Designing Behaviour Change Support Systems for Behaviour Transformation

Dominic De Franco[1] and Alison Pease[1]

University of Dundee, Dundee, DD1 4HN, UK

Abstract. Behaviour Change Support Systems (BCSSs) are not utilising conscious psychological behavioural models and instead focusing on non-conscious behaviour change. A well established model of behaviour change is the Transtheoretical Model (TTM) which combined with Motivational Interviewing (MI) can help transform a person's behaviour. In this paper we outline how we can integrate the TTM and MI techniques within BCSSs with the aim of enacting sustained behaviour change.

Keywords: BCSS · Transtheoretical Model · Behaviour Transformation.

1 Introduction

In *A foundation for the study of behaviour change support systems*, Oinas-Kukkonen describes a Behaviour Change Support System as "a socio-technical information system with psychological and behavioural outcomes designed to form, alter or reinforce attitudes, behaviours or an act of complying without using coercion or deception." [6]

Additionally, in a review of mobile applications for weight management [1], Azar et al found that behavioural theory-based strategies were rarely utilised within these systems. The dominant model in BCSS's – the Fogg Behaviour Model [4] (and the PSD Framework [7] derived from it) – puts the focus on non-conscious behaviour-change. This is in contrast with the dominant model in psychology of behaviour change – the Transtheoretical Model [8] (TTM). In this model, change is a process involving progress through a series of stages (see figure 1). Many of the processes within these stages are conscious processes, focusing on beliefs, rather than actions.

Motivational Interviewing (MI) can provide a way to diagnose which particular stage of change a client is currently in, and ways to progress them to further stages. MI is *"a collaborative, goal-oriented style of communication with particular attention to the language of change. It is designed to strengthen personal motivation for and commitment to a specific goal by eliciting and exploring the persons own reasons for change within an atmosphere of acceptance and compassion"* [5].

The twin problems of over-reliance on a persuasive technology system and lack of longevity of use are major challenges currently facing the BCSS community. Fogg's 2002 warning that the main limitation of the then-current approach

to persuasive technology was that if a person stops using the system, their change in behaviour ceases with it [3] has been borne out many times. When this is coupled with the problem of a lack of long term engagement with a system, it is clear that the potential power of BCSS's to support long term behaviour change has yet to be realised.

We hypothesise that integrating belief change techniques as well as behaviour change into BCSS's will help to address both problems of over-reliance and longevity. In particular, we advocate using techniques which help people to diagnose a current stage and to transition into further stages of change.

2   Transtheoretical Model and Motivational Interviewing

The Stages of Change The TTM proposes that health behaviour change involves progress through six stages of change, shown in Figure 1. To transition through these stages the model utilises processes such as consciousness raising, in which awareness is gained, and knowledge and self re-evaluation, in which understanding of the effects of a given behaviour is gained. This process is non-linear and can involve many "relapses" to a previous stage before termination is achieved.
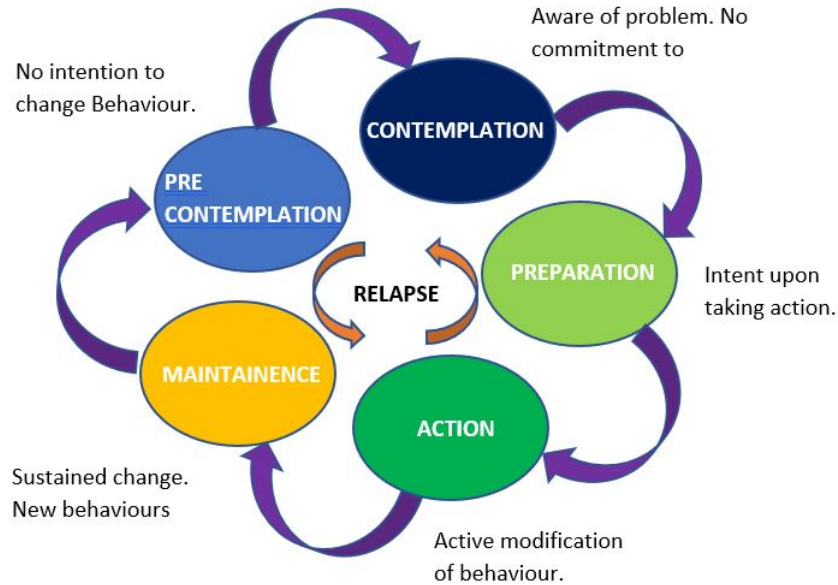
Fig. 1: Stages of Change.

Motivational Interviewing MI utilises 4 core skills, open questions that give people the opportunity to reflect on their current situation and to elaborate, affirmations where the counselor accentuates the client's particular strengths, abilities, efforts and good intentions, reflective listening where the client's thoughts

and feelings are reflected back to them in different words and summaries which are reflections of what the client has been saying, pulled together.

In order to diagnose a particular stage, MI uses the Readiness Ruler (RR). There are two main questions that can provide information about a person's readiness to change: *How important is it for you to make a change?* and *How confident do you feel that you can make changes to your lifestyle?* Answers are given on a scale of 0 (no thoughts about change) to 10 (specific plans to change). The confidence scale helps to assess a client's self-efficacy. A low score would suggest they require further skills to implement a change in behaviour and may need help formulating a plan of action. This can also be supplemented by questionnaires, for instance, [9].

3   Challenges & Proposed Solutions

As described above, MI involves a multifaceted approach which is currently beyond the capacity of BCSSs to implement. The challenges then, are how to assess the stage of change within a BCSS and how a BCSS can transition a user from one stage of change to the next.

For us to incorporate the TTM we must develop a robust method to computationally measure and evaluate the current stage of change the user is in. As well as the Readiness Ruler we can also incorporate techniques adapted from other measures of a person's readiness to change such as a short questionnaire.[9] Our proposal is to utilise a virtual agent who can ask questions designed and validated to assess a person's readiness to change, while utilising the readiness ruler as an interface and tool to measure the user's current stage of change and confidence in making that change.

To solve the next challenge we must formulate strategies that can be implemented within a BCSS to facilitate a transition from one stage of change to the next (see Table 1) [2].

Table 1: Strategies for Transitioning Through the Stages of Change.

Stage	BCSS Strategy
Precontemplation	Provide neutral, personalised feedback using extensive data Provide examples of relevant success stories. Present an array of options.
Contemplation	Provide personalised feedback for their +ve/-ve current behaviour. Use affirmations where appropriate. Encourage +ve actions. Provide exemplars.
Preparation	Use RR for self-efficacy. Provide personalised pitfalls and contingencies. Allow user to set goal.
Action	Give +ve performance feedback. Utilise affirmations and provide information. Suggest modifications to goals & plans.
Maintenance	Provide relevant success stories. Provide +ve feedback. Provide options to modify plan and goals.

To implement these strategies, we can utilise sensors that can provide data which can allow us to monitor and provide feedback on the user's progress. We can also incorporate computational tools such as ranking tasks or questionnaires to understand the current beliefs, behaviours and motivations of the user in order to personalise the approach.

4   Further Work & Conclusions

To meet these challenges we aim to build a system that will measure and evaluate the stage of change a user is in, develop a strategy to motivate a user to transition to the next stage of change based on their data and deliver this strategy through a BCSS. By adapting and incorporating the TTM and MI techniques, we aim to investigate whether we can achieve sustained behavior transformation within a BCSS.

5   Acknowledgments

References

1. Azar, K.M., Lesser, L.I., Laing, B.Y., Stephens, J., Aurora, M.S., Burke, L.E., Palaniappan, L.P.: Mobile applications for weight management: theory-based content analysis. American journal of preventive medicine **45**(5), 583–589 (2013)
2. DiClemente, C.C., Velasquez, M.M.: Motivational interviewing and the stages of change
3. Fogg, B.J.: Persuasive technology: using computers to change what we think and do. Ubiquity **2002**(December), 5 (2002)
4. Fogg, B.J.: A behavior model for persuasive design. In: Proceedings of the 4th international Conference on Persuasive Technology. p. 40. ACM (2009)
5. Miller, W.R., Rollnick, S.: Motivational interviewing: Helping people change. Guilford press (2012)
6. Oinas-Kukkonen, H.: A foundation for the study of behavior change support systems. Personal and ubiquitous computing **17**(6), 1223–1235 (2013)
7. Oinas-Kukkonen, H., Harjumaa, M.: Persuasive systems design: Key issues, process model, and system features. Communications of the Association for Information Systems **24**(1), 28 (2009)
8. Prochaska, J.O., Velicer, W.F.: The transtheoretical model of health behavior change. American journal of health promotion **12**(1), 38–48 (1997)
9. Rollnick, S., Heather, N., Gold, R., Hall, W.: Development of a short readiness to changequestionnaire for use in brief, opportunistic interventions among excessive drinkers. British journal of addiction **87**(5), 743–754 (1992)