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EMPOWERING ENERGY ACTION: A THEORETICAL MODEL AND IMPLICATIONS FOR PROGRAMMES

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Abstract

Scientists and elected officials agree that climate change cannot be ignored and that residential energy use is a prime target for reducing emissions. Research has shown that many people have at least some interest in engaging in behaviors aimed at reducing their environmental impact, but the specific behaviors they report have a minimal impact on energy savings as compared to the potential 10-20% estimated savings potential. While behaviour change is always difficult, energy use present unique challenges because it is non-sensory, abstract, low mindshare, and impacted by multiple behaviours. This paper presents a model for designing behavior-based energy interventions that walks program designers through the steps of see (receiving information), learn (processing information), want (motivation to conserve), choose (selecting specific actions), act (taking action), and add (expanding to other people and/or behaviors). Each step is presented with relevant theory and implications for program designers. We identify how various efforts support energy action, where they miss out, and what efforts could be made to enhance public engagement on energy conservation.

1. INTRODUCTION

Dozens of changes in the use of energy within the home can be made in the immediate term, without economic sacrifice or loss of well-being on the part of consumers [1]. Research has shown that many people have at least some interest in engaging in behaviors aimed at reducing their environmental impact, but the specific behaviors which the public overwhelmingly report engaging in, such as turning off lights when leaving a room, have a minimal impact on energy savings as compared, for example, to insulating building envelopes [2]. Additionally, there are major barriers preventing people from understanding how to successfully operate energy management technologies such as programmable thermostats [3]. This highlights gaps in energy literacy and motivation and an opportunity for engaging and educating the general public in this topic.

As the need for demand-side savings grows, so too does the opportunity for new and innovative approaches to behavioral programs. Many strategies have been identified that show promise in addressing these gaps including (but not limited to) feedback, commitment, and rewards [4]. However, social science is constantly evolving and offering new ideas to test and apply every year and current efforts lack a cohesive model to guide the development and testing of new behavior-based energy interventions. This paper introduces a theoretical model that links behavioural theory to the unique task characteristics of energy use to suggest strategies for maximising the impact of behavioural interventions that target energy use. Rather than viewing programmes as static entities, this model more realistically (and optimally) considers behavioural-based interventions *across a user journey*. By breaking down the different steps of this journey, we can more insightfully build and evaluate new and existing intervention programmes.

2. CHALLENGES OF ENERGY ENGAGEMENT

While all behaviour change in nearly any domain (e.g., health, education, finance) is difficult, the unique task characteristics of energy use present unique challenges. Four characteristics that warrant consideration when designing behavioural interventions are that energy is non-sensory, abstract, low mindshare, and affected by multiple behaviours [5].

2.1. Non-sensory

First of all, energy is nonsensory; unlike other more tangible natural resources (e.g. water or food), energy is silent, invisible, and otherwise unable to be perceived or sensed. People do not typically see how much energy consumption results from their actions, whether at home (e.g. cooking dinner with the TV on in the background) or at work (e.g. leaving the lights on in an office overnight). Further, the impacts of energy consumption are typically not directly felt; while people might be aware of the broad environmental consequences of anthropogenic climate change, they may not directly feel these consequences, or certainly cannot sense the impact of their own actions on these global changes.

2.2. Abstract

Second, energy is abstract: people do not directly use "energy"; rather, they use things that use energy. When someone is browsing the internet, they are aware that they are using a computer, but may not be thinking about how much energy that computer and the infrastructure supporting the internet are using. Further, for people not engaged with or interested in the environment and science in general, the notion of climate change and the impacts of energy use on climate could be largely incomprehensible. For this reason, many individuals' conceptualisation of the impacts of their energy use on the environment is fundamentally abstract. From a psychological perspective, it has been found that abstractness complicates the ability to promote energy-conserving behaviours [6].

2.3. Low Mindshare

Third, energy use is a low priority for most people. Although most of the global public does report concern about environment and climate change, these issues often rank lower than other concerns related to the economy, healthcare, and security [7]. Additionally, most people do not believe they are personally at risk from global climate change or other energy-related impacts. Also, in many countries, energy is relatively inexpensive. For these reasons, many people might not care (or understand) enough about the relationship between energy use and global climate change to feel a personal motivation to alter behaviour.

2.4. Multiple Behaviors

Lastly, there is no single pro-environmental or energy-conserving behaviour; instead, energy conservation is possible through a diverse and varied suite of behaviours, from changing transportation to eating habits. Though it is possible to encourage pro-environmental behaviour holistically, it is perhaps more useful to a consumer to target specific behaviours (i.e. turning off lights is more comprehensible than "going green"). Targeting specific behaviours, however, requires a careful consideration of external influences, psychological consequences, cost, effort, and required knowledge to carry out each behaviour. All of these factors must be considered when developing energy behaviour related policies and programmes.

3. MAPPING THE ENERGY JOURNEY

Considering these four characteristics of energy use, we can see that behavior-based energy interventions needs to overcome several challenges to engage people in action. The theoretical *user journey* presented here carefully considers each of these characteristics and moves people through the following stages: (1) *See*, (2) *Learn*, (3) *Want*, (4) *Choose, (5) Act*, and *(6) Add* (see Figure 1).

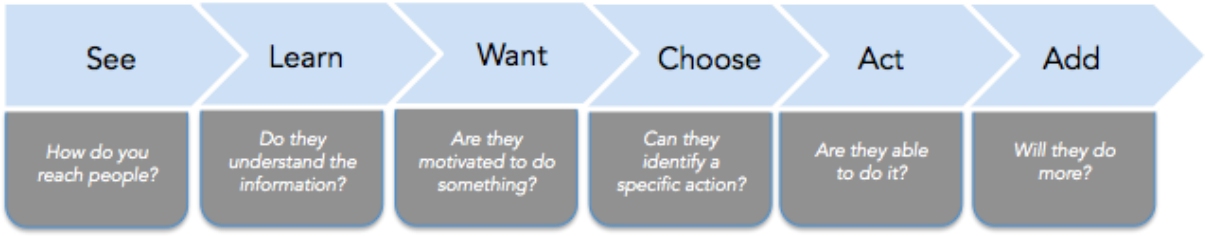

Figure 1. Energy Journey

Below, each stage is discussed, along with the underlying relevant psychological theory and implications for designing behavioural interventions.

3.1. See

The first step of any intervention should be to make energy use and its implications *visible* to the average consumer. In this manner, interventions should strive to act as a *trigger* to direct people's attention to environmental information [8]. Fogg (2009) differentiates between hot and cold triggers; a hot trigger occurs in real-time (e.g., colour changing showerhead) while a cold trigger occurs in advance of behaviour (e.g., highway billboard encouraging efficiency rebates).

The overarching strategy to consider when incorporating this element of the journey into interventions is the choice of **medium**. Options for medium include paper (e.g., energy bill, home energy reports), email, website or mobile application, in-person, or via a community group or organization (e.g., school, church). To ensure people see energy information, it must engage them in a way they are likely to pay attention. Soliciting energy users to sign up for an energy management website, like a utility web portal, is only relevant to if they visit the site. Similarly, placing information in a paper bill that customers do not open or on a flyer that customers discard prevents people from seeing their energy use or the intervention.

3.2. Learn

Both general knowledge and knowledge of specific ways to decrease use are likely to influence energy use behaviour [9]. Information should attempt to reduce the abstraction of energy by helping people simplify the cognitively complex ideas linked to energy and the environment. Ideally, people should be able to interpret information in a way that links their actions to environmental consequences. Information should be unambiguous; any lack of clarity can quickly decrease the effectiveness of the message [10]. Information can be provided in text, graphs, charts, maps, and diagrams. Theories of cognitive ability (i.e. the ability to process information) can guide the communication of energy information for optimal absorption. The ability to interpret data depends on the legibility and quantity of information as well as a person's ability to integrate past experience [11].

Several methods have been proposed to present clearly interpretable information, including the use of well-understood comparisons (e.g. comparisons between different appliances' energy use), visuals, and storytelling. Any of these components, which can be integrated into

interventions, can effectively decrease the cognitive burden of interpreting the impacts of energy use behaviours. Stories in particular can facilitate an understanding of otherwise uninteresting or incomprehensible information. Further, breaking data into smaller pieces of information and connecting information to previously stored information facilitate perception and comprehension [12].

3.3. Want

Interventions will lead to action only if a person is sufficiently *motivated* to change his or her behaviour. Motivation may arise from a combination of behavioural beliefs, normative beliefs, control beliefs, personal norms and moral obligations [13]. Interventions that can cultivate intrinsic motivation have been found to be more effective in the long term than those relying solely on extrinsic motivations [14].

The way content is presented, referred to as **message framing**, is critical when designing interventions to optimally encourage energy users to want to act. Such message frames can tap into different identities ("be an innovator", "rise to the challenge"), reciprocity ("we'll fix your thermostat; please keep your heat low"), and scarcity ("limited time only offer"). Motivation may also stem from providing an explicit comparison between current behaviour patterns and a pre-defined standard, referred to as **feedback**. This comparison may be related to past behaviour (e.g., you used 20% less than last month), a goal (e.g., you are 80% of the way to meeting your goal), or peer behavior (e.g., you are doing better than 80% of your neighbors).

3.4. Choose

A person interested in saving energy must be able to choose at least one specific action to take. However, making this choice can be difficult as there are hundreds of possible behaviors the average consumer can engage in to save energy. As such, interventions should include **recommendations**, ideally tailoured to the targeted customers. Often, these recommendations take the form of behavioural "tips," which are brief snapshots of information providing actionable insight as well as estimated savings. It can be effective to highlight a specific behaviour rather than general energy use feedback, such as shower hot water use feedback [15].

3.5. Act

Once a choice has been made and people are ready to take energy action, they must have the ability to engage in the behaviour they have identified. Contextual variables, such as housing characteristics or availability of time, money, and resources, can impede or enable behaviour regardless of attitudes and motivation. Context, both physical and social, is also important in shaping or constraining behaviour.

The A-B-C (attitude-behaviour-context) model [16] posits that attitudinal and contextual variables are interrelated, and work together to motivate, constrain, or enable action; the stronger one set of factors, the less force the other exerts, such that if sufficient contextual barriers exist, individuals are less likely to engage in a behaviour regardless of their

underlying attitude (and vice versa). Interventions must also help address barriers to action such as financial constraints, time constraints, or the inability to alter the infrastructure of a building (e.g. if someone is renting). Given these numerous barriers, interventions should include some level of support for people along the journey, either through assistance with installations, reminders, and financing.

3.6. Add

Any single conservation action is likely far from sufficient to achieve targeted greenhouse gas emissions reductions. It is thus necessary to consider the role of spillover, both behavioral (i.e. performing additional actions) and social (i.e. encouraging others to take action). Given this consideration, the most effective interventions would be those that support the addition of new people into the journey and new actions by those already in the journey. As someone performs an energy-saving behaviour, this behaviour could become integrated into their sense of self, which would likely spark continual behaviour and the carrying out of other behaviours more seamlessly. Follow up after interventions by connecting with additional behaviours and provide referrals can therefore be crucial in encouraging positive spillover. Ensuring the experience is a positive one can help ensure addition or more behaviours.

4. CONCLUSION

The recommended intervention strategies presented for each element in this journey can be used by policy makers and programme designers to (1) choose which intervention strategy to pursue based on the ultimate programme goals and (2) carefully inform the attributes of each intervention (e.g. choosing a particular type of feedback depending on the overall programme goals). While some behavioural interventions support the elements in this energy action journey, most do not support people through the full journey.

The insights of this model on programme design are not exclusively relevant to energy, and can apply across any number of pro-environmental behaviours, from food consumption (e.g. a food log that provides information on the relationships between food consumption and carbon emissions) to driving (e.g. a dashboard that shows the environmental impacts of different driving styles). Ultimately, when designing environmental interventions, the journey of those engaging with the programme should necessarily be considered a *journey*; that is, moving from energy inaction to energy action should be considered a *process* rather than a product.

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