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Understanding employees' energy saving behavior from the perspective of stimulus-organism-responses

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ABSTRACT

Saving energy in workplaces provides a valuable opportunity to lessen energy consumption and greenhouse gas emissions. This article draws on stimulus-organism-response theory (SOR) to explore the impact of circumstance stimulus and internal psychological states on employee's energy saving intention. Partial Least Square (PLS) was employed to examine the research model with 249 valid responses among Chinese office workers. Findings indicated that descriptive norms, organizational energy saving climate, and media publicity (i.e., stimulus) had a significant direct and positive impact on employee's perceived energy saving responsibility and social pressure (i.e., organism). Moreover, the employee's perceived energy-saving responsibility and social pressure had a significant positive impact on energy saving intention (i.e., response). This study drew theoretical implications for future energy saving research as well as managerial implications for organizations and policymakers.

1. Introduction

Energy consumption throughout the world has been steadily increasing over the last decade (Zhang et al., 2018). According to a report from the International Energy Agency, worldwide energy demand is predicted to increase by about 35% from now until 2035 (Tan et al., 2017). Correspondingly, most energy prices have increased, and global energy supplies have become less stable (Scherbaum et al., 2008; Bissing-Olson et al., 2013). A recent article indicated that energy prices are rising at up to eight times the rate of earning in UK (The Times, 2018). Similarly, as of April 2017, seven US major utility suppliers have declared energy price increases – some as much as a 10% increase (Uswitch com., 2017). Moreover, many cities in China have repeatedly faced energy shortages during the summer and Spring Festival holidays. City governments have had to limit power consumption by conducting electricity rationing during peak hours (Zhang et al., 2014). A related concern is that increased energy consumption causes more carbon dioxide emission and other toxic air pollutants, which can impair the global climate and our health (Zhang et al., 2014; Wang et al., 2018b).

These opposing forces are adversely impacting the profitability of many companies (Scherbaum et al., 2008), so researchers and practitioners are increasingly interested in strategies to reduce energy use by organizations (Zhang et al., 2014; Gao et al., 2017; Leygue et al., 2017). The academic literature suggests that extant advances in decreasing workplace energy consumption have largely focused on reducing energy use "through structural or operational changes to work processes, such as installing energy-efficient equipment" (Scherbaum et al., 2008, p. 819), which can be an effective approach. However, installing energy-efficient appliances and boosting energy use efficiency are not sufficient to diminish energy consumption in the long run because of the so-called 'rebound effect' (Chitnis et al., 2013; Gao et al., 2017). When there is an improvement in technical efficiency in the use of energy, people are more likely to increase their energy consumption, thereby negating the gains. For example, people may choose to use a heater for longer periods or to a higher temperature because the operating cost per square meter has been reduced (Azizi and Wilkinson, 2015).

Due to this conundrum, we are interested in workable, practicable solutions. It has been said that "the greenest lightbulb is the one that you will turn it off." According to Scherbaum et al. (2008), companies and their employees are one of the largest users of the world's energy. Many companies also recognize the importance of employee energy saving and look for guidance to motivate their employees to participate actively in energy saving (Zhang et al., 2014). However, the current literature on energy saving at the individual level largely focuses on households' energy saving. Socio-demographics variables, financial incentives or feedback, and psychological factors were demonstrated to impact households' energy saving behavior (Wang et al., 2018a). There

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is still a research gap regarding our knowledge of individuals' (i.e. employees') energy use behavior in organizations. Extant research on this topic has mainly focused on the employee's attitude, motivations, and rational assessment (Scherbaum et al., 2008). Some studies focused on employees' attitude toward energy saving and employed the framework of the theory of planned behavior (TPB) (Ajzen, 1991) to explain employees' intention to save energy (e.g., Gao et al., 2017). Other studies based on rational choice theory show that employees' energy saving behavior reflects their analysis of the benefits and costs of saving energy (Zhang et al., 2014; Leygue et al., 2017).

However, the explanatory value of these studies is restricted because they did not account for the possibility that employees' energy saving behavior may change over time, depending on the particular circumstances they are experiencing (Bissing-Olson et al., 2013; Attiq et al., 2017). Such within-person variance (Lee et al., 2000) already been shown for determining employees' behaviors, such as job satisfaction, organizational commitment, job performance, and turnover (Rodell and Judge, 2009; Lee et al., 2000; Warr and Inceoglu, 2012). This study attempts to turn attention to the work and social circumstance of all employees. Based on stimulus-organism response theory (SOR), the current study tries to answer following research question. *How do circumstances and experiences of employees in an organization relate to their energy saving intention?* We assume that the three types of stimulus (i.e., descriptive norms, organizational energy saving climate, and media publicity) impact employees' internal psychological states (i.e., perceived energy saving responsibility and social pressure), which in turn motivate them to save energy at work.

This study offers several key contributions to our understanding of this important phenomenon. First, this research explores the factors that motivate employees' energy saving behavior in the workplace, thus further extending and advancing energy-saving behavior research at the individual level. Second, while the SOR has been widely used to study other phenomena, this research will contribute to this theory by adapting it (and hence extending its applicability) to explain pro-environmental behaviors. In substantiating this theoretical contribution, we frame the SOR by incorporating a set of antecedents and intervening variables that are unique to the energy-saving context. Finally, our study is expected to offer rich insights to help policymakers to promote employees' energy-saving behavior.

The reminder of this research is organized as follows. In the next section, we review the previous literature on energy-saving behaviors and the SOR framework. Then, the research model is proposed and the hypotheses are developed. In Section 4, we focus on data and the research method. Data analysis and the results are shown in Section 5. In Section 6, we discuss the key findings of the study, the theoretical and practical implications, and the limitations.

2. Theoretical background and research model

2.1. Determinants of energy-saving behaviors

Energy conservation is a classic textbook instance of a domain where changes in behavior have significant beneficial effects on reducing carbon emissions and preventing global warming (Scherbaum et al., 2008; Zhang et al., 2018). It is therefore not astonishing that this set of behaviors has attracted enormous attentions from researchers worldwide in the recent years. The majority of energy-saving behavior studies to date have focused on domestic (household) settings (Al-Shemmeri and Taylor, 2017; Gao et al., 2017; Wang et al., 2018a), not workplace energy saving. These studies can be loosely grouped into three distinct but related themes. The first stream of literature has focused on the impact of socio-demographic factors (Frederiks et al., 2015; Yang et al., 2016; Ding et al., 2017). Demographic variables including income, gender, education, homeownership status, marital status, and age were found to statistically related to householders' energy conservation behaviors and activities (Frederiks et al., 2015; Al-Shemmeri and Taylor, 2017). For example, Combined correlation analysis and multiple regression, Ding et al., (2017) showed that urban residents in China tend to have more positive energy conservation intent and incline to engage in more energy-saving activities than rural residents. Similarly, by conducting a survey in China, Yang et al., (2016) pointed out that females tend to be more energy saving than males since in traditional Chinese family, wives are in a position to observe more family energy consumption actions. They also suggested that individuals with low family income displayed energy-saving behaviors more regularly than those with high wages, which is not surprising.

The second stream of literature focused on how the government could use interventions to prompt residents to save energy. These interventions including taxes and subsidies, money, rebates or prizes, and feedback (Al-Shemmeri and Taylor, 2017). The basic principle underlying this perspective is the rational choice theory (AKA rational action theory), which suggests that people will rationally seek to maximize their benefits and minimize their losses (Madden et al., 1992), and will spend money on energy ("pain") if it is exceeded by the psychological value of energy use ("gain"). Many previous studies have indicated that financial rewards have been successful in reducing energy consumption (Mizobuchi and Takeuchi, 2013; Zhou and Yang, 2016). However, some studies also argued that financial incentives can only be useful in a short period and may not prompt energy-saving behaviors successfully in the long term (Wang et al., 2018a). Other studies concurred that regular feedback was essential to promote energy-saving behavior (Du et al., 2017). When households can compare their savings levels with their neighborhoods or other social groups, they may try to reduce their energy consumption (Frederiks et al., 2015). Another study showed that individual rate payers may be motivated to adopt smart meters to monitor and reduce energy consumption if they perceive a shared benefit with others to avoid brownout energy disruptions (Warkentin et al., 2017).

Scholars have increasingly recognized that psychological behavior-oriented perspectives may also have powerful effects in achieving energy-saving goals. Psychological behavior-oriented perspectives aims to realize domestic energy saving by underscoring a range of person-specific psychological factors, such as beliefs, values, social norms, attitude, and environmental awareness to activate energy conservation behavior (Frederiks et al., 2015; Wang et al., 2018a). In previous studies, many psychological theories and frameworks have been employed to interpret family energy consumption behavior. Among these theories and models, Ajzen's (1991) Theory of Planned Behavior (TPB) was extensively utilized. Some scholars found that subjective norm, energy conservation attitude, and perceived behavioral control were significantly associated with urban energy consumption behavior (Ding et al., 2017). Some scholars also believe that habit, emotion, and moral norms play a decisive role in people's daily energy consumption behavior (Wang et al., 2018a).

Researchers have also begun to report the antecedents of individuals' energy-saving behavior in the workplace given that many people spend approximately two-thirds of their time in workplaces every week (Gao et al., 2017). Emerging research has mainly focused on the potential impacts of employees' socio-demographic characteristics, as well as psychological factors on employees' energy-saving behavior. For example, by analyzing data from 330 UK college employees, Al-Shemmeri and Naylor (2017) suggested that homeowner status, commute type, social altruism, and home installation of green appliances determined their commitment to actual energy savings in the workplace. By adding descriptive norm and personal moral norm, Gao et al. (2017) also extended the explanatory power of the original TPB model. Their results suggested that employee's attitude towards energy saving, descriptive norm, personal moral norm, and perceived behavior control directly and positively influenced their energy-saving intention, while the effect of the subjective norm was not supported. Similarly, driving on norm activation model (NAM) and using survey data collected from