"The Crowd Keeps Me in Shape": Psychology and the Past, Present and Future of Health Social Machines

Authors
Web and Internet Science Group
University of Southampton
Southampton, UK
{a,b,c,d,wh,nrs}@ecs.soton.ac.uk

ABSTRACT

Health social machines ...

1. INTRODUCTION

Health and well-being are visible indicators of technological progress, as advances in healthcare and medicine are invariably reflected in increases in average lifespan, reduction of disease and suffering, and shortening of time needed to recover from illness and injury. As such, it is natural to ask how and whether the Internet and the Web, two of the most significant inventions in recent human history, have or may have an effect on health and wellbeing.

In this position paper, we examine a specific class of systems enabled by the Web and pervasive Internet-enabled systems, which we call *health social machines*. We define health social machines to encompass a broad class of systems that provide technologically-mediated interaction of large groups of individuals, typically via a website, app, and sensor-based online community. Individuals usually communicate and interact, directly or indirectly, through some mediated or moderation mechanisms, in order to collectively accomplish or address a health-related problem or need. Such problems, as we illustrate through examples we provide later, may be on the scale of an individual's disease or well-being management, to that of contributing evidence and insight to fundamental questions at the frontier of modern medicine.

We first describe the emerging landscape of health-related social machines, identifying sets of classes and characteristics such machines typically exhibit. We then focus on specific challenges faced by these classes in the longer term, and how emerging insights from behavioural ecnonomics and technological platforms may address some of these needs.

2. HEALTH SOCIAL MACHINES: A (BRIEF) CLASSIFICATORY ANALYSIS

We first collected examples of popular health social machines through a iterative process which started with several popular blogs focused on health-technology, the "quantified-self" and "life hacking", and following links that led to new announcements corresponding to online services and apps. We then clustered the collected candidates using a Grounded Theory approach. This process yielded three, partially overlapping clusters based on the following *major objectives* the machines seemed to support: *behavioural intervention*, *disease management*, and *collective understanding/medical science*.

2.1 Behavioural Intervention

The first which we refer to as "behavioural intervention" social machines" are systems that seek to help individuals achieve certain health related-goals by altering their daily routine(s) and activities in some way. The majority of systems we found in this category, which, itself is the largest of the three, seem to focus on helping individuals increase their general activity levels to increase general fitness levels. Since these systems are not focused on any particular kinds of individuals or conditions or conditioning, we consider them general, preventative health machines with a focus on increasing fitness.

A large number, but not all, of such fitness machines either require, or are designed to complement, sensor devices that are intended to simplify regular measurement of various vital statistics of the individual. As such, they are designed to be quick and easy to use, and, even, in some cases, worn directly on the body, for the measurement of physiological signals or activity levels, at high temporal granularity. These on-body activity measurement devices range from simple accelerometer-based devices (such as the FitBit, Nike FuelBand), that can approximately estimate the number of steps/distance the wearer has travelled in a day, to slightly more complex on-body devices (such as the BodyMedia CORE) that measure multiple physiological signals in tandem with activity level. Other, non-worn devices include iPhone-enabled blood pressure cuffs (e.g. Withings' Blood Pressure Monitor), internet-connectivity enabled weight/body mass index scales (e.g., Withings' WiFi Scale), and iPhone-enabled heart rate, blood oxygen level measuring devices (e.g., Zensorium Tinke).

2.2 Disease management

A second class of health social machines

2.3 Collective sensemaking

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Preventative wellness
Device-based: Nike+, FitBit, Withings, BodyMedia, Zeo App-based: RunKeeper, Site-based: Fitocracy, Traineo, Dailyburn, ExtraPounds, SparkPeople
Disease management
ALZConnected (Alzeheimer's patients), Prevent (Prediabetics) BigWhiteWall
Collective sensemaking
PatientsLikeMe

Table 1: Consolidated constructs of social machines.

2.4 Social pressure and Motivation: Gym Memberships and Personal Trainers

2.5 Present: Channel factors, access, convenience

2.6 Present: Salience and reminders

2.7 Futures: Personalised Activity Diaries

2.8 Futures: Citizen-medicine

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