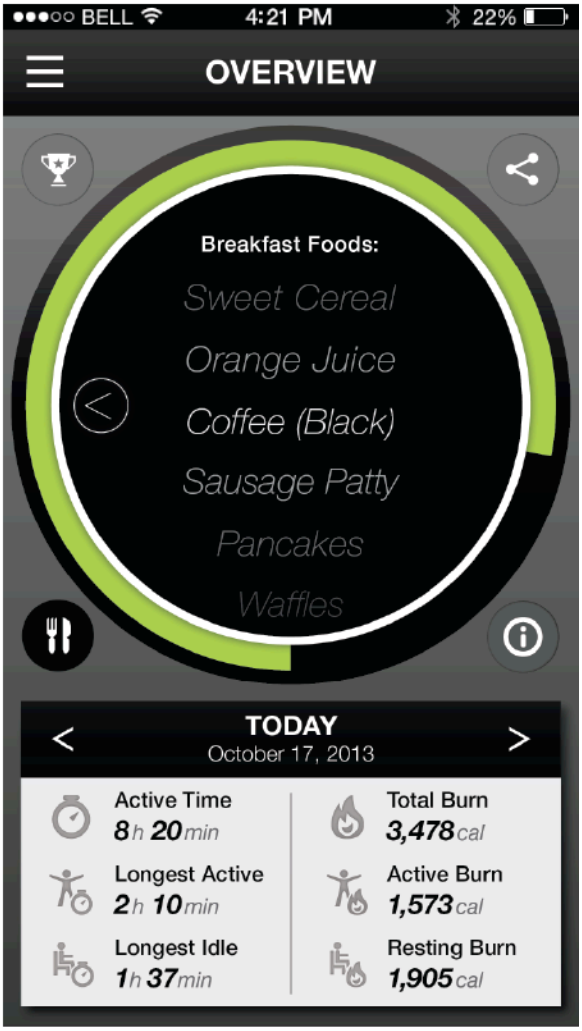
Overview Screen
Achievement Description



Overview Screen
Social Sharing Mode

Overview Screen
Nutrition Mode

Overview Screen
Add Food or Drink



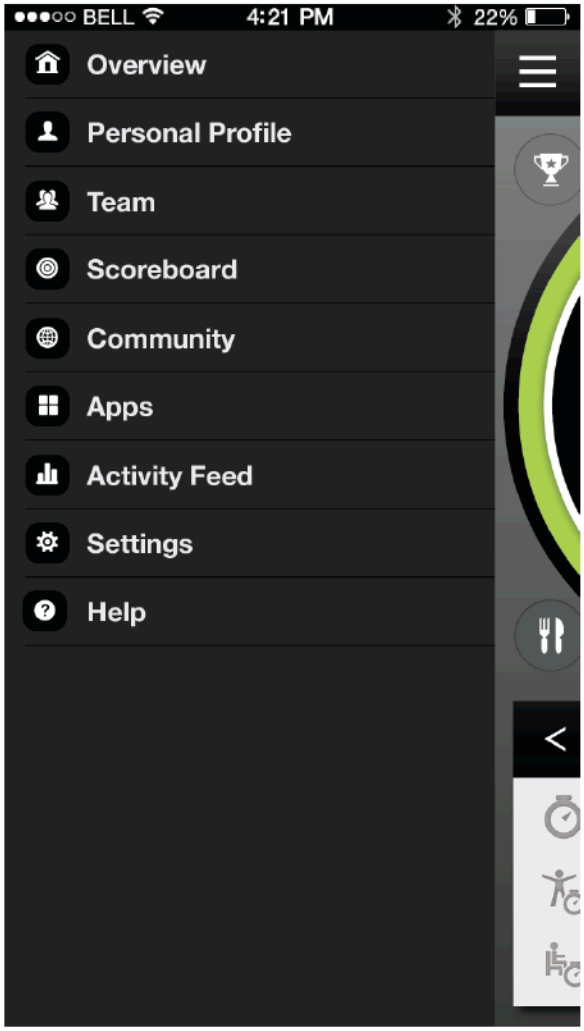
Overview Screen
Add Food or Drink (cont.)

Overview Screen

Food or Drink Added

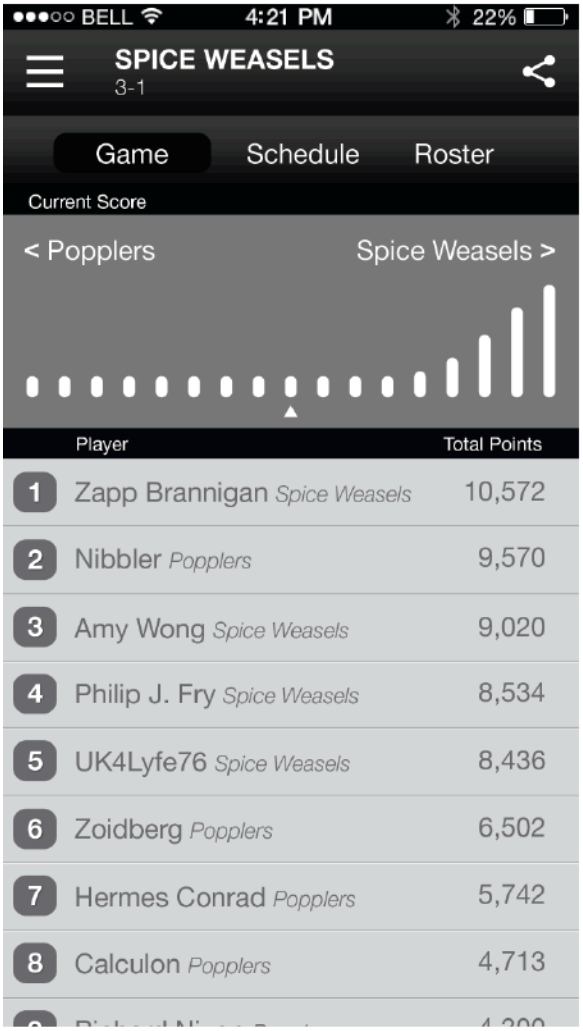
Overview Screen

Remove Food or Drink



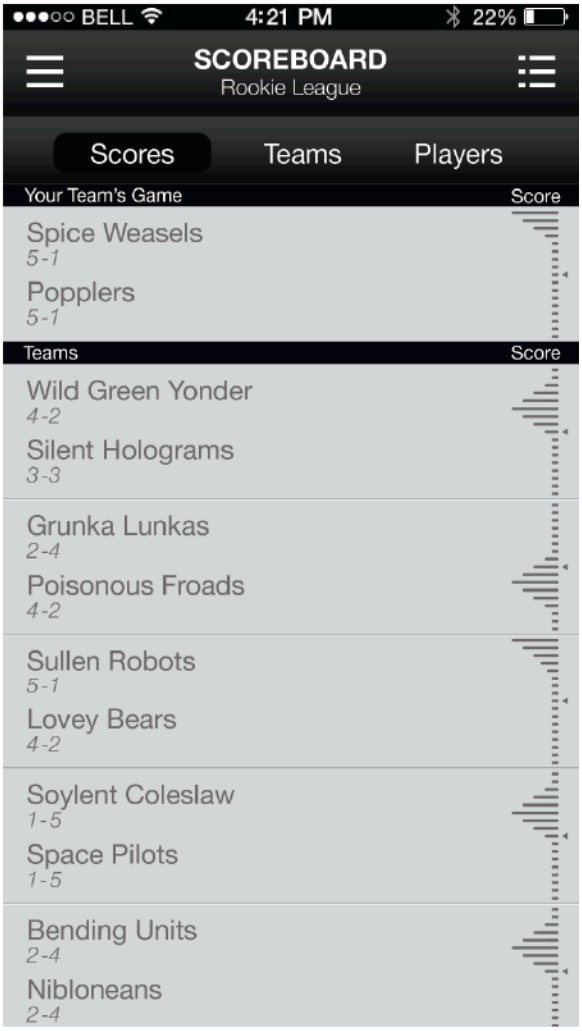
Navigation Menu

User Profile



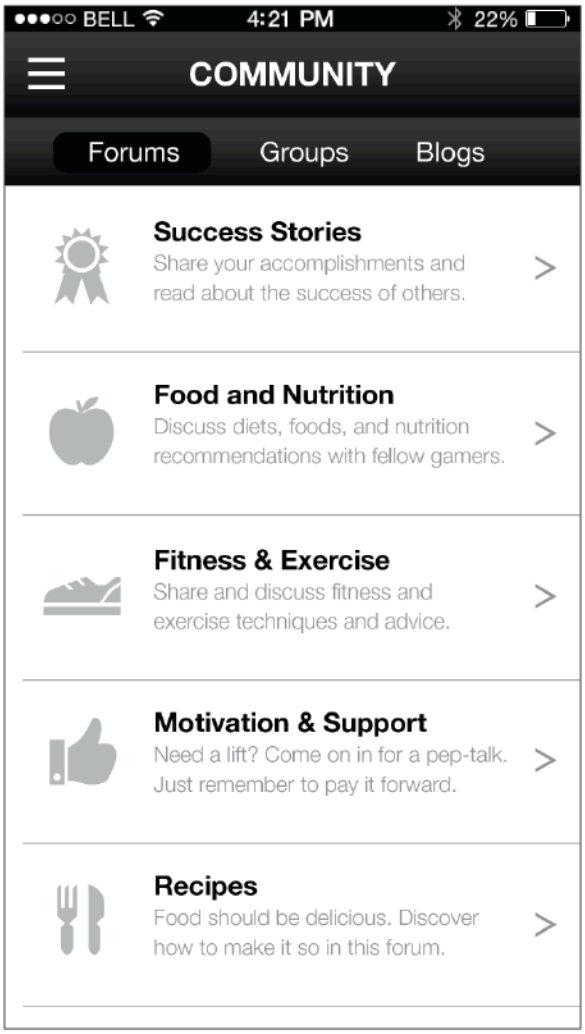
Team

Game

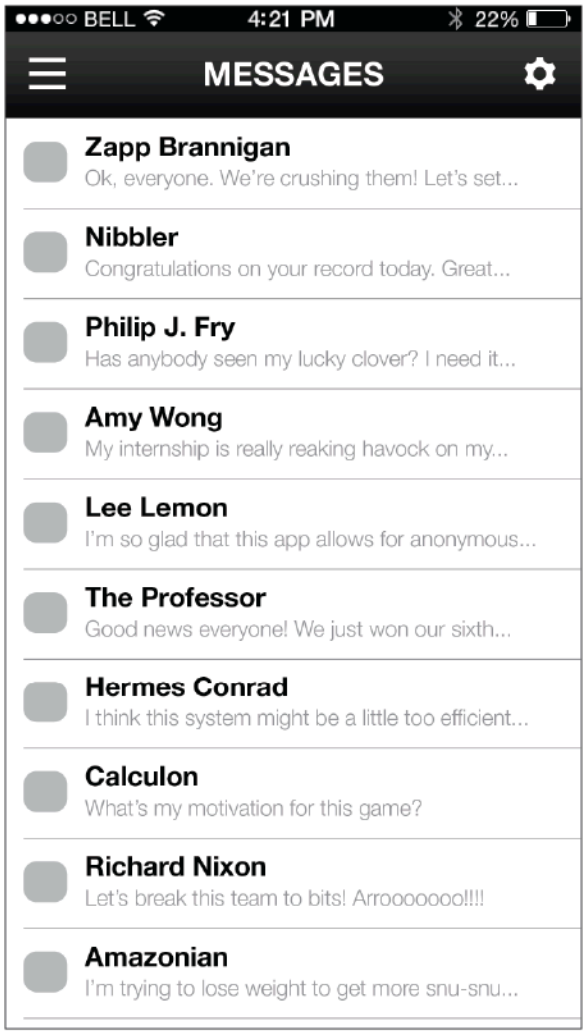


Scoreboard

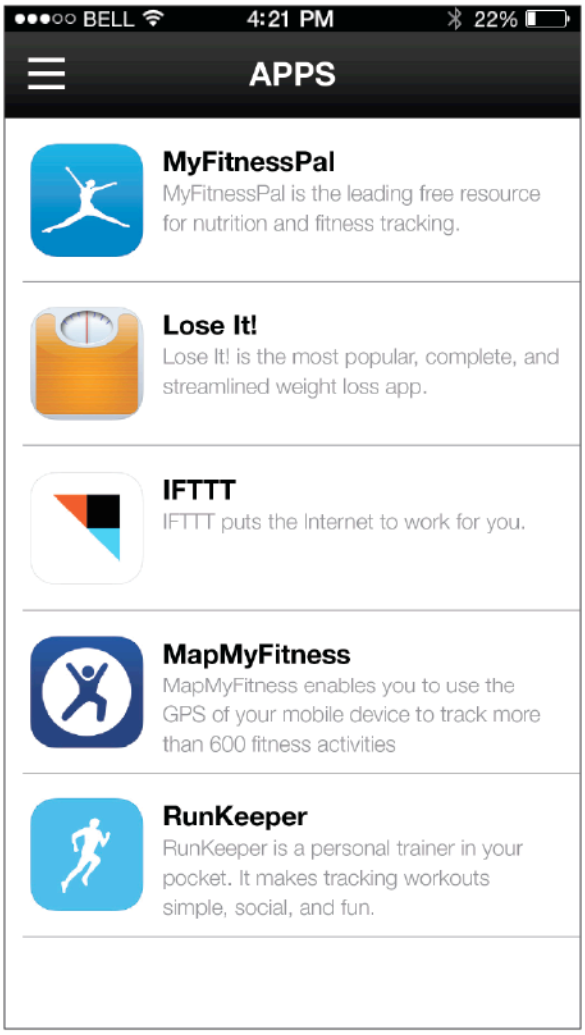
Scores



Community
Forums



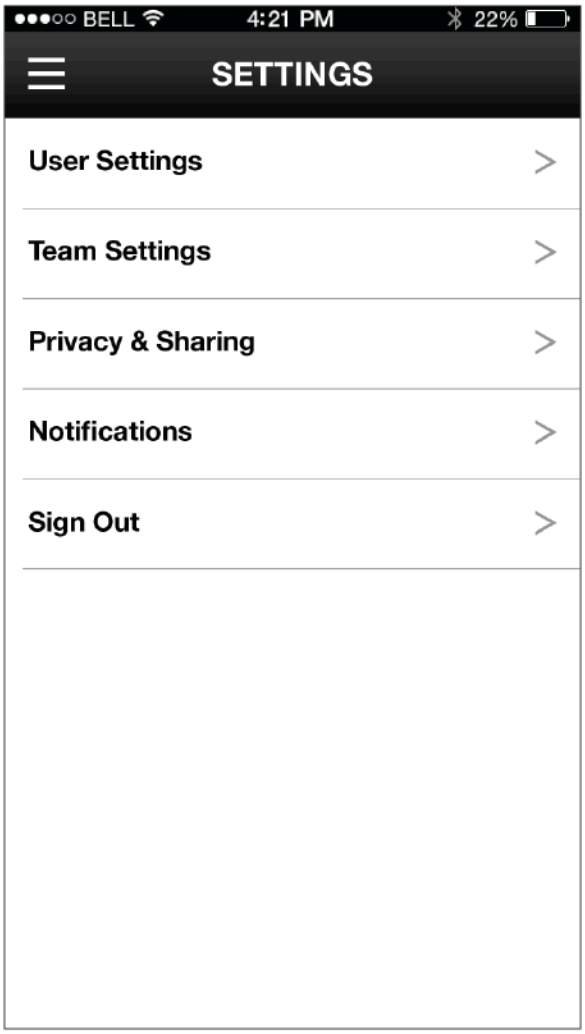
Messages



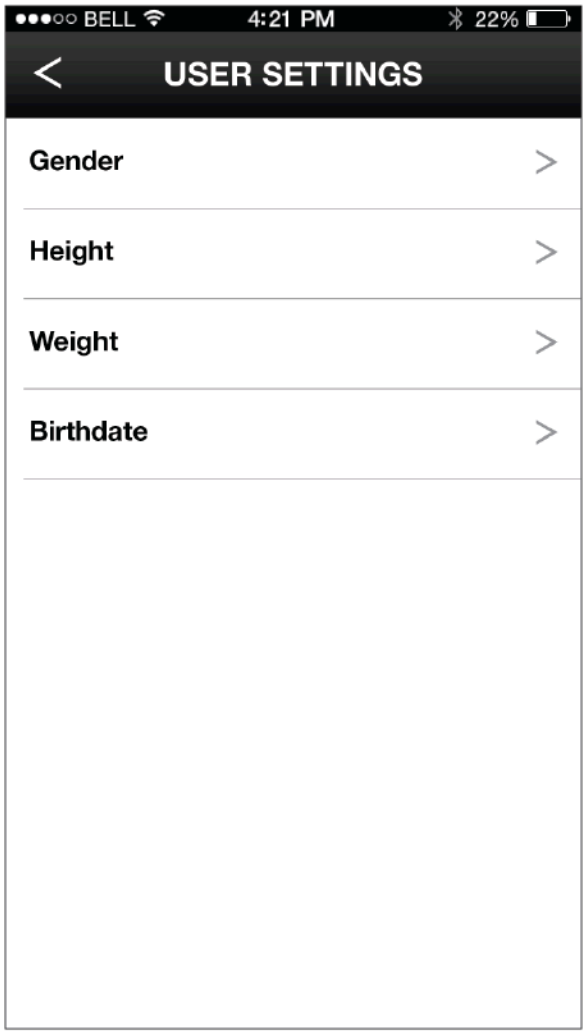
Apps

Third Party Apps

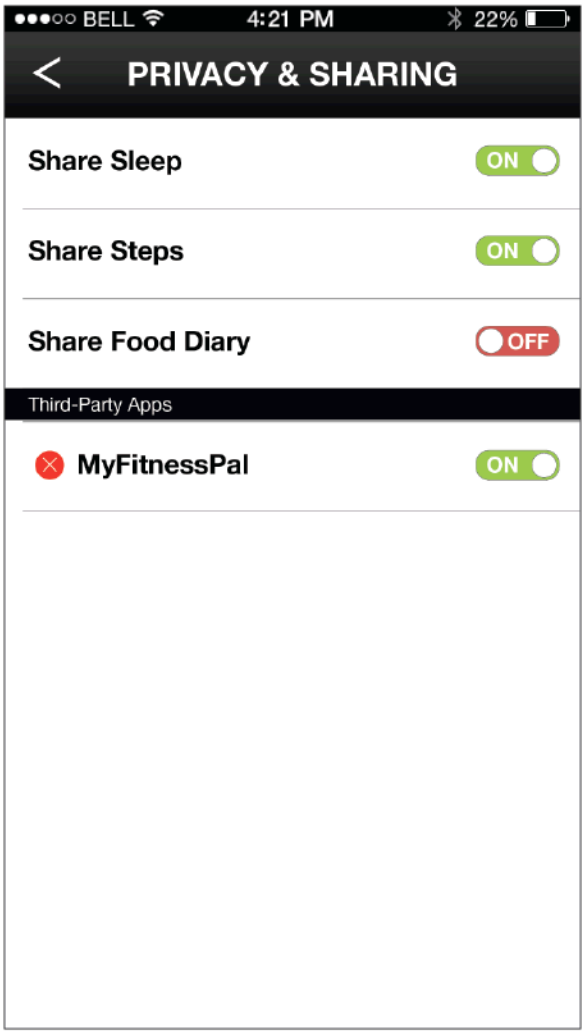
Activity Feed



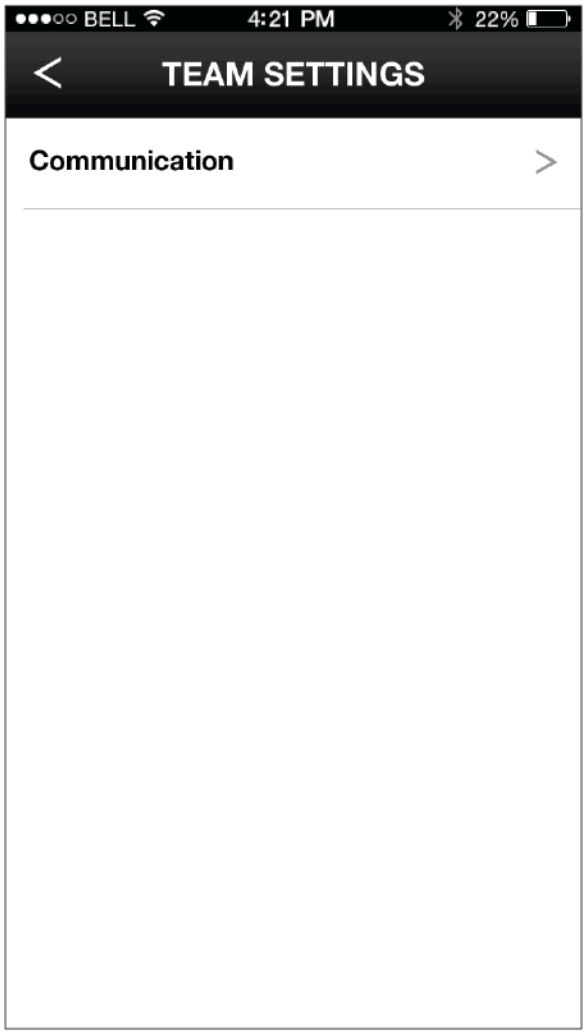
Settings
Home



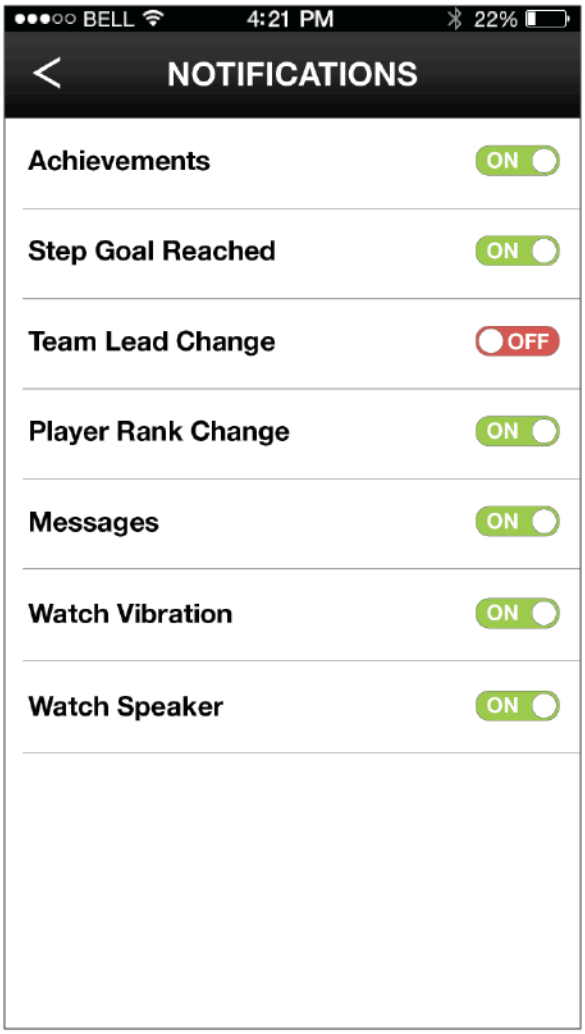
Settings
User Settings



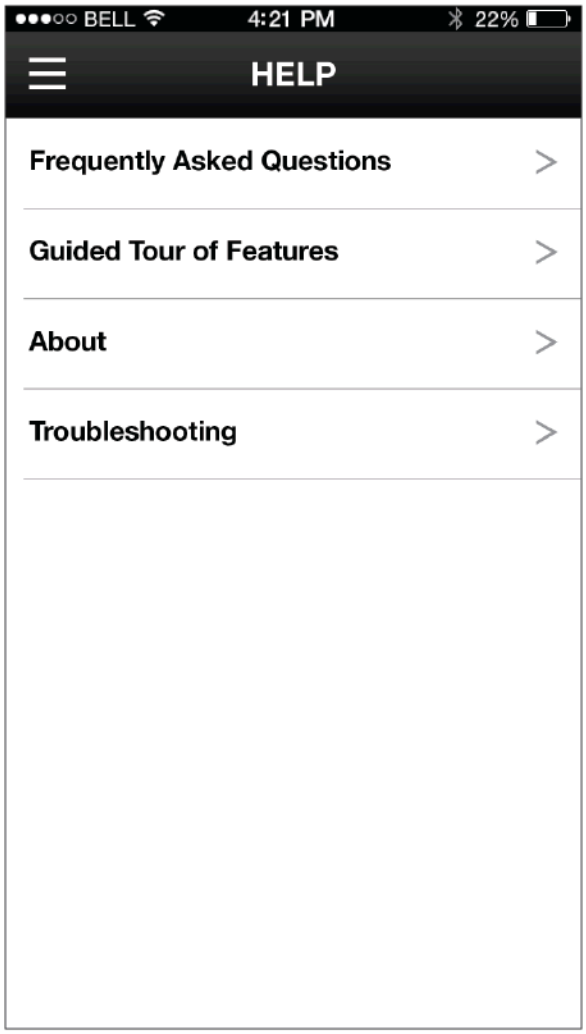
Settings
Privacy and Sharing



Settings
Team Settings



Settings
Notifications



Help
Home

GAME Watch Presentation Model