The Messaging Kettle: It's IoTea time

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ABSTRACT
It's time to consider people in designing the Internet of Things (IoT). We demonstrate a working prototype of a Messaging Kettle. It is designed to facilitate asynchronous communication and enable a sense of presence between adult children and their older parents living remotely from them through the familiar comfort routine of boiling the kettle to make a cup of tea. Our goal is to offer a human centred critique of the Internet of Things, which has largely been conceived without consideration of the people who will use the things, and rather has traditionally moved from a technology oriented perspective. In the case of smart homes this approach has produced a wide array of projects focused on monitoring the habits of the elderly, recognizing anomalies and alerting the caregivers. In contrast we propose to focus on engagement and reciprocity, building on the rituals associated with habitually used and cherished objects. We conclude by revisiting the technology-oriented framework for the Internet of Things to include our observations on people's perspectives on smart communicating objects.

Author Keywords
Habituation; Elderly; Internet of Things; Intimate

ACM Classification Keywords
H.5.3. Group and organisation interfaces

INTRODUCTION
The vision for the Internet of Things has moved over time from a supply chain management perspective [1] to one aimed at combining the power of smart objects, ubiquitous connectivity and semantic interoperability [2]. Fuelled by the increasing availability of miniaturized computing and cheap sensing devices, a multitude of research initiatives has envisioned, prototyped and investigated in depth a wide range of tools and architectures.

In the *smart home*, especially when aiming at elderly users, these initiatives have often taken the form of intelligent surveillance systems, aimed at monitoring, making sense and (mostly automatically) acting upon the behaviors of the occupants. However, despite the claimed direct and indirect benefits that would result from a fast and widespread adoption, older people often actively resist such technologies, suggesting problems in their conception and or design [5, 6]; In homes, people have primacy, not data.

Our work is aimed at designing technologies that engage older people by building on their individual affective attachment to *habituated objects* [3, 8] and leveraging, from a participatory design perspective, the associated rituals and the meaning that such objects have in day to day life.

We explored this research space by means of a *Messaging Kettle* [4] consisting of two augmented kettles that can connect and exchange information over the Internet. When one kettle boils, its remote partner kettle glows and vice versa. Each party can see when the other's kettle is boiling or has recently boiled. Voice or written messages can also be sent through the kettle, with the idea that it is simple to send a message each time one boils the kettle. This is done with a simple push of a button and does not involve any kind of complex configuration.

SYSTEM ARCHITECTURE
To implement the Messaging Kettle (Figure 1) we designed two devices that complement a common kettle (not shown in the figure), endowing it with temperature sensing and voice/scribble messaging capabilities.

Figure 1 Kettle Mate and Tea Box. When the connected remote kettle (in another house) is switched on, the kettle mate displays a dynamic orange/red show of lights as shown.

5th Decennial Aarhus Conference on Critical Alternatives
August 17 – 21, 2015, Aarhus Denmark

DOI: http://dx.doi.org/10.7146/aahcc.v1i1.21323

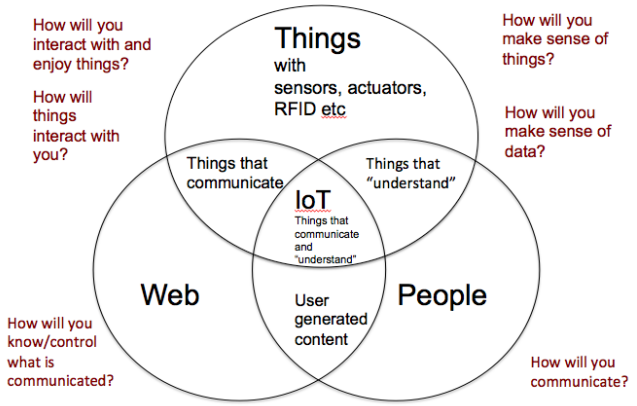

Figure 2 Modified version of Atzori et al. 2010 'Internet of Things' paradigm [2].

The *Kettle Mate* (Figure 1, right) hosts an Arduino microcontroller, a contact-less infra-red temperature sensor to recognize the state of use of the local kettle (for example when it is switched on, boiling, or cooling down) and the corresponding visualization of the remote kettle's state of use by means of an orange/red glowing animation.

It is shaped itself as a kettle and is meant to sit close to the actual kettle or teapot and augment its functionalities without interfering with its original and primary uses, thus allowing people to use their own kettle. It also houses a microphone and speaker to provide voice messaging controlled by a minimalistic (two pushbuttons) user interface for recording/replaying.

A second device, the smart *Tea Box* (Figure 1, left), consists of an Android tablet embedded in a hardwood tea chest, and has scribbling and message archive abilities. The two devices communicate via Bluetooth, and an embedded GSM (phone) chip is used to provide internet connectivity, so that no home network is needed. The *Tea Box* allows the user to draw small notes using a stylus and scroll through previous messages. On the top edge of the screen, a simple interface allows changing ink color, erasing errors, posting a message and browsing received messages.

The Messaging Kettle is coupled to an identical companion device, possibly located several time zones away. The two provide a "red telephone" connection between the two locations, restoring (though on a virtual level) the intimacy associated with the ritual of boiling the kettle to make tea.

A CRITICAL VIEW ON THE INTERNET OF THINGS

An initial evaluation consisting of 'morning teas' and in-home demonstrations was conducted [4]. Besides the usability challenges and the numerous issues that emerge from the special setting and intended users, designing and evaluating the Messaging Kettle reshaped our understanding of the role that people have (or should have) in the conceptualization of the Internet of Things. A useful and widely adopted technical framework by Atzori et al. [2] places the Internet of Things at the intersection of T*hings, Internet* and *Semantic* oriented visions. As Koreshoff et al. [7] have observed, such a model can be fruitfully extended to include HCI oriented efforts. This resulted in including in the model topics central to HCI research, e.g. involving people in the sensemaking of things/data, smart interoperability of things, and design implications resulting from devices' and networks' capabilities. We propose to further extend the model, in order to fully include people (i.e. aims, goals, values, skills, emotions) in the Internet of Things, as we summarize in Figure 2, replacing "Semantic" with "People", since it is people that largely make sense of and utilize things. We argue that this modified version provides a more complete account of the current research issues and design opportunities for smart communicating objects.

By demonstrating the Messaging Kettle at the conference we aim to leverage insights and exchange views on this subject with other delegates.

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