
The Measurable Me: The Influence of Self-Quantification on the Online User's Decision-Making Process

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Abstract

The advancement of information technology, online accessibility and wearable computing is fostering a new playground for users to engage with quantified data sets. On one hand, the online user is continuously yet passively exposed to different types of quantified data in online interfaces and mobile apps. On the other hand, the user may actively and knowingly be gathering quantified data through ubiquitous sensory devices, such as wearable technology, e.g. the Jawbone UP and Fitbit. In both instances, the user is exposed to versions of self-quantified measures, namely the aggregation and transformation of personally attributed activity into quantified data. This study approaches the adoption of wearables by looking at active and passive self-quantification online and explores how it may influence and support the user's cognitive processes and subsequent decision-making process.

Author Keywords

Quantified Self; self-quantification; pointification; personal informatics; behavioral economics; push and pull effect; decision-making; cognitive processes; wearable technology; ubiquitous sensory devices.

ACM Classification Keywords

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

Introduction

The proliferation of technological enhancements and the accessibility to varieties of online applications, smartphones and wearable technology has changed the way people access and interact with different types of data but also the means and purposes of such data collection. The development has spurred a phenomenon of self-tracking, which essentially refers to users that track aspects of themselves by gathering various metrics, most commonly through wearable technology, such as activity trackers like Jawbone UP and Fitbit. The trend partially stems from the Quantified Self movement that pursues "self-knowledge through numbers" (Wolf, 2010), and may also be referred to as personal informatics. In this study, the focus is on how self-quantification, as a result of the user adoption of wearable technology, has influenced its users and how it may subsequently affect decision-making processes, and even behavior. In this context, self-quantification is understood as the act of actively or passively collecting personally attributed quantified data sets and performing self-evaluation through test, comparison and experimentation. This activity is argued to be a way of obtaining self-knowledge through gathering and aggregating various streams of data stemming from online usage (e.g. Li et al., 2010).

I am eagerly hoping that my PhD topic on wearable technology's influence on user decision-making will be of interest to the ISWC Doctoral School as it is a unique opportunity to indulge in a knowledgeable and niched environment of interest, which I rarely encounter in the information systems field where I am generally situated. As such, it is a fantastic possibility to present and discuss the findings from the data collection and the preliminary theoretical framework developed from

the data as well as challenges going forward. I am particularly excited about the prospect of attending because it is a rare academic space that allows wearable technology and related fields, such as personal informatics, to have a formal place on the agenda. My aim is to gain inspiration, constructive feedback and guidance by the community, during both the doctoral consortium and the conference.

Research question

The interest of this study is to approach how wearable technology influences the phenomenon of active and passive self-quantification by posing the research question: *"How does self-quantification influence and support the online user's cognitive processes and subsequent decision making process?"*

Research motivation and goal

This is the first known study to research the relationship between self-quantification and the user's decision-making process through the employment of wearable technology. Existing academic work often is related directly to the Quantified Self (QS) as a movement of active self-trackers (e.g. Swan, 2009; Swan, 2013) or focuses on aspects of wearable technology (e.g. Park and Jayaraman, 2003), yet does not extend it to decision-making processes. Studies on self-tracking are also often focused on health and medical aspects where patient progress can benefit from the quantified self-practices (e.g. Bottles, 2012; Wolbring and Leopatra, 2013). Swan (2012, p.238) argues that individuals would pursue self-tracking to "resolve or optimize a specific lifestyle issue".

However, this study aspires to go beyond the current and often narrow research by extending the concept of

self-quantification. Such an umbrella focus allows exploring the layers of self-quantification. For instance, this study proposes that the act of self-quantification may inspire a pursuit the “measurable me”, which could be a new type of self-hood emerging from the increased interaction with quantified information in online interfaces. As such, the act of self-quantification offers the possibility to create a new, alternative or complementary personal narrative and meaning based on quantified measures, most commonly through wearable technology such as activity trackers like Jawbone, Fitbit and related mobile apps. Furthermore, the creation of such new meaning and narrative could also enforce personal insight and sense of autonomy, which may thus influence cognitive and decision-making processes. It is then possible that the quantified data operates as mental shortcuts or cues, for decision-making. As proposed further down, mental shortcuts (or heuristics; Kahneman, 2003) imply that the user will not necessarily be able to improve the decision-making process, but merely that cognitive bias is adopted through the exposure and potential interaction with quantified data and thus influencing decision-making. The meaning is created by collecting several streams of various types of data and metrics, which are then adopted by the user as a basis to make decisions and understand the context of self, thus influencing self-hood. In short, the data becomes a basis for decision-making, rather than intuition.

Theoretical basis and context

The theoretical basis for this PhD study is placed in the traditions of cognitive psychology and underpinnings of behavioral economics. The understanding of decision-making processes is based on the assumption that an individual operates according to two cognitive systems:

the emotional (system 1) and the rational/cognitive (system 2; Kahneman, 2003). The systems will be applied to how the user may be influenced by push and pull mechanisms that produce self-quantification, stemming from the usage of wearable technology. A framework for discussion is presented further down.

System 1 and 2

System 1 is intuitive, evolutionary, automatic and operated by emotions and operates largely on impressions, which makes it fast, automatic, effortless and associative. Decisions are quickly made and often rely on instant associations that are available, which makes system 1 “a doer, not a planner” (Sunstein, 2012). On the other hand, system 2 is slow, cognitive, controlled, effortful, neutral, intentional, and often more consuming, which makes it disruptive to intuition, as it attempts to make judgments based on complex thought processes. However, system 2’s more effortful process may be overtaken by the intuitive and emotional nature of system 1 on final decisions. Kahneman (2003) summarizes the relationship between the two systems “The judgments that people express, the actions they take, and the mistakes they commit depend on the monitoring and corrective functions of System 2, as well as on the impressions and tendencies generated by System 1”(p. 1467). Individuals are lazy and procrastinate (Ariely and Wertenboch, 2009) and are thus prone to resort to system 1, since system 2 processes are more demanding (Kahneman, 2003). The systems set the foundation for how users decision-making processes will be understood when exposed to push and pull.

Additionally, to extend understanding of system 1 and 2, the application of heuristics will be explored to

Glossary of Main Concepts

Self-quantification: The act of actively or passively performing self-evaluation through test, comparison and experimentation of personal data sets gathered through information technology.

Pointification: The use and exposure of points (i.e. numbers, quantified information) in online interfaces for the purpose of engaging the user with the interface or each other. It stems from gamification.

Pull Effect: Occurs when the user actively and consciously pursues personal data collection through IT tools, such as web and mobile applications and commonly wearable technology, i.e. Jawbone UP.

Push Effect: Occurs when the user is passively exposed to personal data through embedded pointification in web and mobile applications.

understand how mental shortcuts or cues are adopted by users in the decision-making processes (Eyseneck, 2012). This is valuable when discussing how self-quantification might influence the user that experiences difficulties in individual information processing in a noisy online environment (Bawden and Robinson, 2009). A study by Koroleva et al. (2012) show that users will apply heuristics to process information found in an online setting, such as social networking sites' newsfeed, and this study aspires to apply it to a similar as well as extended context (mobile app and wearable technology context).

The push and pull effect

Self-quantification may occur in a passive and active manner. The user is exposed to self-quantification through either an active (pull) or passive (push) effect. Both the push and pull effects may occur simultaneously, to various degrees and be dependent on each other. The pull effect occurs when the user actively and consciously pursues personal data collection. The push effect present itself through websites or mobile apps through so called embedded pointification, which refers to the exposure of self-quantitative measures to the user despite the lack of pursuit. The push and pull effect is a way to describe that the user is possibly exposed to different types of personally attributed quantified data while interacting with information technology. Both the push and pull effects were discussed in the focus groups and interviews.

The pull effect

The pull function suggests that the user extracts personal numbers that are entered into the tool, both manually and automatically. The user is thus active in

retrieving personal informatics and has a certain degree of influence. Some self-tracking activities are manual, like entering mood or calorie intake, whereas other activities like running is automatically tracked if the suitable sensory device is worn.

Active self-quantification is often synonymous with self-tracking. Self-tracking can be the collection of both metric and semantic data through online applications, i.e. MoodScope, and ubiquitous sensory devices, i.e. Jawbone, for the purpose of self-reflection, self-discovery, and self-improvement (Quantified Self, 2012; Wolf, 2010). The movement engages in tracking various aspects of life, such as fitness, health, mood, productivity, and daily activities. For example, a self-tracker might use mobile apps like RunKeeper to trace details of a running route while other users may wear Jawbone UP or pulse watches that track pace, speed, and pulse. Enthusiasts argue that gathering and crunching the data will improve the quality of life (Economist, 2012).

The push effect

The push function suggests that the user is pushed, or exposed to numbers by the interface, meaning that the user is passive and assigned to the numbers without the possibility of changing the results. For example, if a user posts an update on Facebook, s/he might receive likes but s/he cannot delete individual likes nor induce likes, but they must come from another person without deleting the post. The same scenario can be seen in Instagram, Twitter, and LinkedIn.

Passive self-quantification often occurs through push, or what is known as pointification. This stems from gamification: "the use of game design elements in non-

game contexts” (Deterding et al., 2011, p.10). The concept of gamification is not new but can be traced back to loyalty programs, i.e. airline point collecting programs, that have proven to impact on customer loyalty and thus customer behavior (Pritchard et al., 1999). The application of gamification in an online context has grown with the intent of engaging the user with the interface or each other (Deterding et al., 2011). Pointification is then the increasing use and exposure of points (i.e. numbers) in online interfaces for the purpose of engaging the user with the interface or other users. Points exist through a variety of design features, such as Fuel band points, Facebook likes, Instagram hearts, LinkedIn endorsements, Foursquare points, and ResearchGate score. Numbers are thus gathered, aggregated and exposed to the user in the online platform.

Research design and method

The research methodology has been approached through a qualitative lens insofar: focus groups and interviews. In fall of 2014, I aspire to launch a six month study involving Jawbone UP. Since self-tracking and self-quantification is an emerging phenomenon that involves both active pursuit but also passive exposure and perception, it was desirable to take an exploratory approach that would allow variables and hypotheses for testing to develop through the qualitative data.

Firstly, two focus groups were conducted to gain understanding of how online users experience exposure to quantified data through push and pull effects (Morgnan, 1988). There were two groups of 8-10 people, evenly distributed across gender, age ranging between 20s-40s, both university students and working professionals. The participants were asked about initial

perceptions, interactions and motivation to use various online social platforms, such as Facebook, Twitter, Instagram, LinkedIn. The results made it possible to identify themes user reaction to numerical respectively semantic content, which in turn informed the interview questions.

Thereafter, 35 purposive semi-structured interviews of active self-tracking Jawbone UP + Fitbit users have been conducted. The interviewees are between 20-50 years of age with an even distribution of men and women. The sample was purposive so participants were chosen “because they have particular features or characteristics which will enable detailed exploration and understanding of the central themes and puzzles which the researcher wishes to study” (Ritchie and Lewis, 2003, p.78). A purposive sample ensures that relevance of the subject matter is covered, yet diversity remains important to allow varying characteristics within the sample to be explored (ibid, p.79). In this case, the interviewees are all currently using or have recently used wearable technology that allows both a pull and push function. The interview data offered a stronger foundation to identify patterns of behaviors on how individuals interact with self-quantitative measures, such as mobile apps or ubiquitous sensory devices. The interviews have been coded through MaxQDA to derive a set of personas to explain variations of self-quantification behavior.

In summary, the focus groups offered general insights on how users interact and become influence by content on online social platforms, with a particular focus on quantified information. The interviews gave insight on the both push and pull effect, but most specifically on how users are actively self-tracking, by collecting and

analyzing personal data by means of wearable technology. The combination of this data will infuse the theoretical discussion of the framework. The next step is to launch a study where individuals will be equipped with a ubiquitous sensory device, i.e Jawbone UP. A pilot study is undergoing during the summer of 2014.

Preliminary findings

The preliminary findings are twofold: a preliminary discussion framework (Table 1) as well as three types of user personas. The user personas are based on the interviews with Jawbone UP and Fitbit users. It has been possible to distinguish the goal oriented, the sense maker and the gatherer. These extreme personas hope to help identify and inform patterns of behavior when it comes to decision-making. The framework (Table 1) is primarily based on the theoretical foundation but also informed by the focus groups and interviews. This means that the interplay between the conceptual framing of system 1 and system 2 is combined with the push and pull mechanisms. It aims to identify different scenarios of how users are exposed to self-quantification.

Contributions

The study of the adoption of wearable technology and its production and attribution of self-quantification and how it may subsequently influence the cognitive processes is a valuable addition to the research field of both wearable computing and personal informatics on

Info on PhD Study

The PhD study started in May 2012 and the expected completion is the fall of 2015. The primary supervisor is Ioanna Constantiou. The secondary supervisor is Matthias Trier. We are all affiliated with the Department of IT Management (ITM) at Copenhagen Business School.

	System 1	System 2
P u s h	The passive user is exposed to quantification embedded in an online interface and reacts intuitively to numerical cues.	The passive user is exposed to quantification embedded in an online interface and applies strategic reasoning.
P u i i	The user that actively self-tracks data is exposed to numbers in an online interface that give cues by which the user reacts quickly without analyzing further.	The user is actively self-tracking data that is translated into numbers in an online interface that give cues by which the user strategically analyzes the data.

Table 1. Preliminary discussion framework

how individuals may be affected, inspired and even potentially disrupted in the decision-making processes.

This study contributes to the discussion of new types of adoption and diffusion of wearables and how it may have significant effect on decision-making by identifying the challenges created by self-quantification. The research on how quantified cues are used may also shed light on the challenges of coping with information overload and how users revert to heuristics for relief of cognitive processes. Further, the research may help improve understanding and design of related wearable technology, such as applications for health, education but also social interaction online.

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