



A comparative study of theoretical behaviour change models predicting empirical evidence for residential energy conservation behaviours



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ABSTRACT

As the role of consumer behaviour becomes more integral to energy production and consumption systems, models of behavioural decision making are becoming increasingly important. Two models are compared: the planned behaviour theory and the value belief norm theory. Using a six-stage methodology, the results show that the first is better suited to understanding consumer energy efficiency behaviours; the second is preferred for behaviours related to the voluntary green power market. The factors causing the differences are identified. The differentiation is important for energy policy makers and business strategists aiming to leverage consumer demand.

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1. Introduction

The author applies two distinct behaviour change theories with the specific purpose of evaluating whether a certain theory offers a better fit than the other for understanding two separate forms of residential energy purchases. This work builds on the existing literature in its modelling of two distinct home energy behaviours. Justification is then established to show how the existing empirical evidence identifies the favourability of one theory over another to model each behaviour. This work has the potential to lead to greater precision in aligning marketing communication strategies with peaking consumer interest in purchasing in a competitive environment.

This meta-study builds on previous papers published in the Journal of Cleaner Production regarding the way in which socioeconomic factors influence residential energy use (Desmedt et al., 2009). It also illustrates an entirely separate approach to adopting industrial energy efficiency measures within a theoretical framework addressing technical assumptions and conventional views involving barriers to energy efficiency (Chai and Yeo, 2012). The study simultaneously offers the possibility for better constructed research and applied solutions to advance green marketing with

respect to expanding energy efficient product purchases and the renewable energy supply. In addition, it offers promise for encouraging more holistic evaluations of environmental performance to further our understanding of life cycle-related energy use at the consumer level (Vergragt et al., 2014). In terms of scale in particular, these articles serve to illustrate the critical importance of including within larger research conceptualizations the way in which systems of production and consumption interact behaviourally, economically and environmentally with the needs, interests and concerns of the average consumer.

The reader gains a means to understand how specific psychological constructs, including values and beliefs, predict the prevalence of follow-through with regard to a given purchasing decision. The paper illustrates how the theory of planned behaviour (TPB) (Ajzen, 2005a, 2005b; Ajzen and Fishbein, 1980) offers certain advantages for studying residential energy efficiency purchasing decisions, which are found to be distinct from the advantages of studying the choice of voluntary green power utilizing the value belief norm theory (VBN) (Stern, 2000; Stern et al., 1995a, 1995b).

A framework methodology builds on the practice of empirically comparing each of the two theories within each of two distinct behavioural contexts (i.e. voluntary green power and home energy efficiency). This new approach examines the core attributes inherent to the linking of the theoretical modelling of the two behaviours with the most empirically justifiable predictive theory.

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The reader will gain an appreciation of how empirically validated distinctions arise in the application of each theory. It is suggested that this will serve to create a greater understanding for future behavioural research that is theory-specific to each behaviour. In addition, it demonstrates where the empirically tested strengths of theory application become the most useful in predicting specific consumer behaviours. In summary, the following three objectives serve to highlight the contributions of this work (See Table 1).

1. Define a behavioural context for establishing a theoretical base for each behaviour (Table 2).
2. Develop a six-stage comparative methodology to correlate the particular psychological constructs that most strongly fit each theory with a particular range of empirical research.
3. Draw on tests of precision and analysis to extrapolate the empirical strengths of predictors of behavioural performance (Tables 6 and 7).

2. Integrating behaviour change models with outcome performance

Our discussion begins by considering the relative merits of choosing VBN as a better theory for understanding consumer purchasing behaviour involving voluntary green power, while the TPB is hypothesized to understand residential energy efficiency decision making the best. It will be shown that the determination is significant regarding how VBN in particular may be applied to leverage consumers opting to purchase green power, which in 2008 contributed a modest 5.5 billion kWh of the national annual sales involving some 520,000 homes (Bird et al., 2009, p. 4).

The capability for growing the green power market offers a significant challenge with respect to rate payers' lack of understanding of how the \$.0229 average premium per kWh supports the demand for increasing the renewable energy capacity nationally. The ease of enabling consumers to comprehend more immediately how green power may work for them personally is argued to be more complex than recognizing more tangible cost savings from residential energy efficiency measures, which are estimated to save homeowners \$21 billion by 2020 (Middle Class Task Force Council on Environmental Quality, 2009).

If an imperative to advance the clean energy demand involves consumer participation, then a better understanding of the marketing aspects involving voluntary choice in support of green power in relation to home energy conservation purchases becomes important both economically and environmentally. This involves researchers gaining greater clarity regarding the design of their empirical studies in relation to their goal of understanding consumer behaviour in greater depth within a theoretical framework.

3. Establishing a theoretical framework to compare

The assertion of values (VBN) in regard to consumer behaviour is distinct from that based on beliefs (TPB). This distinction is pivotal in justifying the formation of an empirical comparison to test the efficacy of one theory and gain a better understanding of one particular behaviour over another. Values are believed to represent larger and more universal principles to reinforce the development of important life goals and standards, thus transcending the situational nature evident with beliefs (Poortinga et al., 2004, p. 72).

Since values are recognized as lacking the specificity of beliefs as separately defined psychological variables, they appear not to be as

Table 1
A key word summary.

Factors Social-Psychology Variables	A general term to describe things that influence behaviour, such as attitudes, knowledge, or sense of responsibility (Newhouse, 1991, p.179). Factors impacting & impacting attitudes, beliefs, and behavioural intention (Stern et al., 1998, p.985).
Attitude	An enduring positive or negative feeling about some person, object or issue (Newhouse, 1991) involving a complex system of beliefs, feelings, and action tendencies. A measurable degree of like or dislike towards an individual object. The definition of "object" itself is defined generically as a representative aspect of an individual's world (Ajzen, 2005a, 2005b).
Value	A guiding principal towards thought and action (Poortinga et al., 2004, p.71). A value may not specify for a specific object such as global warming; however it is known to be a good predictor of attitudes emergin g from attitude objects (Stern et al., 1998).
Behavioural Intention Behaviours	A measure of the likelihood that a person will engage in a given behaviour (Ajzen and Fishbein, 1980, p.5). An initiation to act based on the recognition of an opportunity to act (Newhouse, 1991, p. 79). Consistent actions are normative to individual expressions of values, culture, socialization, and education. Behavioural based research (Heimlich and Ardoin, 2008, p.230) involving the ordering of specific social, psychological, and personality variables builds empirical evidence to validate the prediction of specific behaviours (Jackson, 2006, p.115).
BNC Beliefs	A composite definition by the author of behavioural, normative, and control beliefs as a postulate of the Theory of Planned Behaviour (Ajzen, 2005a, 2005b, pp.123–126). Ajzen defines behavioural beliefs in terms of what is experienced preceding the performance of a behaviour and during the behaviour as they relate to perception of consequences. These beliefs are therefore linked to attributes involving outcomes (B). The term is further defined through a person belonging to a particular social referent group receiving pressure from the group to confirm (N). As resources and opportunities are believed to be necessary to form the intention of acting, the perception of obstacles to overcome forms perceived behavioural control (C) (Ajzen, 2005a, 2005b, pp.91–92). The term BNC Beliefs is defined here merely for convenience as it recognizes the importance of establishing a foundation from which a more focused intention is found to arise.
Locus of Control	The ability to differentiate outcomes from within despite external threats, challenges, or obstacles encountered. It's a measure of an individual's ability to take direction without being under the control of various external factors (e.g. luck, chance, fate, powerful others) (Ajzen, 2005a, 2005b; Rotter, 1966).
External Locus of Control	A strongly felt belief in the complexity of forces surrounding oneself to strongly influence behavioural outcomes (Rotter, 1966, p. 1). Individual behaviour is found to be strongly influenced by a diversity of external factors influencing the individual (Ajzen, 2005a, 2005b, p.91).
Social Norms	A social norm of a group is characteristic of thinking and acting in ways granting resource access and rewards. Social pressures tend to influence individual behaviour, resonating with the norms of a particular group.
Personal Social Norms	Personal social norms emphasize one's interest to act on a given level of intensity involving a felt moral obligation towards a particular altruistic behaviour (Schwartz, 1977).
Subjective Personal Norms	Subjective personal norms elicit expectations from interactions with significant others in one's environment thus developing a focused personal opinion on a set of mutually understood beliefs (Ajzen and Fishbein, 1980).
Descriptive Norms	Descriptive norms focus on the perceptions of what is commonly done in a situation with respect to the actions of others (Griskevicius et al., 2008).
Injunctive Norms	Injunctive norms arise that emphasize perceptions involving the disapproval of certain behaviours (Cialdini, 2003).
Contextual Factors	Operate outside of established psychological constructs to influence behaviour change models developed and/or tested through empirical research. Contextual factors are less understood in regards to function and impact. They are postulated to impact the predictability of empirical data & analysis involving established behavioural theory (Steg and Vlek, 2009).

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