

ICSD 2018  
36<sup>th</sup> International Conference of the System Dynamics Society  
Reykjavík, 6-10 August 2018

# A Dynamic Model of Psychological Fatigue in the Process of Low Carbon Home Retrofit

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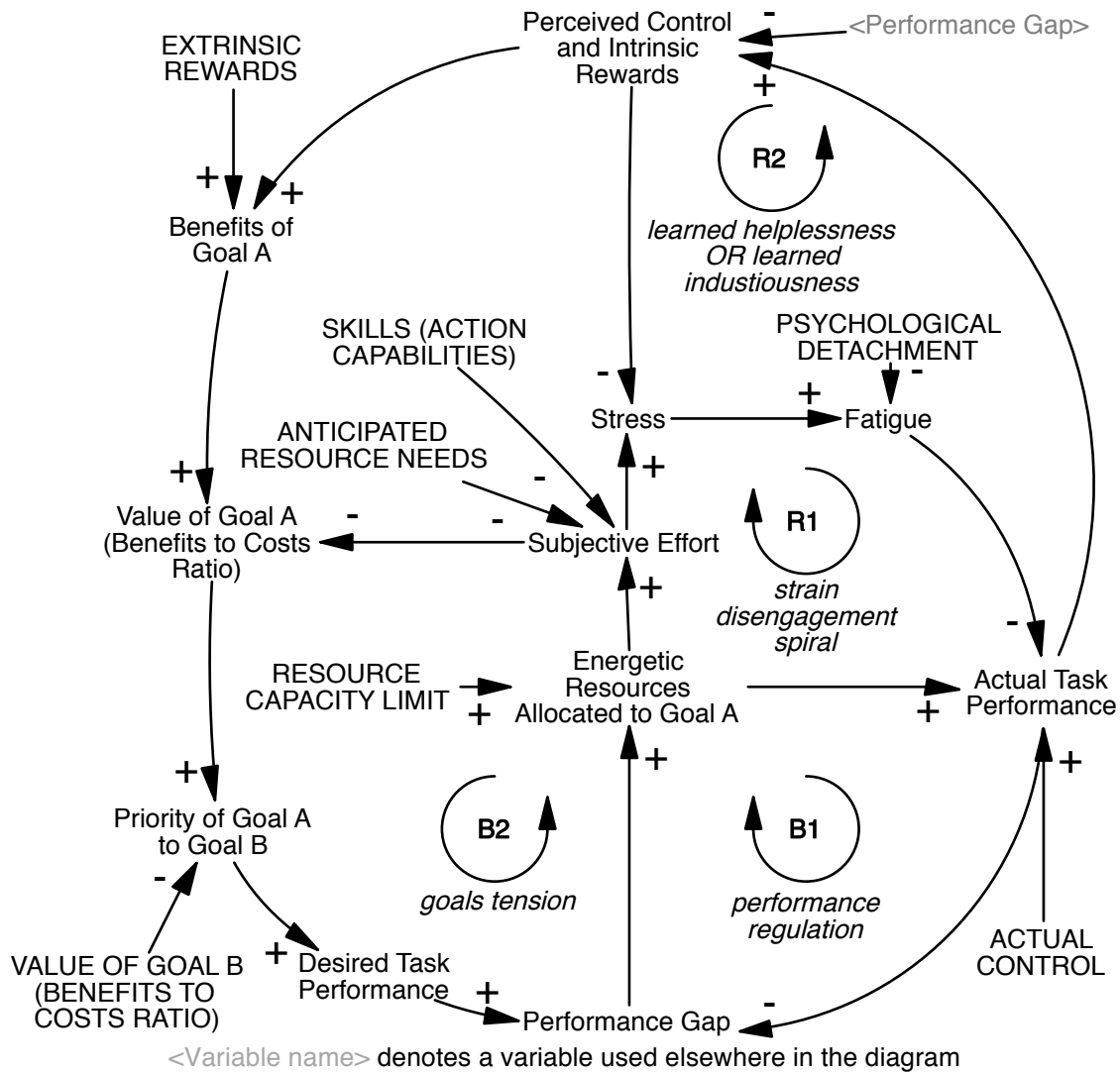
**Keywords:** Psychological Fatigue, Retrofit Process, Home, Control Theory, Multiple Case Study, Interview, Thematic Analysis, System Dynamics

## Extended Abstract

The promotion of low carbon home retrofit among homeowners is widely recognised as an important strategy to mitigate climate change (BEIS, 2017). The *theory of innovation diffusion* can be used to explain how an idea of low carbon home retrofit spreads over time through communication channels in a particular social system (Rogers, 2003). The innovation decision-making process of an individual agent has five stages, during which an agent: (i) accumulates knowledge of a particular option, (ii) forms positive or negative attitude towards this option, (iii) takes a decision to adopt or reject the innovation, (iv) implements the new idea, and (v) confirms the decision (ibid.). Earlier research highlighted that homeowners' positive experience of both outcomes and the retrofit process (stage v. Confirmation) appears to be important, in order to persuade others (stage ii. Persuasion) to retrofit their homes (Bobrova et. al, 2018). It was found that the formation of a negative experience of low carbon home retrofit process is a possible but not inevitable consequence of carrying out such works, regardless of the level of disruption to occupiers' every day life, which is associated with such works (ibid).

This paper conceptualises an endogenous causal explanation of psychological fatigue development during the process of low carbon home retrofit, which is needed to understand how a formation of a negative experience associated with low carbon home retrofit process could be minimised. The explanation is based on Hockey's *motivation control theory of psychological fatigue* (Hockey, 1997; Hockey, 2013). Hockey conceptualises fatigue as one aspect of the complex set of control mechanisms that regulate performance in light of changing motivational priorities (Figure 1). Task performance is continually adjusted to match goals-driven desired performance (**B1**). Desired performance is subject to modification in the light of changes in the perceived costs and benefits of current and alternative activities (**B2**). The mismatch between desired and prevailing performance underpins a state of stress, which can be reduced by control opportunities. The concept of control includes satisfaction from work well done. A sustained activity under high effort and low control provides the foundation for the development of fatigue (**R1**). However, an effortful activity, where control is available, appears to have very moderate impact on development of fatigue (**R2**).

The research used a multiple case study design with a qualitative approach for data collection and analysis. Eight home retrofit cases were selected with a maximum variation purposeful sampling strategy. The aim was to maximise the sample diversity in terms of the development of psychological fatigue during the retrofit process. The 8 dwellings were selected from the SuperHome network. It is a UK-based voluntary network of homeowners that achieved more than 60% carbon reductions as a result of retrofit activities. Semi-structured interviews took place in owners' homes, closed questions were asked for model parameterisation, interviewees drew behavioural graphs over time for model validation. Interviews were transcribed verbatim. The model was validated against generic behavioural modes described in Hockey's theory as well as against behavioural modes specific to particular empirical cases.



**Figure 1.** Causal diagram of Hockey's motivation control theory of fatigue

The developed model was used to explain why some owners in the case studies developed retrofit-associated fatigue and consequently formed a negative impression of their retrofit experience, while others did not. A feeling of psychological fatigue is developed over time under conditions of high effort and low control. The household that carried out separate works in small chunks over few decades did not report such feelings. The households, which had an opportunity to take a break and recover from work- and retrofit-associated stress, reported more manageable levels of stress compared to the households that did not had such opportunity. Finally, households found a higher level of effort to be tolerable if they carried out the works themselves and were proud of their achievements.

The research suggests that a step-by-step and do-it-yourself (DIY) retrofit processes may appeal to a wide range of owner-occupiers. Step-by-step retrofit could minimise the timeframe within which a feeling of fatigue can be developed. DIY retrofit could maximise feelings of control and pride in a job well done. Thus, these approaches have a potential to generate a more positive impression of the retrofit process (compared to a whole house approach or retrofit carried out without owners' involvement), which is needed to persuade others to retrofit their homes.

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