Going Beyond Buildings: Mindfulness and Real Estate User Behavior

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Abstract

Purpose – Building performance does not only depend on its efficiency but also on the behaviors of its occupants. Occupant behaviors can more than offset technological efficiency gains so that corporate real estate (CRE) managers have to go beyond sustainable buildings. CRE managers need to understand occupants in order to effectively reduce the environmental impact their building portfolio. This study investigates the effects of environmental attitudes and mindfulness on occupant behaviors at home and at the office. Thereby, we address numerous calls for research regarding the drivers of more environmental real estate user behaviors (EREUB).

Design/methodology/approach – The authors employ partial least squares structural equation modeling based on self-report data obtained for a representative German sample.

Findings – The results show that environmental attitudes as well as mindfulness have both positive effects on occupant behaviors. However, the effects tend to be weaker in the office context.

Research limitations/implications – This study relies on self-reports as indicator of actual behaviors. Besides, the findings are limited by the cross-sectional nature of the data.

Practical implications – Environmental education as well as mindfulness training may be an effective way to promote more environmental occupant behaviors and help CRE managers to further reduce the environmental impact of their building portfolio.

Originality/value – The paper contributes to prior research about the antecedents of environmental behaviors and provides evidence for the positive impact of environmental attitudes and mindfulness on occupant behaviors. We provide a new approach for CRE managers, which may improve occupant behaviors.

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1 Introduction

The building sector has a significant impact on the natural and built environment by being one of the main consumers of resources and energy (OECD, 2003). Extant studies have unanimously shown its tremendous potential for reducing its environmental impact and promoting sustainable development (Levine *et al.*, 2007). Hence, a fundamental contribution of a corporate real estate (CRE) manager is his or her attempt to green operations within the corporate real estate portfolio (Roper and Beard, 2006). In this way, the CRE manager does not only support environmental conservation, but also brings value to the organization by minimizing resource and energy consumption.

Since approximately 70 to 85 percent of an office building's total energy and water consumption accrues in the operational phase (Junnila *et al.*, 2006; Suzuki and Oka, 1998), CRE managers have focused on technical efficiency measures to minimize the negative environmental impact. Indeed, technological efficiency measures for both new and existing buildings can reduce energy and water consumption by up to 80 percent cost effectively (Levine *et al.*, 2007). However, the performance of a building does not only depend on its efficiency. Occupant behaviors can more than offset technological efficiency gains.

Studies about similar and identical buildings revealed that the energy consumption varies by a factor of two to three due to user behaviors (Galvin, 2013; Gill *et al.*, 2011). Likewise, the impact of user behaviors is highlighted by the disparities between planned and actual energy consumption of up to the twofold in offices (Bordass *et al.*, 2001; Curwell *et al.*, 1999) and residential buildings (Guerra Santin, *et al.*, 2009; Majcen *et al.*, 2013). In this respect the International Energy Agency (IEA) (2016) stated that the underlying reasons for the observations "have more to do with the role of human behavior than the building design" (p.1).

A commonly observed problem at the office is that occupants behave inefficiently, incorrectly, or wastefully. Office occupants were found to leave windows open when leaving the room even though heating, ventilation, and air conditioning systems were turned on (EBOB, 2006). Moreover, lights and office equipment, such as computers, are left on when leaving the work space (Lindelöf and Morel, 2006). The results of such occupant behaviors can be shocking. A study by Masoso and Grobler (2010) revealed that 56 percent of the total energy consumption took place during non-working hours.

Consequently, CRE managers have to go beyond buildings and focus on the occupants. They need to understand occupants in order to promote more environmental real estate user behaviors (EREUB).

User behaviors have been and still are puzzling researcher for more than several decades. This study attempts to answer numerous ongoing calls for research regarding the understanding EREUB and their drivers (Frederiks *et al*, 2015.; Hori *et al.*, 2013; Huebner *et al.*, 2015; Steg and Vlek, 2009; Wei *et al.*, 2014). Specifically, we investigate the effects of environmental attitudes and mindfulness on EREUB for two different contexts, namely at home and at the office. Despite not been investigated in detail, recent findings suggest that mindfulness is a relevant predictor of EREUB (e.g. Barbaro and Pickett, 2016; Panno *et al.*, 2017; Geiger *et al.*, 2018).

We contribute to academic research in several ways. First, to the authors' best knowledge, this is the first study to assess the same set of behaviors of the same respondent for different contexts. Thereby, potential differences in the effects of the antecedents (i.e. attitudes, automatisms, and contextual factors) can be pointed out. Second, in contrast to past research, we focus only on EREUB. Accordingly, specific conclusions can be drawn for behaviors within buildings. Third, unlike many other studies, we conceptualize EREUB as formative construct based on theoretical considerations and previous findings. Fourth, we employ partial least squares structural equation modeling (PLS-SEM), which permits the simultaneous analysis of all variables in the model in order to specifically identify variables of higher interest.

The following section will describe the conceptual framework, research model, as well as hypotheses. Subsequently, we depict the methodological approach. In the next section the study results will be given, followed by limitations, discussion of results, and research implications.

2 Conceptual Framework

Human behaviors are complex by being a function of internal as well as external influences. The conceptual framework for this study builds upon Attitude-Behavior-Context (ABC) theory developed by Guagnano, Stern, and Dietz (1995) and Stern (2000). According to ABC theory, "behavior (B) is an interactive product of personal-

sphere attitudinal variables (A) and contextual factors (C)" (Stern, 2000, p.415). The theory further postulates that the influence of attitudinal variables (A) is particularly strong when contextual factors (C) are neutral. The influence of attitudinal variables (A), however, approaches zero when contextual factors are either strongly positive or negative (Guagnano *et al.*, 1995). In comparison with other behavioral theories, it offers several advantages by being an integrative theory accounting for internal and external influences and by being developed particularly for environmental studies subsuming over three decades of research (Stern, 2000). Against the background of one criticism formulated by Stern (2000), we account for automatisms and unconscious actions. Figure 1 depicts the conceptual model and Table 1 summarizes the related hypotheses.

2.1 Behavior

Environmental real estate user behaviors (EREUB) refer to curtailment behaviors, which involve repetitive behavioral efforts in order to reduce the energy and water consumption (Gardner and Stern, 2002). These behaviors include turning off the lights when leaving a room, turning off the heating while airing, or using as little water as possible when flushing the toilet, for instance. Thus, EREUB are defined as direct impact-oriented day-to-day behaviors within a building that minimize the negative impact on the natural and built environment (Kollmuss and Agyemann, 2002; Stern, 2000).

As a predictor for EREUB, our model includes general environmental behaviors (GEB), since many academics assume related environmental behaviors to be correlated (Gatersleben *et al.*, 2002; Poortinga *et al.*, 2004). Indeed, studies have found positive spillover-effects for environmental behaviors (Nilsson *et al.*, 2017; Thøgersen and Ölander, 2003) so that GEB are positively related to EREUB at home (H_{1a}) and EREUB at the office (H_{1b}).

2.2 Attitude

Attitudinal factors reflect an individual's general predisposition to engage in environmental behaviors (Stern, 2000, p.416). Thereby, attitudes impact behaviors

directly (Steg and Vlek, 2009). Numerous studies suggest environmental attitudes to be positively related to environmental behaviors (Black *et al.*, 1985; Stern & Oskamp, 1987; Dunlap *et al.*, 2000; Guagnano *et al.*, 1995).

Empirical studies provide evidence for a direct positive relationship with environmental behaviors (Martinsson *et al.*, 2011; Poortinga *et al.*, 2004; Vining and Ebreo, 1992). Others found this relationship to be weak or non-existent (Stern, 2000; Gatersleben *et al.*, 2002). Yet, these controversial findings do not invalidate the suggested relationship, but rather point to the fact that a myriad of other factors (automatisms, context, perception, etc.) influences environmental behaviors (Kollmuss and Agyeman, 2002). Thus, environmental attitudes are positively related to EREUB at home (H_{2a}), EREUB at the office (H_{2b}), and GEB (H_{2c}).

However, ABC theory differentiates between the effects of attitudes depending on the context. In particular, when contextual forces are strongly positive or negative, they can effectively compel or inhibit behaviors (Stern, 2000). Empirical findings about real estate user behaviors suggest that individuals behave especially inefficient (i.e. without consideration for the wasted resources) when not paying for utilities (Gunay *et al.*, 2014; Levine *et al.*, 2007). Given our focus on different contexts for EREUB, we can expect the effects of environmental attitudes to be stronger for EREUB at home than for EREUB at the office (H_3).

2.3 Automatisms

Despite being environmentally aware, individuals often fail to adopt more environmental behaviors. This phenomenon is commonly known as attitude-behavior gap (Kollmuss and Agyeman, 2002; Fischer *et al.*, 2017). One possible explanation is that many of our daily behaviors are driven by automatic, non-conscious mental processes (Bargh and Chartrand, 1999; Frederiks *et al.*, 2015). In everyday life, individuals are commonly not focusing on what they are doing. During a particular action, their consciousness may be engaged in something completely different. They are not being mindful. Various findings suggest that the same holds true for occupant behaviors (Galvin, 2013; Gill *et al.*, 2011; Gram-Hanssen, 2010). However, paying attention is necessary for making more environmental choices, especially if they have

not become the norm yet (Amel *et al.*, 2009). Hence, training one's mindfulness may promote more environmental choices.

Mindfulness is commonly defined as a "state of being attentive to and aware of what is happening in the present" (Brown and Ryan, 2003, p.822). When behaving automatically or compulsively without being attentive to or aware of one's behavior, mindfulness is compromised. Hence, mindfulness is characterized by a conscious deliberate focus on the present moment (Grossman, 2011; Fischer *et al.*, 2017). Mindfulness may disengage individuals from unfavorable automatisms by enabling individuals to actively observe and change previously unconscious routines and facilitate behaviors, which are consistent with one's attitudes (Brown and Ryan, 2003; Chatzisarantis and Hagger, 2007; Ryan and Deci, 2000).

Empirical literature suggests that mindfulness can positively influence behaviors. The concept has shown to be effective to treat binge eating disorders (Kristeller and Hallett, 1999), obsessive-compulsive disorders (Schwartz, 1997), tobacco addiction (Brewer *et al.*, 2011), as well as alcohol and substance use disorders (Garland *et al.*, 2010; Kamboj *et al.*, 2017; Witkiewitz *et al.*, 2005). Recently, researchers investigated the effects of mindfulness on environmental behaviors. Significant positive relationships were found for mindfulness and environmental behaviors (Amel *et al.*, 2009; Bahl *et al.*, 2016; Barbaro and Pickett, 2016; Geiger *et al.*, 2018; Panno *et al.*, 2017). Thereby, the studies included also environmental behaviors related to the usage of real estate. Additionally, mindful individuals are more likely to care and reflect about their environmental impact (Bahl *et al.*, 2016). Correspondingly, mindfulness positively related to environmental attitudes (H_4). Moreover, mindfulness is positively related to EREUB at home (H_{5a}), EREUB at the office (H_{5b}), and GEB (H_{5c}).

2.4 Context

Apart from the different context where behaviors are performed, a variety of contextual variables can influence behaviors. Prominent contextual variables, which are suggested to affect environmental behaviors, are perceived wealth and perceived busyness (Ertz *et al.*, 2016; Guagnano *et al.*, 1995; Steg and Vlek, 2009). Perceived wealth refers to the

perceived availability of monetary resources. Perceived busyness refers to an individual's perceived availability of time to act (Stern, 2000).

The perceived availability of financial resources can have both a positive and negative effect on environmental behaviors (Black *et al.*, 1985). Occupants may be reluctant to engage in EREUB, since they require repetitive behavioral effort, which can potentially be considered as a cut-back in amenities. Consequently, perceived wealth is negatively related to EREUB at home (H_{6a}), EREUB at the office (H_{6b}), and GEB (H_{6c}). Since the perceived availability of time may limit the ability to engage in certain behaviors (Kollmuss and Agyeman, 2002; Stern, 2000), perceived busyness is negatively related to EREUB at home (H_{7a}), EREUB at the office (H_{7b}), and GEB (H_{7c}). Furthermore, perceived busyness may affect the time to reflect and think about one's actions (Steg and Vlek, 2009) so that perceived busyness is negatively related to mindfulness (H_8).

3 Data and Methodology

We test our hypotheses by estimating a structural model by partial least squares (PLS-SEM). Note that as a non-parametric approach, PLS-SEM does not require normally distributed data and can provide robust results for small sample sizes. Secondly, PLS-SEM can handle formative measurement models without any limitations, even in endogenous positions like for EREUB (see Hair *et al.*, 2017; Hair *et al.*, 2011; Henseler *et al.*, 2009; Reinartz *et al.*, 2009).

3.1 Measurement

We have developed a measurement scale related to EREUB that is based on real estate and behavioral literature (see Table 2). Following Kaiser's (1998) proposition, EREUB are "measured specifically through reference to concrete types of behaviors" (p.397). The specificity of the items also minimizes the systematic error due to social desirability and anchoring effects (Gatersleben *et al.*, 2002). [3]

[3]Past research has measured environmental behaviors as a reflective construct (e.g. Barr *et al.*, 2005; Poortinga *et al.*, 2004). More recently, also formative conceptualizations can be found (e.g. Thøgersen and Grønhøj, 2010; Zhang *et al.*, 2013).

GEB were measured based on a single-item construct developed by Amel *et al.* (2009). The scale demonstrated consistent psychometric properties and was validated against various composite scores of environmental behaviors.

The revised New Environmental Paradigm (NEP) by Dunlap *et al.* (2000) was used to measure environmental attitudes. The NEP measures people's attitudes "on the human-environment relationship" and is frequently used in academic studies to measure environmental attitudes (Poortinga *et al.*, 2004, p.72; Stern, 2000; Vining and Ebreo, 1992).

Mindfulness is measured based on the Baer *et al.*'s (2006) mindfulness scale "acting with awareness". In addition, two items from Brown and Ryan's (2003) mindfulness attention awareness scale were included, which capture two additional aspects, namely eating without awareness, and breaking or spilling things because of carelessness.

Perceived wealth and busyness are measured based on scales developed by Ertz *et al.* (2016). Since answers in self-report research are often assumed to be subject to social desirability bias, the revised social desirability scale short form X1 by Fischer and Fick (1993) was included. All items were measured on a 5-point Likert scale.

3.2 Data Collection

In cooperation with Respondi, an ISO-certified panel provider with over 100,000 respondents in Germany, a representative sample was drawn based on characteristics of the German working population aged between 18 and 69. In total, 392 out of 535 respondents finished the questionnaire resulting in a response rate of 73.27 percent.

We employed several screening techniques such as instructed item, response time, invariant responses and semantic synonyms/antonyms, as recommended by e.g. Curran (2016), or Desimone *et al.* (2015). In total, 75 respondents were removed resulting in an adequate removal rate of 19.1 percent (Curran, 2016). The sample of 317 respondents was further reduced, as not all individuals work at an office, resulting in a final sample size of 201.

Since not all individuals can operate windows or heating systems at the office, several indicator data for EREUB at the office were missing. Missing data was imputed based on logical rules as recommended by Gelman and Hill (2007) as well as Hair *et al.* (2017). Missing values were replaced on the basis of global items serving as a proxy for EREUB as well as a comparison of response patterns.

In order to detect common method bias (CMB), Harman's single factor test and a full collinearity test were conducted. In Harman's single factor test, no single factor emerged, which accounts for the majority of the covariance of the measures (Podsakoff *et al.*, 2003). The full collinearity test revealed that no variance inflation factor (VIF) at factor level exceeded the threshold of 3.3 (Kock, 2015). Both tests point toward the absence of CMB.

3.3 Assessment of Measurement Models

Reflective Measurement Models

The reflective measurement models are evaluated in terms of internal consistency reliability, convergent validity, and discriminant validity (see Table 3). Indicators with loadings between 0.4 and 0.7 are considered for removal if the deletion resulted in an increase of reliability or average variance extracted (AVE) (Hair, *et al.*, 2011). Except for social desirability, all reflective constructs reach adequate reliability, convergent validity, and discriminant validity levels after removing some indicators.[4] Consequently, only the average social desirability score is included in the model.

Formative Measurement Models

Formative measurement models are evaluated in terms of convergent validity,[5] as well as significance and relevance of the formative indicators. Since high numbers of

[4] The following indicators were removed: Environmental Awareness: Limit, Rights, Ingenuity, Resources, Animals, Crisis, Control; Mindfulness: Concentration, Dream; Perceived Busyness: Person, Perceived Wealth: Enough.

[5] Following propositions by Chin (1998) as well as Sarstedt *et al.* (2013), convergent validity is evaluated by redundancy analyses with global items (see Figure 2). Only EREUB at the office exceed the proposed path coefficient threshold of 0.7 (Hair *et al.*, 2017). Nevertheless, a strong positive and significant relationship is present for EREUB at home, suggesting convergent validity has been reached for the formative measurement models (Diamantopoulos and Siguaw, 2006).

formative indicators result in an increasing likelihood of non-significant outer weights, distinct groups of indicators were formed in advance (Cenfetelli and Bassellier, 2009).

The significance and relevance of the formative indicators are assessed based on Hair *et al.*'s (2017) propositions. Therefore, the outer weights and loadings are tested for significance by means of bootstrapping with 5,000 samples. Not all weights are significant, indicating that not all indicators are relatively important (see Table 4). Yet, the assessment of the indicator loadings highlights that nearly all formative indicators are absolutely important by showing outer loadings above 0.5 or significant p-values (Hair *et al.*, 2017). Two indicators for EREUB at the office do not meet the proposed requirements. Since these indicators have proven to be absolutely and relatively important for EREUB at home, they are retained in the model.

4 Assessment of the Structural Model

The reflective and formative measurement models exhibit satisfactory level of quality so that the structural model can be subsequently assessed. By grouping the formative indicator into several groups, EREUB were specified as formative-formative hierarchical component model (HCM) following suggestions by Hair *et al.* (2018). Considering the model requirements of formative-formative HCM in endogenous positions, a repeated indicator approach is applied and the model is evaluated based on a total effects analysis (Becker *et al.*, 2012; Hair *et al.*, 2018; Temme *et al.*, 2014). Thereby, the model is assessed for collinearity issues, significance and relevance of the structural relationships, as well as coefficients of determination (R^2) (Hair *et al.*, 2017).

4.1 Analysis and Results

The VIF of the structural model are uniformly below the rigorous cut-off value of 3.3, suggesting the absence of multicollinearity (Diamantopoulos and Siguaw, 2006).

The total effects analysis reveals significant effects ~~of different strengths~~ between the constructs under investigation, which are in line with most of the hypothesized

relationships (see Table 5). A significant positive effect of medium strength can be identified for GEB on EREUB at home and at the office. The result indicates a positive spillover effect proposing that engaging in one behavior affects the probability of engagement in another behavior. Thus, a transfer of environmental behaviors between different behavioral categories is present in this study. Individuals generally engaging in environmental behaviors are likely to engage to some extent in EREUB at home (H_{1a}) and at the office (H_{1b}).

A medium to strong significant effect can be identified between environmental attitudes and the behaviors under investigation. Strong positive effects of attitudes on behaviors are present for GEB and EREUB at home as well as a medium positive effect for EREUB at the office. Hence, the common logical conclusion that environmental attitudes are predictive for environmental behaviors (H_{2a}, H_{2b}, and H_{2c}) holds true. However, the effect of environmental attitudes also depends on the context. The effect of environmental attitudes on EREUB is weaker at the office. The strong negative contextual force (i.e. not paying for utilities) weakens the attitude-behavior association and causes the effects of environmental attitudes on EREUB to be weaker in the office context (H_3).

The total effect of mindfulness on environmental attitudes renders to be significant and of medium to high strength. Being mindful results in awareness of and reflection about one's actions and the associated environmental impact. Hence, mindfulness positively affects environmental attitudes (H_4). Moreover, the results suggest that mindfulness positively influences EREUB at home and at the office (H_{5a} and H_{5b}). Most individuals know which kind of their occupant behaviors can be ameliorated. Yet, their routines, habits, and unconsciousness prevent them from adopting more EREUB, which have not become the default. An increased level of mindfulness enables occupants to make more environmental behavioral choices by disengaging them from unfavorable automatisms. However, the weaker effect of mindfulness on EREUB at the office also points to another fact. Behaviors at the office may be driven to a lesser extent by automatic mental processes than expected. This could mean that individuals deliberately choose less environmental behaviors in this context.

In contrast to previous findings by Amel *et al.* (2009), no significant effect of mindfulness can be identified on GEB (H_{5c}). One possible explanation may be that one

has to differentiate between institutionalized and non-institutionalized environmental behaviors. Mindfulness is hypothesized to affect non-institutionalized environmental behaviors in particular. Consequently, the effect renders to be insignificant for GEB covering both types of behaviors.

The hypothesized relationships between perceived wealth and environmental behaviors (H_6) as well as perceived busyness and environmental behaviors (H_7) have to be rejected. Perceived wealth does not inhibit GEB. Likewise, perceived wealth does not negatively affect EREUB despite the fact that some EREUB may cause a loss of amenities. Similarly, perceived busyness does not affect the ability to engage in environmental behaviors, even if the behaviors require repetitive behavioral effort. Nonetheless, a strong negative effect is present between perceived busyness and mindfulness (H_8).Perceived busyness and mindfulness are incompatible with each other, since attention and awareness are central elements of mindfulness. When being busy, these elements are likely to be compromised.

All aforementioned results account for social desirability. Social desirability had significant positive effects on reported environmental behaviors as well as levels of mindfulness. Individuals chose responses which they believed to be socially appropriate or acceptable – thus, overstating the actual level of environmental behaviors and mindfulness.

4.2 Limitations

A number of limitations in the current study should be acknowledged. First, the study relies on self-reports as indicator of actual behaviors. Despite the fact that numerous studies indicate that self-reports are adequate indicators of actual environmental behaviors (Fujii *et al.*, 1985; Stern & Oskamp, 1987; Warriner *et al.*, 1984), other studies report only low correlations between reported and actual behaviors (Corral-Verdugo, 1997). Therefore, we cannot rule out whether reported behaviors differ from actual behaviors. Likewise, there is concern that individuals cannot accurately rate their own level of mindfulness (Grossman, 2011).

Second, the cross-sectional nature of the data precludes conclusions about the causality and long-term effects of environmental attitudes, mindfulness, and GEB on EREUB. A longitudinal study may yield additional insights about their effects on EREUB.

Third, despite the fact that the antecedents explain an adequate share of variance of the endogenous constructs, a large amount of variance remains unexplained. Thus, important antecedents seem to be omitted. Commonly individuals are neither alone at home nor at the office. The complexity of group behavior has not been covered in the study. Likewise, we assumed EREUB to be equally easy to perform, which is not necessarily the case. For example, turning the heating off in one room could mean turning off several heaters instead of a central thermostat.

5 Discussion and Implications

The study answers several calls for research on the drivers for occupant behaviors. Thereby, we examine behavioral differences in two different contexts, namely at home and at the office. In line with previous research, we empirically support the postulation of positive spillover effects of environmental behaviors on occupant behaviors (Nilsson *et al.*, 2017; Thøgersen and Ölander, 2003). A person generally engaging in environmental behaviors is more likely to engage in EREUB. Besides, the findings lend further support to a direct positive effect of environmental attitudes on occupant behaviors (Martinsson *et al.*, 2011; Poortinga *et al.*, 2004). Environmental attitudes translate into environmental behaviors (i.e. GEB and EREUB). Yet, in line with ABC theory, the effect of attitudes is weaker for the office context, suggesting that strong contextual forces (i.e. not paying for utilities) suppress the effects of attitudes on behaviors (Black *et al.*, 1985; Stern, 2000). Despite holding environmental attitudes, individuals are less likely to engage in EREUB at the office than at home.

In addition, the findings support the hypothesis that mindfulness positively affects environmental attitudes due to reflecting and caring about the environmental impact of their actions (Bahl *et al.*, 2016). At the same time, we corroborate assertions that mindfulness results in more environmental occupant behaviors. Indeed, mindfulness may disengage individuals from unfavorable automatisms and presents a necessary condition for making environmental behavioral choices in contexts (i.e. buildings),

where they have not become the default (Amel *et al.*, 2009; Bahl *et al.*, 2016; Barbaro and Pickett, 2016; Brown and Ryan, 2003; Geiger *et al.*, 2018; Panno *et al.*, 2017). Our findings provide further evidence for the positive effects of mindfulness on environmental behaviors, in particular on EREUB. These findings are in line with previous studies, which included some environmental behaviors related to the usage of real estate (e.g. Barbaro and Pickett, 2016; Geiger et al., 2018; Panno et al., 2017).

Besides greening the building portfolio, CRE managers need to focus on the occupants operating the buildings. Occupant behaviors can more than offset technological efficiency gains. This study provides valuable reference points for CRE managers on how to nudge occupants toward more environmental behaviors by focusing on two key determinants, namely environmental attitudes and mindfulness. An alteration of attitudes toward more environmental ones may encourage positive behavioral changes. Environmental education may be a useful intervention to foster more environmental attitudes. In turn, these attitudes may result in environmental behaviors as our findings suggest.

Furthermore, CRE managers need to consider that individuals may be perfectly willing to change their behaviors but still not do so, because they do not persist enough in practicing the new behavior until it has become a habit (Kollmuss and Agyeman, 2002). Mindfulness training may serve as means to overcome this problem by fostering the replacement of reactive habitual behaviors. It enables individuals to observe and change unfavorable automatisms until environmental occupant behaviors have become the societal default (Amel *et al.*, 2009; Barbaro and Pickett, 2016; Geiger *et al.*, 2018; Panno *et al.*, 2017). Previous findings suggest mindfulness training to be a fruitful approach to alter habitual behaviors and increase behavioral regulation (e.g. Brewer *et al.*, 2011, Garland *et al.*, 2010; Kamboj *et al.*, 2017; Witkiewitz *et al.*, 2005).

In addition, the positive but weaker effects of environmental attitudes and mindfulness on EREUB at the office indicate that further behavioral intervention types may be necessary to establish better occupant behaviors in the office context. One reason for this observation may be the absence of financial incentives to save energy. Creating financial incentives might strengthen the effects of environmental attitudes on EREUB at the office (e.g. Gunay et al., 2014; Levine et al., 2007). Furthermore, they might

prevent individuals from deliberately choosing less environmental behaviors and, thus, increase the positive effects of mindfulness.

Each of the aforementioned intervention approaches (i.e. environmental education, mindfulness training, financial incentives) can change behaviors if carefully executed. However, the most effective behavior change programs involve a combination of several approaches, which is underlined by the limits of single-variable explanations (Stern, 2000). Hence, a combination of all approaches may be an effective way to promote more environmental occupant behaviors and help CRE managers to green operations within their building portfolio.

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Appendix

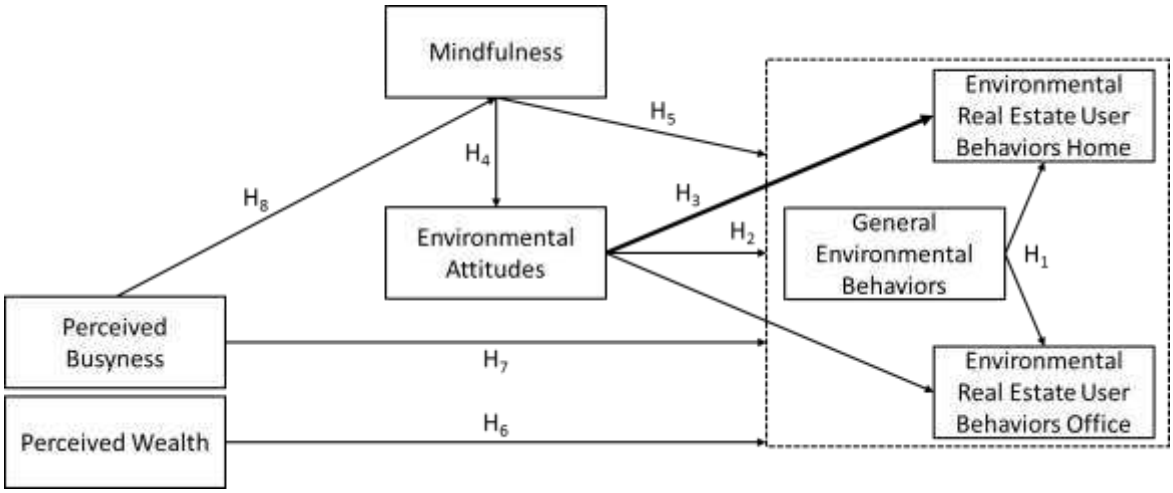

Figure 1: Conceptual Model

Table 1: Summary of Hypotheses

No.	Hypothesis
H1	GEB are positively related to EREUB.
H2	Environmental attitudes are positively related to EREUB and GEB.
H3	The effects of environmental attitudes are stronger for EREUB at home than for EREUB at the office.
H4	Mindfulness positively related to environmental attitudes.
H5	Mindfulness is positively related to EREUB and GEB
H6	Perceived wealth is negatively related to EREUB and GEB.
H7	Perceived busyness is negatively related to EREUB and GEB.
H8	Perceived busyness is negatively related to mindfulness

Table 2: Item List for EREUB

No.	Item
1	Reduce heating in unoccupied rooms
2	Put on more clothing instead before turning up heating
3	Keep heating low to save energy
4	Turn heating off while airing
5	Tilt windows while heating*
6	Switch off lights in unoccupied rooms
7	Reduce time of lighting
8	Turn off devices completely (not standby)
9	Wait until a full load until using dish washer
10	Use as little warm water as possible
11	Rinse the dishes with cold water
12	Wash hands with cold water
13	Use as little water as possible when flushing the toilet

* Indicates reverse item

Scale is based on Barr *et al.* (2005), Black *et al.* (1985), Ek and Söderholm (2010), Fujimi *et al.* (2016), Gatersleben *et al.* (2002), Hori *et al.* (2013), Huebner *et al.* (2015), Kaiser (1998), Poortinga *et al.* (2004) Ouyang and Hokao (2009), Thøgersen and Grønhøj (2010), Whitmarsh and O'Neil (2010) Zhang *et al.* (2013).

Table 3: Result Summary for Reflective Measurement Models

Latent Variable	Indicators	Convergent Validity			Internal Consistency Reliability		Discriminant Validity
		Loadings	Indicator Reliability	AVE	Composite Reliability	Cronbach's Alpha	HTMT Confidence Interval does not include 1
		> 0.70	> 0.50	> 0.50	0.60 - 0.90	0.60 – 0.90	
Mindfulness	Distraction	0.72	0.51	0.53	0.90	0.88	Yes
	Attention	0.78	0.60				
	Automatic	0.71	0.50				
	Automatic 2	0.76	0.57				
	Eat	0.71	0.50				
	Thoughts	0.71	0.50				
	Hurry	0.76	0.58				
	Break	0.71	0.50				
Environmental Attitudes	Nature	0.77	0.59	0.51	0.88	0.84	Yes
	Balance	0.67	0.44				
	Interference	0.71	0.50				
	Catastrophe	0.75	0.56				
	Abuse	0.67	0.45				
	Laws	0.73	0.53				
	Spaceship	0.66	0.43				
Perceived Wealth	Money	0.89	0.79	0.77	0.91	0.85	Yes
	Buy	0.85	0.72				
	Wealth	0.89	0.80				
Perceived Busyness	Free Time	0.88	0.78	0.75	0.90	0.83	Yes
	Rush	0.85	0.72				
	Time	0.87	0.75				

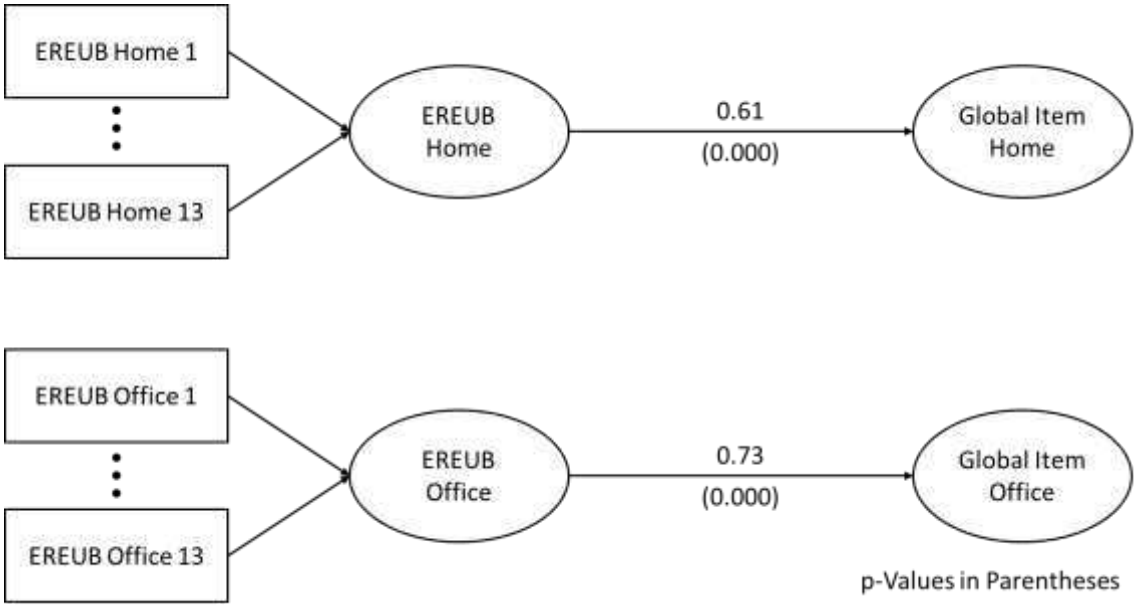

Figure 2: Result of Redundancy Analyses

Table 4: Result Summary for Formative Measurement Models

Latent Variable	Dimension	Indicators	Weighting		Loading		Contribution	
			Indicator Weight	p-Value	Indicator Loading	p-Value	Absolute	Relative
EREUB Home	Heat	Heat Room	0.08	0.413	0.56	0.005	x	
		Heat Clothing	0.16	0.023	0.82	0.000	x	x
		Heat Less	0.16	0.132	0.87	0.000	x	
	Light	Light Room	0.24	0.003	0.78	0.000	x	x
		Lighting	0.20	0.001	0.85	0.000	x	x
	Cold	Hand Cold	0.52	0.223	0.70	0.054	x	
		Dishes Cold	0.74	0.072	0.87	0.014	x	x
	Air	Heat Air	0.50	0.208	0.57	0.140	x	
		Heat Tilt	0.83	0.023	0.87	0.013	x	x
	Devices	Standby	0.78	0.000	0.83	0.000	x	x
		Dishwasher	0.56	0.001	0.63	0.000	x	x
	Water	Toilet Flush	0.55	0.001	0.77	0.000	x	x
		Water Usage	0.67	0.000	0.85	0.000	x	x
EREUB Office	Heat	Heat Room	0.60	0.000	0.87	0.000	x	x
		Heat Clothing	0.12	0.457	0.57	0.000	x	
		Heat Less	0.50	0.003	0.84	0.000	x	x
	Light	Light Room	0.66	0.000	0.86	0.000	x	x
		Lighting	0.55	0.000	0.79	0.000	x	x
	Cold	Hand Cold	0.96	0.093	0.99	0.021	x	x
		Dishes Cold	0.11	0.848	0.43	0.356		
	Air	Heat Air	0.96	0.000	0.98	0.000	x	x
		Heat Tilt	0.21	0.339	0.30	0.198		
	Devices	Standby	0.55	0.000	0.68	0.000	x	x
		Dishwasher	0.75	0.000	0.84	0.000	x	x
	Water	Toilet Flush	0.61	0.000	0.84	0.000	x	x
		Water Usage	0.61	0.000	0.83	0.000	x	x

Table 5: Total Effects Results of Structural Measurement Model

Relationship	Path Coefficient	T-Value	p-Value	
Environmental Attitudes → EREUB Home	0.316	4.026	0.000	***
Environmental Attitudes → EREUB Office	0.222	2.845	0.004	***
Environmental Attitudes → GEB	0.284	4.744	0.000	***
Mindfulness → EREUB Home	0.246	2.400	0.016	**
Mindfulness → EREUB Office	0.184	2.005	0.045	**
Mindfulness → GEB	0.047	0.619	0.536	(n.s.)
Mindfulness → Environmental Attitudes	0.206	2.482	0.013	**
GEB → EREUB Home	0.189	1.668	0.095	*
GEB → EREUB Office	0.176	2.267	0.023	**
Perceived Busyness → EREUB Home	0.008	0.079	0.937	(n.s.)
Perceived Busyness → EREUB Office	-0.086	1.046	0.295	(n.s.)
Perceived Busyness → GEB	-0.025	0.749	0.454	(n.s.)
Perceived Busyness → Mindfulness	-0.309	4.541	0.000	***
Perceived Busyness → Environmental Attitudes	-0.099	1.172	0.241	(n.s.)
Perceived Wealth → EREUB Home	-0.069	0.749	0.454	(n.s.)
Perceived Wealth → EREUB Office	-0.148	1.538	0.124	(n.s.)
Perceived Wealth → GEB	-0.014	0.707	0.480	(n.s.)
Perceived Wealth → Mindfulness	0.046	0.671	0.502	(n.s.)
Perceived Wealth → Environmental Attitudes	-0.048	0.715	0.475	(n.s.)
Social Desirability → Perceived Busyness	-0.259	3.427	0.001	***
Social Desirability → EREUB Home	0.191	2.051	0.040	***
Social Desirability → EREUB Office	0.286	4.070	0.000	***
Social Desirability → GEB	0.209	2.661	0.008	***
Social Desirability → Mindfulness	0.310	4.257	0.000	***
Social Desirability → Environmental Attitudes	0.068	0.957	0.339	(n.s.)
Social Desirability → Perceived Wealth	-0.065	0.898	0.369	(n.s.)

Path coefficients are non-standardized
n.s. stands for non-significant
* $p < 0.10$
** $p < 0.05$
*** $p < 0.01$