An initial model for designing Socially Translucent systems for Behavior Change

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ABSTRACT
Applications aiming at behavior change are gaining momentum within HCI. Much of that work has been built upon the idea of psychological empowerment. We report on a qualitative study that aimed at inquiring at an alternative path to behavior change through strengthening individuals' feelings of *personal accountability*. Two behavior-change-related scenarios were construed to evaluate how people perceive socially translucent systems aiding the process of behavior adaptation. We found that motivation to change is shaped by the access to information concerning one's behavior, by the type of provided feedback and the strength of the social ties accessing that information. Based on these results we propose an initial model defining possible approaches that can be considered when designing socially translucent systems supporting behavior change.

Author Keywords
Social Translucence; behavior change; conceptual model

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

INTRODUCTION
In recent years there have been a number of technologies designed with the goal to help individuals change their lifestyle-related behaviors, whether directed towards altering habits such as eating or smoking, or adopting new ones like physical exercise or sustainable resource consumption [see 3, 12, 15 for an overview].

Researchers have also reviewed and appropriated a number of theories that can be used by designers in inducing behavior changes. While most of the work so far has focused on the individual, grounded on theories of goal-setting [9], self-determination [13] and the transtheoretical model of behavior change [11], researchers are increasingly recognizing the value of social theories, stressing the influence that social networks exert on individuals' behaviors [e.g., 3, 10, 15]. Yet, much of this work was built on the assumption that positive feedback from one's social network empowers the individual to achieve a given change in their behavior.

In this paper we attempt to examine an alternative path to behavior change through strengthening individuals' feelings of personal accountability. Grounded upon the *Social Translucence (ST)* framework [6], which characterizes the social norms around communication and coordination in work settings – we conceptualize a three-step process in which socially translucent systems for behavior change induce feelings of accountability on individual behaviors. By exposing the information concerning one's behavior change decisions, Our findings demonstrate how feelings of accountability are generated as information about the individuals' behaviors is made visible to others, and highlight the role of the strength of social ties in this process.

In the remainder of the paper, we first review different theoretical approaches to behavior change and highlight the principles of the ST framework. We then describe an empirical study that employed the Repertory Grid Technique [8] to study users' reactions to scenarios varying in *degree of information sharing* and *type of feedback* provided by the system. Finally, we synthesize the insights from the empirical study into an initial model that highlights two alternative approaches to behavior change – psychological empowerment and personal accountability.

RELATED WORK
Behavior change has frequently been motivated by psychological theories, which attempt to decompose behavior on an individual level. For instance, the *Transtheoretical Model* defines six stages of behavior change: precontemplation, contemplation, preparation, action, maintenance and termination [11]. The *Goal-setting Theory* views behavior change as a result of having as a main motivator a collection of clear, self-set and easy to achieve goals [9]. The *Self-determination Theory* exposes the concepts of intrinsic and extrinsic motivation to explain how individuals produced desired behaviors [13]. The *Behavior Model* states three factors that need to be present at once, for a behavior to happen: motivation, ability and effective triggers [7]. Theories rooted in social sciences

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understand behavior change as a function of the influence relevant others exert on an individual. The *Social Cognitive Theory*, for example, introduces concepts such as modeling and identification to explain how people learn by observing behaviors of others and adopt such behaviors whenever they identify themselves with them [1].

On the other hand, the *Social Translucence* (ST) framework emerged from a long-lasting motivation in computer-mediated communication to imitate social interaction in the digital space [6]. For individuals to effectively communicate, the following properties have to be present: *visibility*, *awareness* and *accountability*. Visibility regards how socially significant information is made visible in the system. Awareness reflects the extent to which all users of the system know what information is being shared among them and what others can see about their behavior. Finally, accountability is seen as a basis for the creation of social norms as a consequence of a mutually understood possibility of being held responsible for one's actions. Attaining a successful level of visibility and awareness allows for making social knowledge reusable in future interactions and define new sets of social rules [14].

Focusing on the fact that social contexts have an important role in the formation of accountability, our research aims to appropriate the ST framework for the purpose of designing systems supporting behavior change. The potential of ST framework to support behavior change may be even greater due to the fact that social media, such as Facebook and Twitter have made large real-time social sharing and comparison feasible [10]. Social networks have the potential to stimulate behavior change by incorporating mechanisms such as competition, comparison and public commitment. In our research, the ST framework was used as a basis to formulate an initial model of how social networks could aid behavior change. This work expands on our prior that has looked at the role of strong social ties in forming feelings of accountability about individuals behaviors [2].

THE STUDY

In order to understand how people perceive a socially translucent system supporting them in the process of behavior change, two scenarios were constructed using two behavior change situations. The first scenario described Lisa, a 16-year-old girl using an application called *GetFit* to help her loose weight. The application was designed to monitor her eating and exercising habits, food consumption and cooking practices in her household bringing all family members into the challenge. The second scenario described John, a 45-year-old father of two teenagers and a smoker for 15 years. He started using the *quitNow* application to help him quit smoking when he found out about his son's breathing problems.

Both scenarios were accompanied with a number of alternative system responses (see: Tab. 1). Responses varied according to two variables: the degree of information sharing and the type of feedback. The scenarios and responses were printed in 5x5 cm cardboards.

Dimensions	**John's scenario**
Degree of information sharing	
Narrowcast	*Your wife will receive a notification as soon as you finish this cigar. Are you sure you want to have it?*
Broadcast	*You are about to fail your goal. Your whole family will receive a notification about it. Are you sure you want to smoke that cigar?*
Broadcast with social feedback	*A few minutes after smoking a cigar, John receives text messages from 3 of his family members. "C'mon man! You fell again? "John, I'm disappointed. Weren't we together in this?"*
Type of feedback	
Praise	*We noticed that you managed to avoid smoking in the past few days. Keep up the good work. Your family is very happy for you.*
Punishment	*You are not following the plan to quit smoking. If you keep it up like this it will be harder for you to be smoke-free. Are you sure you are up for this challenge? Your family will be disappointed with you.*
Judgmental	*Do you want your family to see you as a quitter? If you choose to proceed it will be harder for you to complete your goal, this will make you weaker as a person.*

Table 1. System responses designed for John's scenario.

Ten participants (four female, mean age: 29, min=26, max= 38) were recruited for the study through the snowball sampling method. Five participants (non-smokers) were probed about the loosing weight scenario while the other five (smokers) were probed about the smoking one using the Repertory Grid Technique [for details see 8]. It is an elicitation technique where participants are asked to group two responses that appeared similar and different from the third in terms of: i) how they made information about their behavior visible to others, ii) what others could understand about their behavior, and iii) how these responses motivated them to change behavior. For each scenario, participants were presented with two triads. Interviews lasted between 30 and 60 minutes. Participants' responses were recorded and transcribed. Two independent coders organized the statements using the affinity diagram technique [4] and then subcategorized them according to the ST dimensions: visibility, awareness and accountability.

RESULTS

When faced with behavior change participants' reactions seemed to be affected by three aspects: (i) the access to information concerning one's behavior, (ii) the type of such

information, and (iii) the strength of the social ties who had access to that information (see: Fig.1).

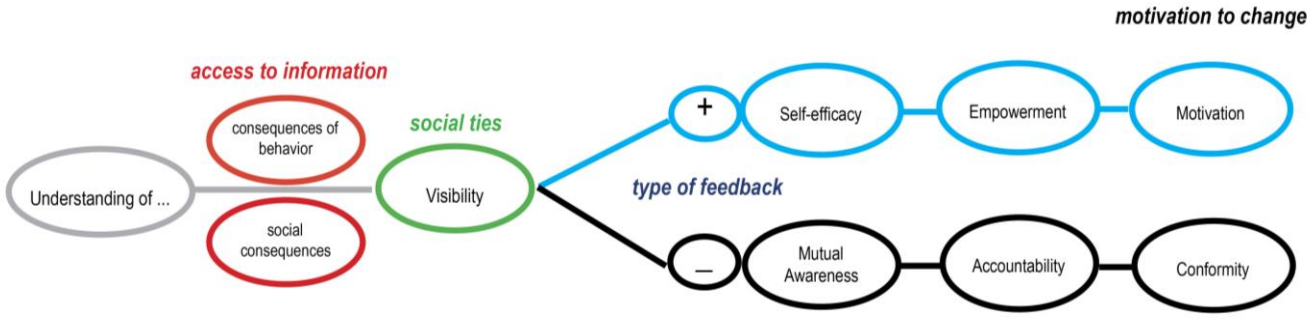

Figure 1: The initial model where ST framework is adopted to design systems aiming at behavior change

Access to information

By making their behavior visible, the system helped participants to achieve both self-awareness as well as mutual awareness (I know that others are informed about my behavior). Self-awareness regarded an understanding of the consequences of one's own behaviors, which allowed participants to assess the impact of their behavior-related decisions and perform the necessary adjustments: "P6 - *I know what the consequences of my actions are and I can change them as I go along*". Mutual awareness made participants adjust their behavior based either on the need to present oneself in a desired manner: "P8 - *Others reactions to my behavior make me feel pressured to behave in a particular way*" or as a way to avoid judgment: "P1 - *The system can trigger impolite comments on my behavior*".

Type of information

In line with earlier findings [5,6,15] we saw that participants were most inclined to change their behavior when presented with positive feedback. They felt such feedback encouraged them to focus on positive outcomes rather than failures: "P4 - *The system allows me to analyze my actions using positive and reinforcing feedback*" or "P9 - *I feel supported when the system provides me supportive and judgment-free feedback from others*". Participants were more willing to share positive information with others and less concerned about how others would interpret their actions. Positive feedback tended to evoke the feelings of self-efficacy and empowerment: "P10 - *I feel accountable when others get rewarded as a result of my good decisions/behaviors".* Such behavior change was self-motivated using intrinsic characteristics of one's character: "P8 - *I feel accountable when the system provides me supportive, contextual and personalized feedback about my behaviors*" or "P9 - *I feel supported when the system highlights my achievements and personal qualities*".

The use of negative feedback seemed to lead to conformity rather than motivation. It referred to the act of changing behavior aided by the need to please others where change was generated by others' reactions: " P8 - *I am more likely to change my behavior when people I care about feel it's not the best path for me*" or "P5 - *I find myself changing my behavior to get someone's approval*". Consequently, as it was considered to bring an undesired exposure of participants' failures, the negative feedback seemed to make them more focused on the impact of that exposure and less on their personal efforts: "P2 - *If I misbehave, other people will see that*"; "P1 - *The system makes it easy for others to judge me".* Such exposure further generated the feelings of helplessness and lack of control: "P3 - *When the system provides information about me to others I don't relate to makes me feel out of control*".

Social ties

The level of experienced accountability differed according to the social relationship participants maintained with people who saw their behavior-related information. If these were family members, participants wished to hide negative feedback to avoid invoking disappointment: "P8 - *I feel accountable when people I care about react in a negative way to my actions*". Interestingly, sharing negative feedback with weaker ties was in some situations interpreted as supportive in correcting participants' behavior towards the desired one: "P10 - *The system providing information to my extended network helps me to achieve my goals*" or "P6 - *I feel accountable when more people know about my situation*". Participants wanted, however, to be able to filter which feedback to share with whom: "P7 - *I choose people I share the information with based on the emotional support they offer*".

DISCUSSION

The results of this study point at two alternative approaches to the design of socially translucent systems aiming at behavior change (see: Fig. 1). The first approach stems from one's intrinsic motivation that is built upon the understanding of the consequences of one's behavior. This approach is likely to be successful when using positive feedback presented to the user him/herself and his/her strong ties (e.g. family members). Such feedback is likely to lead to feelings of self-efficacy and empowerment, which are seen as strong motivators to behavior change.

The alternative approach is built on the premise that the motivation to change is derived from the understanding of social consequences invoked by one's behaviors. Critical to

supporting this approach is to support a sense of mutual awareness. If the individual is aware that his behaviors will be visible to others (and especially weak social ties), the individual will feel more accountable about his or her behaviors and behavior change is likely to occur in order to conform with social rules. These findings, to some extent, resemble the role of seeking social acceptance and avoiding social rejection in persuasive technologies, as identified by Fogg [7].

In both cases participants stated the need to have control over the access to their behavior-related information. Such control could be implemented either by defining the level of visibility of users' behavior-related information and social actors who are involved or by making the users aware when their decisions do not match the goals set to modify their practices.

We believe both approaches could prove successful in aiding behavior change, however, it is crucial to take into consideration the above-described dependencies between the level of access, the type of feedback and the group such behavior-related information is presented to. The access to behavior-related information renders information both on the current behavior and its social consequences providing self-awareness [15]. The type of exposure is likely to shape the individual decision to change. Using positive feedback builds confidence to change, as it makes the users believe they hold the skills to address such a change. If the feedback is negative individuals feel accountable to those whose approval they want to attain.

The research presented here represents a first exploration of how the Social Translucence framework can be appropriated to enhance behavior change. The findings suggested the ST properties: *visibility, awareness* and *accountability* can be integrated to change lifestyles. For that purpose, two approaches were presented combining the access to information, the type of provided feedback and the social ties that were exposed to such information. An initial model was presented to illustrate how those approaches on the one hand generate behavior change built upon personal intrinsic motivation, and on the other, behavior change based on conforming to external factors beyond individual intentions.

One may note a number of limitations in this study. First, behavior change covers a large number of situations; in our study we focused on weight loss and smoking cessation. As such, we cannot generalize these findings to different behavior change scenarios. Second, our study employed the use of scenario-driven elicitation. One could wonder whether the results would hold in real-life situations, thus field trials of social translucent systems are required. Last, our study was conducted with a limited sample of participants. This helped us to gather an initial set of qualitative insights, which we aim to further assess quantitatively using a larger sample of participants.

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