Cleaner Engineering and Technology 8 (2022) 100480

Contents lists available at ScienceDirect

Cleaner Engineering and Technology

journal homepage: www.sciencedirect.com/journal/cleaner-engineering-and-technology

A comprehensive review on the adoption of insulated block/eco-block as a green building technology from a resident perspective

Hashita Joyram [a,b,*], Kannan Govindan [c,d,e], Robin Nunkoo [f,g,h,i]

[a] Open University of Mauritius, Réduit, 80835, Mauritius
[b] Mauritius Research and Innovation Council, Ebène, 72201, Mauritius
[c] China Institute of FTZ Supply Chain, Shanghai Maritime University, Shanghai, 201306, China
[d] Center for Sustainable Supply Chain Engineering, Department of Technology and Innovation, Danish Institute for Advanced Study, University of Southern Denmark, Campusvej 55, Odense M, Denmark
[e] Yonsei Frontier Lab, Yonsei University, Seoul, South Korea
[f] University of Mauritius, Réduit, 80837, Mauritius
[g] School of Tourism and Hospitality, University of Johannesburg, South Africa
[h] Griffith University, Gold Coast, Australia
[i] Copenhagen Business School, University of Copenhagen, Denmark

ARTICLE INFO

Keywords:
Building insulation and eco-block building technology
Contextual factors
Psychological factors
Demographic factors
Adoption decision framework

ABSTRACT

Green building technologies (GBTs) have gained significant momentum as a result of the environmental, energy management and societal problems within the building sector. The insulated block/eco-block is a GBT, which consists of an insulation material that prevents hot/cold air to enter inside buildings, conserve energy and improve indoor comfort in comparison to conventional block. However, conventional building techniques are still dominant in developing countries due to a lack of people's knowledge about GBT, poor interaction with building experts and low support from policymakers. Public acceptance of the eco-block technology is essential for its successful introduction into society. This paper is the first one to systematically review 45 peer-reviewed articles in this field of study with a focus on eco-block. Recent publications have extended theoretical models like (TPB, TAM, DOI, VBN and UTAUT) to study green building consumption. Lack of subjective knowledge about eco-block, lack of trust in the suppliers of eco-block, high price sensitivity, poor education and low-income households are recognised as the major barriers to the technology adoption. The contribution of the paper lies in establishing an original adoption decision framework that groups together a set of (contextual factors, psychological factors and demographic factors) to fill the research gap. The adoption framework could eventually assist the construction experts to analyse the different stages involved in the residents' decision to adopt the eco-block building technology. The paper culminates with a discussion on the application of the conceptual framework as a reference in future GBT usage.

1. Introduction

Since the past decade, the attention towards energy issues has gained momentum and several policies across the globe have been designed to assure worldwide sustainability. Within this context, the building sector has received particular concern in developing countries since it accounts for 40% of the global energy consumption use (Peng, 2016). Owing to energy inefficiencies in the building arena, it is imperative to develop green building technologies (GBTs). GBTs are defined as technologies such as wall technologies, green roof technologies, solar system technologies, smart lightning systems and energy-efficient appliances that are integrated into building design to enhance building sustainability (Chan, 2018). In this context, the insulated block, referred to as the eco-block technology falls under the building insulation category.

Notably, the external envelope/wall of a building has a considerable impact on the surrounding climate as it sets a boundary between the interior and the exterior environment, affecting the occupant thermal comfort level (Pisello, 2016). Given that the thermal gain or loss through the building walls are significant, the adoption of properly insulated walls has received particular attention (Asdrubali et al., 2014). The

* Corresponding author. Open University of Mauritius, Réduit, 80835, Mauritius.
E-mail addresses: h.joyram@mric.mu, eng.hashita@gmail.com (H. Joyram), kgov@iti.sdu.dk (K. Govindan), r.nunkoo@uom.ac.mu (R. Nunkoo).

https://doi.org/10.1016/j.clet.2022.100480
Received 2 September 2021; Received in revised form 1 March 2022; Accepted 30 March 2022
Available online 12 April 2022

insulation material is the layer that controls the heating effects of the building walls during the summer and winter seasons (Schiavoni, 2016). The literature highlights that there exist numerous types of building insulating materials, as reflected in appendix table A.

Insulation in buildings has become a major concern in maintaining the sustainability of the building envelope. In a developing country like Mauritius, GBTs such as eco-blocks were introduced on the island in 2015 (UBP, 2015) to offer superior insulation in houses. The eco-block technology has many benefits due to its availability, affordable cost, low payback period and its suitability for new building construction in developing countries. Even though, the conventional building techniques are still dominant due to a lack of people's awareness about the new building technology and this message has not diffused effectively in the society due to low interactions with building experts and the absence of policy measures to endorse sustainable building construction (UBP, 2015). An exploration of the various factors, which motivate residents to adopt eco-block is indeed crucial.

Some researchers have explored the potentiality of using eco-block for building insulation and experimentally proven that the latter has better energy performance than the conventional block (Prato and Schiavi, 2015). The eco-block is fabricated with a solid polystyrene core that is embedded into a concrete matrix. The polystyrene insulator has various benefits such as its thermal efficiency, lightweight material, resistance against severe storms, fire and water resistance (Sayadi, 2016). A study was conducted by (UBP, 2015) to assess the energy performance of two similar buildings, one constructed with conventional blocks and the other one with eco-block under the same conditions. The result findings revealed that the eco-block is 3 times more efficient in terms of thermal resistance and the air conditioning unit in the eco-block building consumes minimal electricity than the conventional one.

Despite the benefits correlated with eco-block and building insulation, there exist numerous barriers to public acceptance (Ye, 2015). Within the building sector, empirical research has investigated the impact of contextual and demographic/personal factors on behaviour. For example, Nair and Mahapatra (2010b) surveyed 3000 homeowners to assess the effect of demographic factors and contextual factors in influencing building envelope investments. The study concluded that the acceptance of building envelope amplifies the building age, thermal discomfort, perception of high energy costs, greater levels of education and income. In another study, Tovar (2012) discovered several factors such as (dwelling type, length of residence, dwelling age, age of the respondent, respondent income) influenced households' acceptance of insulation strategies. The findings of Baldini et al. (2018) reported that low-income groups cannot afford investment measures due to their financial constraints.

In line with past studies, questions can be postulated as:

1. What are the contextual factors impacting residents' decision to adopt the eco-block technology for building insulation?
2. What are the demographic factors impacting residents' decision to adopt the eco-block technology for building insulation?

Many psychological models such as Theory of Acceptance Model (TAM) and Theory of Planned Behaviour (TPB) have been designed to determine consumers' behavioural intention. For instance, Rajaee and Malekmohammadi (2019) have expanded the TAM model with five additional constructs (environmental attitudes, subjective knowledge, social trust, social norm and perceived cost) to study green building consumption. In surplus, Shin et al. (2018) have extended the TAM by the inclusion of compatibility and privacy protection factors to describe the acceptance of smart homes. Besides, Zahan et al., (2020) have explored the TPB to analyse the effect of environmental concern on green housing purchase intention. Zhang et al. (2020) have also extended into the TPB model with the addition of the consumer perceived value to study the willingness to pay for energy-saving appliances. These studies lead to a question as:

3. What are the psychological factors impacting residents' decision to adopt the eco-block technology for building insulation?

In emerging economies, society's attention towards a shift in building technology has gained little impetus. The purchase of high investment GBTs like the eco-block technology requires in-depth investigation, however, most empirical studies have analysed only limited influential factors as identified above. No review study has unveiled a comprehensive set of factors influencing the acceptance of general GBT except for three reviews reported in (Huijts et al., 2012; Ding, 2018; Kuhe and Bisu, 2019). The originality of this paper is to systematically review the various factors including a set of factors (contextual psychological and demographic) that might potentially influence residents to adopt the eco-block technology. The main contribution of the research is to propose a new framework to aid the policymakers in understanding the different stages involved in the residents' adoption decision. This paper ultimately seeks to respond to a research question to fill the research gaps as:

4. How to link all the above-mentioned factors in a framework in the effort to understand the resident decision-making process to purchase eco-block for building insulation?

The review paper is structured into several sections. Section 2 reviews the existing studies on green building consumption. Section 3 outlines the systematic literature search methodology. Section 4 describes the content analysis. Section 5 proposes the adoption decision framework and discusses the research questions. Section 6 elucidates the policy implications and application suggestions for policymakers. The last section contains the conclusion and culminates into future research opportunities.

2. Review of review on resident adoption of GBTs and eco-block

Several countries including some developing countries have made considerable efforts to address climate change. In the building sector, numerous initiatives have been issued to raise ecological awareness and promote GBTs (Kylili and Fokaides, 2017). Nowadays, there are various environmental buildings codes such as LEED or BREEAM to rate a building environmental sustainability (Asdrubali et al., 2014). GBTs are progressing gradually in developing countries, while conventional buildings are persistently dominant.

A review of relevant published literature was performed to identify the factors influencing the acceptance of GBT with a focus on eco-block technology. This research contributes to the existing studies on the consumption of GBT and energy-saving measures in building given that eco-block is regarded as a green and energy-saving material as discussed previously. Most of the research on the factors influencing residents' green building consumption have employed some classical behavioural theories and innovation theories as illustrated in appendix table B. However, those research findings are varied in terms of different geographic locations, sampling, cross-sectional analysis and diverse conclusions It is utmost important to conduct a systematic review of the current studies to grasp its research status and unveil the research gaps.

In the building sector, previous review studies were conducted on the adoption of GBT by different stakeholders (building designers, contractors, consultants, suppliers of green construction products), yet, no review study was undertaken primarily on the adoption of GBT from a consumer perspective, except for three reviews as illustrated in Table 1. This review paper extremely differs from the previous reviews in terms of different approaches, literature searches, conceptual frameworks and influential determinants. Notably, those reviews have concentrated on the general energy consumption behaviour in the residential green building instead, this study specifically focuses on the use of eco-block

Table 1
Review on household energy consumption.

Author	Title	Main contribution
Kuhe and Bisu (2019)	Influence of situational factors on household's energy consumption behaviour Towards an effective energy policy	A systematic review was performed to identify the situational factors influencing house owner's energy usage in developing countries
(Ding, 2018)	Factors affecting low-carbon consumption behaviour of urban residents: A comprehensive review	A review of the theoretical foundation was undertaken. The variables are categorised into demographic elements, psychological determinants, family factors and situational parameters.
Huijts et al. (2012)	Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework	A comprehensive acceptance framework was built on the basis of a review on psychological models and technology acceptance studies.

technology.

3. The systematic literature search methodology

In this paper, a systematic literature search procedure was employed to address the research topic, research gaps and to seek answers to the research questions. This systematic search approach helps researchers to examine research findings in an unbiased manner by gathering literature sources from reputed research databases while ensuring the objectivity of the research (Govindan et al., 2021). The systematic article searches and selection had enabled the identification of several factors that could certainly motivate or hinder consumers' intention to adopt eco-block.

In this paper, the authors seek to unveil the contextual factors, psychological factors, and demographic factors impacting residents' decision to adopt eco-block as green building technology.

The selection criteria of the search strategy are outlined as follows:

1. Papers focusing on the general green/ecological product consumption behaviours were not directly considered because the study is primarily centred on green building product consumption with a focus on eco-block technology. Even though, some valuable papers from the general field of consumer behaviour were solicited to reinforce the analysis, despite they were not included in the article selection.
2. Papers dealing with other specific types of ecological/green/energy-efficient products, including the consumption of (eco-cars, eco-bags, ecological furniture, green electronics, green fashion, green cosmetics) were not retained in the literature.
3. Articles discussing on the factors influencing the resident's energy consumption behaviours in building were supplemented in the research, given that the eco-block technology is an energy-efficient product due to its capability to reduce the high energy consumption from air-conditioning use.
4. Only published articles in green building consumption from residents' perspectives which explicitly investigated, analysed and explored the factors such as contextual factors, psychological variables, demographic/personal factors, consumer behaviour in green building, intention to adopt green/energy-efficient building products, the consumer decision-making process in the building sector were selected.
5. Unpublished articles, textbooks, conference papers, dissertations (masters, doctoral, textbooks) were exclusively omitted from this review to raise the reliability of the study.
6. Owing to the limited research articles in the field of green consumption in the building sector, 45 peer-reviewed articles identified through the search strategy were considered. Most of the papers emanate during the last 10 decades from the year (y) [2010–2020]. The recently published articles have reached the highest peak during 2018 as shown in the chart Fig. 1.

Notably, the systematic search methodology is based on a work procedure from (Govindan et al., 2021) with some adaptations. The selection process of articles is depicted in Table 2.

In the first stage, useful papers were spotted through a methodical search procedure by exploring keywords in the Scopus database to find out useful literature. The keywords typed for selecting the papers during the article identification phase are: "Adoption of green/energy-efficient building technologies from a resident perspective", "green consumption/consumerism in buildings", "consumer behaviour in green buildings", "Household behavioural intention in green dwelling", Willingness to pay for green housing, "Willingness to pay for energy-saving measures in residential buildings". This step resulted in a total of 105 peer-reviewed articles.

In the second stage, articles were screened to retain only those articles that primarily discuss the factors affecting residents' behavioural intention in the building sector'. The search strings used for the screening purpose include: "factors affecting adoption of insulated concrete block/eco-block", "psychological factors in green building", "demographic factors in green building", "contextual factors in green building", "household intention to purchase sustainable housing", "household renewable energy usage intention", "individual energy-saving intention at home", "household intention to adopt energy-saving measures at home", "residents intention to purchase green dwelling", "adoption of energy retrofit investment by homeowners", "adoption of individual energy-efficient home", "residential energy-efficient technology adoption", "factors for purchasing energy-efficient household products", "factors affecting the adoption of smart home technologies" and "consumer purchase intention of green housing". This step resulted in 62 articles.

In the third stage, the articles were then filtered to remove extraneous and similar papers. An abstract analysis was then performed and 51 articles were shortlisted. Eventually in the last stage, after examining the abstract and removing common papers, 45 selected papers were finally assembled for full paper analysis which is clearly in line with the research topic, related to any of the research questions and focus on the factors affecting resident's intention to use/adopt eco-block as GBT. A detailed description of the selected papers for analysis is outlined in Appendix table B.

4. Content analysis

The content analysis is a technique that was adapted to gather and synthesise ideas and information of diverse published articles in a systematic manner to obtain constructive insights and generate future research prospects (Govindan et al., 2021).

In this review paper, the contents of the useful articles have been examined taking into consideration the contextual factors, psychological factors and demographic factors that could potentially influence the adoption of eco-blocks from the human dimension. The same underlying parameters have been explored in subsequent sections before constructing the comprehensive adoption decision framework.

4.1. Resident purchase decision of the eco-block technology for building insulation

A review of past studies has enabled the identification of some key factors that could potentially impact the adoption of building insulation and eco-block technology. But those studies have failed to employ an adoption decision model as a vital method to provide more insights on the individual selection and decision-making process. This adoption decision framework is primarily based on the Diffusion of Innovations theory (DOI) (Rogers, 2003). The framework could generate feedback to

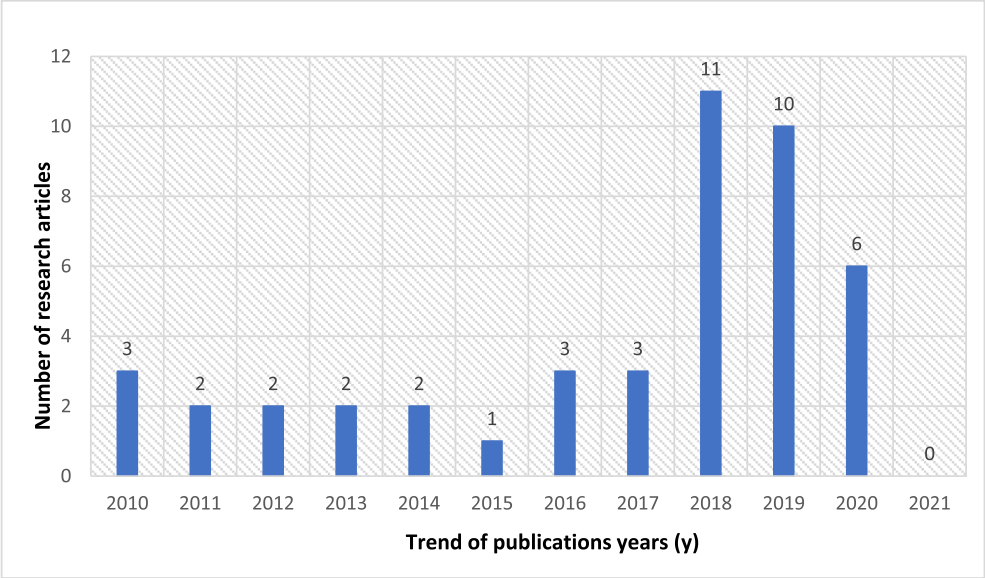


Fig. 1. Trend of research journal publications.

Table 2
Method for article selection.

Steps	Details	No. of articles
Step 1: Identification of useful articles through literature	Keywords used: Adoption of green/ energy-efficient building technologies from a resident perspective", "green consumption/consumerism in buildings", "consumer behaviour in green buildings", "Household behavioural intention in green dwelling", Willingness to pay for green housing, "Willingness to pay for energy-saving measures in residential buildings	105
Step 2: Screening	Articles screened to retain only those discussing the factors affecting individual behavioural intention in the green building sector Keywords used: factors affecting adoption of insulated concrete block/ eco-block, psychological factors in green building, demographic factors in green building, contextual factors in green building, household intention to purchase sustainable housing, household renewable energy usage intention, individual energy-saving intention at home, household intention to adopt energy-saving measures at home, residents intention to purchase green dwelling, adoption of energy retrofit investment by homeowners, adoption of an individual energy-efficient home, residential energy-efficient technology adoption, factors for purchasing energy-efficient household products, factors affecting the adoption of smart home technologies and consumer purchase intention of green housing	62
Step 3: Filtering	Removal of biased and similar papers	11
Step 4: Eligibility	Analysis of abstract	51
Step 5: Final collection of articles	Analysis of full papers	45

stakeholders about the possibility of residents' decision to adopt the eco-block technology, their attitudes, and the key determinants affecting their adoption behaviour (Nair et al., 2012). These types of feedback are essential for stakeholders such as manufacturers and suppliers of the new building technologies to develop effective communication strategies in order to raise the adoption rate of the insulation alternative.

Previous studies have focused on the adopter-centric model to investigate eco-innovation adoption in the building sector (Nair et al., 2010a, 2012). A potential adopter passes through several stages before deciding on whether to adopt the innovation (Rogers, 2003) as illustrated in Fig. 2. The initial stage of the innovation decision-making process is the need or requirement for an innovation such as in this case the need for building insulation (Rogers, 2003). During this stage, the need for a new building technology arises when there is a need for building envelope renovation or new building construction. The second stage is the searching and collection of information about building insulation. The third stage is the selection of a building envelope component and the fourth stage is reaching the choice decision. The post-purchase behaviour is the last stage, where adopters provide feedback from product usage and they may seek additional support from the adoption decision. External factors such as financial incentives (grants, loans, tax reduction) from the government, trust in eco-block suppliers, sales promotion or gross discounts offered by suppliers, may also impact residents' decisions to adopt the eco-block technology.

The main contribution of this paper is that the proposed adoption decision framework differs from the classical adoption centric approach in Fig. 2, which is extremely lacking in terms of examining the influential parameters on the adoption decision. The suggested adoption framework is more exhaustive in the sense that it groups the different categories of the influential factors to gain a thorough understanding of the different stages influencing the adoption of the eco-block technology to fill the literature gaps. The proposed adoption decision framework is comprehensive and it entails the role of contextual factors such as (building age, thermal comfort), demographic/personal factors (age, education, income), psychological factors (attitudes, knowledge, perceived benefits) along the stages and the influence of direct communication, mass media and government interventions, all underlying factors impacting on the decision to adopt eco-block by potential adopters (Nair et al., 2012).

A context analysis from the 45 selected papers in Appendix B has unveiled a list of psychological factors, contextual factors and demographic factors that could potentially influence the adoption of eco-

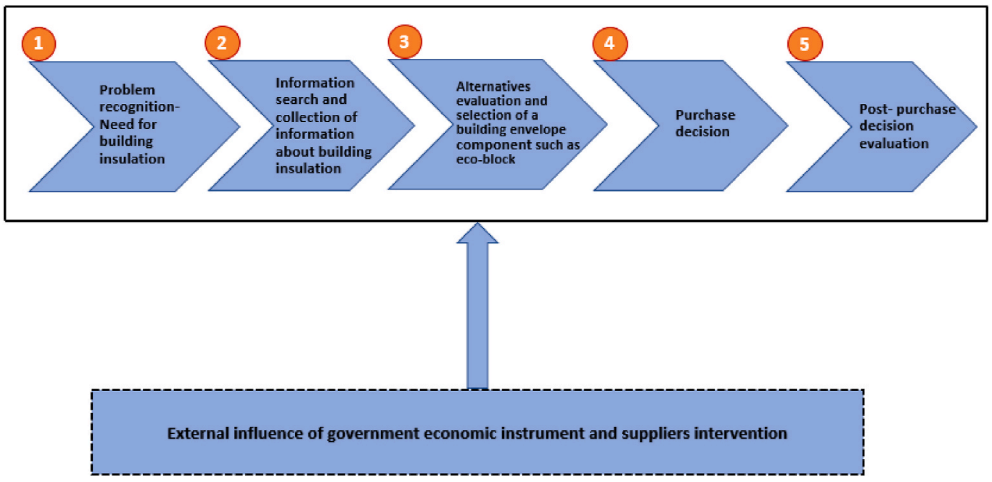


Fig. 2. -Representation of the different stages in the resident decision-making process.

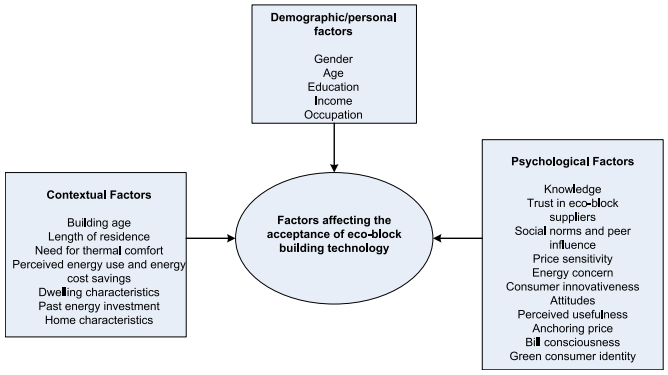


Fig. 3. Factors affecting the acceptance of eco-block for building technology.

block technology as illustrated in Fig. 3. The section below elaborates on the three categories of factors (contextual, psychological, personal) influence on the eco-block purchase decision, further to which the comprehensive adoption decision framework is then conceptualised.

4.2. The role of the contextual factors affecting the usage of GBTs and eco-block

Several contextual factors might influence resident intention to incline towards the eco-block building. These factors are specifically related to the context of the research setting such as building age, need for thermal comfort, past investment in residence, home characteristics, which are elaborated in the sub-sections. Table 3 summarises the importance of the contextual factors in the context of eco-block usage intention.

4.2.1. Building age/age of house

Building age could largely impact the decision to adopt the building insulation and green building envelope. Households residing in old houses (e.g. building age >25) are more likely to accept wall energy efficient measures as their current home may be in a poor physical and aesthetical condition, needing the renovation or placement of a new building envelope (Achtnicht and Madlener, 2014a). For instance, in developing countries such as Mauritius, most houses were constructed during the 1960s, before the establishment of the building code in 2012 that emphasise building energy efficiency. These ancient houses were built with low energy efficiency standards. The age of the house and poor building conditions might lead to renovation and probably the acceptance of new building techniques such as eco-block technology in emerging countries.

4.2.2. Need for thermal comfort

The need for higher thermal comfort could motivate the adoption of building envelope investment measures (Roy, 2007). People feeling cold/hot air ingress in existing buildings are more susceptible to adopting energy-efficient building envelopes (Nair and Mahapatra, 2010b). A need for thermal comfort may generate a willingness to reduce energy use from space cooling. The aim to reduce residential energy costs could further impact residents' selection of energy efficiency and insulation measures. People having a high perception of their energy consumption may adopt energy-efficient measures to reduce their energy usage (Kaveh, 2018). For instance, Nair et al. (2010a) reported an association between the level of importance to reduce energy use and household intention to use energy-efficient building envelopes.

4.2.3. Past investments in residence

Previous investment in energy-efficient enhancements in dwellings might raise residents' assurance in adopting those measures in the long term. On the other side, previous investments could obstruct the ultimate adoption owing to financial restrictions. Residents may think that they have already invested significantly in building energy activities and this new insulation measure for building envelope renovation requires further high investment (Nair, Gustavsson and Mahapatra, 2010a).

4.2.4. Home characteristics

The home characteristics could have a major impact on the decision to adopt an energy-efficient building envelope (Baldini et al., 2018). For instance, extended families with a large number of households may prefer to move to a new house. Moreover, young couples usually prefer to move to their new housing after marriage. Larger households and the young generation, are prospective homebuyers, and they might be more susceptible to adopt the new and efficient building technologies when deciding to construct their home.

4.3. The role of psychological factors affecting the usage of GBTs and eco-block

Past studies have modified the original theoretical models such as the TAM and TPB by incorporating additional psychological factors to raise the explanatory power of the model. In this context, it is vital to explore deeper into the psychological factors for uncovering the potential drivers and barriers impacting the eco-block purchase intention. A full list of potential ten (10) psychological determinants unveiled from the literature review is elucidated in the subsequent heading. Table 4 summarises the key findings of the psychological variables affecting the

Table 3
Findings of the contextual factors in relevance to the eco-block purchase decision.

Contextual factors	Findings in general	Expected findings based on eco-block
Building age	- Empirical findings revealed that most households wait until their building structures to attain the end of their building life cycle, before seeking possibilities for new construction, replacement or renovation (Achtnicht and Madlener, 2014a) - According to Nair et al. (2010a), about 80% of the household had no such intention to purchase a new building envelope for the next 10 y. This is because households were quite satisfied with their building performance and its year (y) of construction - Households residing in old houses (e.g. building age >25) are more likely to accept building insulation as their current home may be in poor thermal condition (Achtnicht and Madlener, 2014a). - The age of the house and poor building condition might lead to renovation and probably new building construction.	Based on findings, ancient homes may lead to the construction/ renovation of new building technology in the future. As such, the eco-block technology can provide adequate thermal comfort needs in new building construction as opposed to the conventional block in developing countries. For instance, the empirical study performed by (UBP, 2015) in Mauritius, has affirmed that eco-block is three times more efficient than conventional block mainly in terms of its sound and thermal insulation properties.
Need for thermal comfort inside the building	- Hu et al. (2016) emphasise that thermal comfort in green buildings leads to enhanced indoor air quality and improved health status. - People feeling hot air ingress in existing buildings are more inclined to adopt building insulation (Nair and Mahapatra, 2010b). - A need for thermal comfort may create a willingness to decrease energy use and energy costs from space cooling. - Nair et al. (2010a) reported a relationship between the level of significance to reduce energy use and household intention to use building insulation - Kaveh (2018) reported that homeowners are mostly concerned to improve home comfort and reduce energy bills	In line with research studies, the eco-block is a highly energy-efficient material that can help to reduce the reliance on air-conditioning usage and its associated costs while maintaining the ambient indoor temperature. An individual willingness to reduce residential energy costs could further impact residents' selection of eco-block building
Past energy investments in building	- Previous investment in energy-efficient enhancements in dwellings might raise residents' assurance in adopting those measures in future. - Past investments could obstruct the ultimate adoption owing to financial restrictions and in other cases, residents may think that they have already invested significantly in building energy activities (Nair, Gustavsson and Mahapatra, 2010a) - Prior investments can generate barriers for promoting the acceptance of energy-efficient technologies (Kaveh, 2018). For instance, if a person has invested significantly in high energy investment in the past (such as wall insulation technology) and the latter has not yet reaped the benefits in terms of the payback period. This negative feedback might in turn discourage other prospective buyers from the adoption of such technology in the future.	Based on research facts, past investments in green building technologies might obstruct the adoption of eco-block buildings. This new building envelope measure requires further high investment upon renovation, leading to a barrier in technology adoption.
Home characteristics	The findings of (Baldini et al., 2018) inferred that the number of members in a household has a significant influence on the choice of energy-efficient products. - In developing countries, extended families with a large number of households may prefer to move to a new house. - Young couples usually prefer to move to their new housing after marriage and they are more converge to embrace energy-efficient building technologies. - Home characteristics could represent a barrier to the acceptance of high energy investment measures. This is due to different opinions between spouses and lack of concern from other family members, particularly children and the elderly households (Pelenur and Cruickshank, 2012).	Conferring to the findings, larger households and the young generation, are the potential buyers of eco-blocks when deciding to construct their home. But, the views of all family members (spouse, children) are equally important before embarking on a new housing project.

use of eco-blocks.

4.3.1. Attitude (ATT)

Attitude is regarded as a major psychological variable impacting an individual usage intention. According to Ajzen (1991), an attitude refers to "*the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question*". In other terms, Attitude is defined by Fazio (2007) as "*an interaction in memory between a particular subject and a summary evaluation of the subject*". An individual exhibits a favourable attitude when the consequences of using the product/or adopting a certain measure are assessed positively and inspiring the latter to involve in that particular behaviour (Cheng et al., 2006). In the field of energy conservation behaviours in building, Ru et al. (2018) and Jabeen (2019) emphasise that if a person believes that an energy-saving product is favourable/beneficial in terms of reduction of carbon emissions to ensure environmental protection, the latter is more likely to sustain a positive attitude and form an energy-saving behaviour. The research findings of Judge et al. (2019) concluded that most homeowners have positive attitudes towards sustainable housing.

4.3.2. Perceived usefulness (PU)

Perceived usefulness (PU) is one of the main psychological variables in the TAM model. Following Davis (1989), PU is "*the degree to which a person believes that using a particular system would enhance his or her job performance*". Despite, PU was initially defined in relation to job performance; this term is often related to a personal subjective assessment of a particular technology. PU can be interpreted as the benefit of a new technology that has an optimistic impact on the user's attitude and behavioural intention. Most recently, Vahdat (2020) defined PU as "*the extent to which target customers believe that using a specific technology will generate significant value for them*". In the residential building context, PU was confirmed to have a positive impact on the purchase intention of GBTs (Liu et al., 2018; Rajaee and Malekmohammadi, 2019), smart home adoption (Shin et al., 2018; Schill, 2019) and renewable energy usage (Alam, 2014). Extending in relation to eco-block usage, PU is regarded as the users' discernments of the effectiveness in using eco-block for building insulation to ensure energy management, environmental protection, improving occupants indoor comfort level and future energy cost savings.

Table 4
Findings of the psychological factors in relevance to the eco-block purchase decision.

Psychological variables	Findings in general	Expected findings based on eco-block
Attitudes (ATT)	-The study of Liu et al., (2018) affirmed that attitude positiSlista vely influenced the adoption intention towards GBTs. -The research findings of Judge et al. (2019) deduced Slista that most homeowners have positive attitudes Slista towards sustainable housing. -Jabeen (2019) and Prete (2017) reported Slista that attitudes have a strong influence on household energy conservation behaviours. -Zhang et al. (2019) suggested that individual attitudes have a substantial effect on WTP for the Slista green and energy-efficient roof, - The findings of Zhang et al. (2020) portrayed that consumers' attitude toward buying energy-efficient products strongly influence WTP a price premium - Other findings confirmed the positive effects of attitude on the adoption of energy-saving products, (Akroush, 2019) and green and sustainable home (Tan and Goh, 2018)	Based on most of the research findings, it can be deduced that a positive attitude towards eco-block, could certainly influence the usage of the product.
Perceived usefulness (PU)	- PU is a strong psychological factor for developing positive attitudes towards new technology, predicting consumer usage intention and leading to actual technological product use by an individual Davis (1989). - PU has a strong influence on the acceptance of GBTs (Rajaee and Malekmohammadi, 2019), smart home adoption (Schill, 2019), smart meter acceptance (Chen et al., 2017), renewable energy usage (Alam, 2014), energy-efficient products (Akroush, 2019), purchase of green dwellings (Tan and Goh, 2018) as well as willingness to pay a cost premium for green building (Ofek & Portnov, 2020).	In the eco-block context, PU is regarded as the users' awareness of the benefits of using eco-block for building insulation to improve occupants indoor comfort level and to ensure future energy cost savings from heating and cooling appliances while at the same time ensuring energy conservation and environmental protection.
Perceived ease of use (PEOU)	Research demonstrates that PEOU is the main variable for forecasting technology acceptance (Amin et al., 2014). - Rajaee and Malekmohammadi (2019) concluded that PEOU has a considerable effect on attitude and perceived usefulness. - PEOU was confirmed to significantly influence the attitudes towards smart home adoption (Shin et al., 2018) and small-scale green energy usage (Alam, 2014).	Based on research findings, PEOU could significantly affect the usage of eco-blocks through positive attitudes.
Perceived behavioural control (PBC)	Evidence indicates that PBC has a positive association with energy conservation behaviours such as green products consumption (Arli, 2018), reduction of household energy use (Abrahamse and Steg, 2011), purchase of green electricity products (Bamberg, 2003) and intention to accept solar water heaters (Chen et al., 2016). - PBC was positively corroborated with the adoption of smart home technologies (Perri et al., 2020) and green building retrofits (He, 2019). - Other findings revealed the positive association of PBC on the acceptance of green and energy-saving products at home (Sang, 2020; Zahan, 2020) - PBC has a negative association with energy-saving intention as reported by (Ru et al., 2018). - PBC confirmed no significant influence on green housing purchase decision (Lin Zhang et al., 2018)	In line with previous research, PBC is an essential determinant in this research because the adoption of an innovative construction material (eco-block) involves opportunities/resources (in terms of knowledge, costs and time) that are required to evaluate the outcome of product adoption, and the time factor is a necessity to ensure a change into green consumption habits in the building sector.
Subjective norms (SN)	- The findings of Judge et al. (2019) found that SN has a huge impact on eco-house purchase intention with the conclusion that housing purchases are reliant on the desires and needs of family members and the opinion of one's spouse. - SN had a major impact on WTP for green roof (Zhang et al., 2019) and the adoption decision of smart household technologies (Perri et al., 2020). - Social norm was negatively associated with energy-saving intention as reported by Ru et al. (2018). - SN has no impact on attitudes towards GBTs and adoption intention as a result of contrasting peer opinions (Ali, 2019; Zahan, 2020).	With reference to the studies, SN could have an important impact on the decision to utilise eco-block. From personal experiences, social agents such as (family, colleagues, business partners, friends and peers) may advise people to use the eco-block technology when the need arises. Conversely, a difference in peer perspectives could pose a barrier to the adoption of the product.
Subjective knowledge (SK)	- Consumers having sufficient knowledge and express familiarity with green building benefits are WTP about 10% of GB price premium as compared to those who are less familiar with the benefits are WTP 7% less (Ofek and Portnov, 2020). - Households are inclined to invest in green home projects as long as they are being provided with more credible information (Zhang, 2016). - Conferring to Achtnicht (2011), residents have a relatively low WTP for insulation choices. This might be due to limited knowledge on insulation measures, and psychological reasons - Limited knowledge on insulation measures represents a barrier to the acceptance of these measures, as long as, people are unaware of the trend of future energy prices, the CO_2 savings of emerging technologies, the payback period of these investments and their length of time in their current residence (Achtnicht, 2011)	SK about eco-block could positively impact consumers' attitudes towards the technology, the perceived value of the technology and their decision to adopt the new product. As such, limited knowledge about eco-block could hinder the acceptance of the product, where resident expresses no familiarity about the technology and its benefits, the associated energy cost-saving and the paybacks.

(*continued on next page*)

Table 4 (*continued*)

Psychological variables	Findings in general	Expected findings based on eco-block
	- The results of Liu et al., (2018) and Rajaee and Malekmohammadi (2019), reported the positive role of SK on the household's attitudes, perceived benefits and intention to adopt green building products. - The research of He et al., (2019) revealed that green retrofit cognition has a huge impact on homeowners' intention towards housing retrofits. - Ecological awareness is the major determinant influencing the elderly generation towards the purchase of green sheltered housing (Management, 2010)	
Trust in the responsible organisation (OT)/Trust in supplier of eco-block	Lack of trust in an organisation is considered the main obstacle to green and smart technology adoption (Darko and Chan, 2017). - Achtnicht and Madlener, (2014) concluded that expert energy assistance appears to be a favourable option to achieve trust and confidence for building insulation upon renovation. - Rajaee and Malekmohammadi (2019) affirm that social trust has a great impact on household perceived usefulness and the adoption intention of green housing. - As long as users establish their confidence in responsible organizations for green building and innovation, they appreciate the quality and develop a positive attitude towards the desired innovation (Liu et al., 2018).	With reference to research findings, it can be deduced that as long as individuals place their trust and confidence in the suppliers of eco-block, the chance of using the product increases in the presence of positive attitudes.
Energy concern (EC)	- Despite environmental concern has been commonly utilised as a general concept in investigating pro-environmental behaviours, energy concern (EC) is a more specific term in the assessment of energy-saving behavioural intention. - Previous research by Chen and Knight (2014) discovered that EC has a direct influence on attitudes towards energy conservation. - Chen et al. (2017) found a positive association between EC and energy-saving intention. - There is a powerful correlation between general environmental concern, attitudes and energy consumption (Kowalska-Pyzalska, 2018; Prete, 2017)	Based on the evidence, it is predicted that EC has a positive impact on the attitudes towards eco-block technology and its usage intentions.
Personal innovativeness (PI)	The findings of Nikou (2019) denote that smart home acceptance is influenced by personal innovativeness. - Chen (2014) claimed that consumer innovativeness has a positive impact on renewable energy system installation. - The results of Ali (2019) indicate that personal innovativeness has a significant impact on households' attitudes towards purchasing energy-saving products. - Alzubaidi et al. (2020) affirmed that consumers' intentions to adopt pro-environmental behaviours are affected by personal innovativeness.	Based on the research findings, it is proposed that a high level of personal innovativeness has a positive effect on the eco-block purchase decision.
Price sensitivity (PS)	- The research findings of Achtnicht and Madlener (2014) identified homeowners as sensitive to price and were reluctant towards building insulation due to the perception of a long payback period. - Judge et al. (2019) confirmed that if the payback period for green building is greater than two (2) y and though the paybacks are not significant, consumers had no intention and were less WTP a price premium for sustainable housing. - Rajaee and Malekmohammadi (2019) indicated that perceived cost has an undesirable influence on the usage of GBTs as well as the acceptance of smart home technology (Nikou, 2019) - The perceived price has a negative association with perceived benefits and consumers attitudes towards energy products (Akroush, 2019) - Jabeen (2019) found that consumers' willingness to purchase green power diminishes with a rise in cost. - The results of (Alam, 2014) confirmed that cost reduction has a huge effect on renewable energy usage intention.	With reference to these facts, high price sensitivity has an adverse association with the behavioural intention to use eco-block. - The finding of (UBP, 2015) showed that the amount invested on eco-block can be recovered within four (4) y based on the amount which would have been spent on air-conditioning. Some residents might find this payback to be significant and they may express their unwillingness to buy the product. - Highly price sensitive residents may be reluctant to pay a price premium of 50% more to buy an eco-block in comparison to the conventional one.

4.3.3. Perceived ease of use (PEOU)

Perceived ease of use (PEOU) is referred to as "*the extent to which an individual believes that using a product/process or system is free from effort*". Other studies defined PEOU as "*the degree to which a person believes that the technology is easy to use, install, implement, maintain and operate*" (Veríssimo, 2016). According to Venkatesh (2000), PEOU is directly affected by an individual attitude and experience. Research demonstrates that ease of use is the main factor for forecasting technology acceptance (Amin et al., 2014), such as the eco-block usage intention. In the residential building context, Rajaee and Malekmohammadi (2019) concluded that PEOU has a considerable impact on attitude and PU. In addition, PEOU was confirmed to significantly influence the attitudes towards smart home adoption (Shin et al., 2018) and small-scale green energy usage (Alam, 2014).

4.3.4. Perceived behavioural control (PBC)

Perceived Behavioural Control (PBC) is an essential psychological parameter within the TPB model and is designated as "*the perceived ease or difficulty of performing the behaviour in a specific situation*" (Ajzen, 1985, 1991). A particular behaviour possibly arises when a person has both the motivation and ability to execute that behaviour (Zuo and Zhao, 2014). Many researchers have deduced that confidence in the capability of the human to control their behaviour exhibits a direct influence on usage intention (White et al., 2007). When a person holds a low control over performing a specific behaviour because of limited resources (such as knowledge, costs and time), it is anticipated that the intention to incline towards that behaviour is lower and despite there might be optimistic attitudes and social pressure regarding the behaviour (Zuo and Zhao, 2014). PBC is regarded as a vital variable in this

research because the adoption of an innovative construction material (eco-block) involves opportunities/resources (such as knowledge, costs and time) that are required to evaluate the outcome of product adoption. The time factor is also a necessity to ensure a change into green consumption habits in the building sector.

4.3.5. Subjective norm/social norm (SN)

The Subjective norm (SN) as described by Ajzen (1991), is "*the perceived social pressure to perform or not to perform a particular behaviour*". In addition, SN is defined as the process by which other members of the community influence a person's opinion and perceptions as a consequence of direct communication (Choi, 2014). Research revealed that social agents such as close associates (family, colleagues, friends and peers) may be regarded as a reference point for observational learning, and further regarded as a guide and advisor on ecological products usage (Choi, 2014). Evidence shows that if individuals recognise that important referents believe that he/she needs to conserve energy in routine life, or important referents perform energy-saving behaviour as role models, the latter will perceive pressures and incline to save energy. In other words, the stronger the social influence, the more the individual is inclined to engage in that behaviour. Social norm perceptions (perceptions that others are involved in and believe others to involve in a certain behaviour) have a positive correlation with pro-environment or energy behaviours (Jabeen, 2019; Prete, 2017).

4.3.6. Subjective/product knowledge (SK)

Knowledge/awareness plays a fundamental role in the behavioural research context. An individual's knowledge about a certain product or subject considerably influences his/her purchasing decisions on the actual behaviour of the product or subject. Product awareness implies the ability to gather product information in real-time while simultaneously gaining sufficient knowledge on the product benefits. A person's knowledge entails any data that stays in a person's mind that eventually influences the latter purchase intention (Joshi and Rahman, 2015a). Information that controls purchasing decisions involves particulars about the product attributes, economic advantages as well as health and environmental benefits. The findings of Portnov (2018) pointed out that limited awareness is the main obstacle impacting the intention to accept green building and this information gap creates a low acceptance of new technological products. It is argued that the amount of information on ecological concerns, green products, energy-saving products and energy conservation might not be discerned effectively among less educated people (Lopes, 2019). Households might consider purchasing green housing when provided with more reliable and concrete information (Zhang, 2016).

4.3.7. Trust in responsible organisation/trust in eco-block suppliers (TO)

Trust is an essential concept that has gained momentum in the field of social science research. Ganesan (1994) defined trust as '*a belief, a sentiment, or expectation about another party from the party's expertise, reliability, and intentionality*''. Individuals usually utilise trust as a risk reduction strategy for high investment products which are yet to be established on a larger scale (Liu et al., 2018); such as in the eco-block context. Having trust in organizations endorsing green building products can lessen the complexity, decrease the uncertainty and perceived risks in the usage intention (Liu et al., 2018). It can generate a feeling of safety to incline towards ecological products since consumers normally do not trust the eco-products characteristics and they are not confident that the utilization of these products can lead to pro-environmental or personal gains (C. fei Chen et al., 2017). At the initial adoption stage, when the uncertainty level is high, the concept of trust plays a pivotal role in the adoption decision.

4.3.8. Energy concern for the environment (EC)

Environmental concern is another psychological variable mostly utilised in the field of green consumer behaviour. Scholars have generally concluded a positive association between environmental concern and environment-friendly behaviours (Kim and Han, 2010; Mohd Suki, 2016). With regards to energy-efficient technology, people with greater environmental concern are more susceptible to incline towards residential energy-efficient technologies and perform energy conservation behaviours (Urban and Ščasný, 2012).

Environmental concern has been mostly acknowledged as a general concept consisting of a series of broad environmental attitudes and environmental consequences (Fujii, 2006). The environmental concerns comprise the attitudes towards land, air and water pollution, which are studied to comprehend the impact on general environmental behaviours (Chen and Knight, 2014). The current study focuses on using eco-block as an energy-saving product; as such, the current study claims that energy concern needs to be investigated distinctly from the overall environmental concern. Energy concern is likely to be more specific in predicting eco-block usage intention than the general environmental concern. Previous research by Chen and Knight (2014) discovered that energy concern has a direct influence on attitudes towards energy conservation.

4.3.9. Personal innovativeness (PI)

Personal or consumer innovativeness originates from the DOI Theory (Rogers, 2003). Consumer innovativeness is defined as the "*degree to which an individual is relatively earlier to adopt an innovation than other members of his social system*" Rogers and Shoemaker (1971). As proposed by Bowden and Corkindale (2005), innovative consumers are curious, they like to seek novelty and are venturesome to experience new systems/products instead of relying on previous choices and the same consumption patterns. According to Rogers (2003), a technology that is perceived as new by the customer is regarded as an innovative technology. In a developing country such as Mauritius, eco-block is an innovative product since a relatively small group of households have adopted the insulated concrete block for building construction. So, in case an individual intends to use eco-block or insulation to improve the performance of their building envelope, they could barely rely on close acquaintances (such as family, friends) that have experiences and could provide them information and feedback on using the product. Individuals must seek relevant information from internet sources and experts to make decisions independently in the new product adoption decision process. Notably, the impact of innovativeness on the adoption of GBTs has received little attention in the literature.

4.3.10. Price sensitivity (PS)

Research studies reported that high product prices act as a major barrier to purchasing ecological products (Joshi and Rahman, 2015). Price sensitivity is defined as "*the extent of consciousness and reaction displayed by consumers when finding differences in prices of products or services*" (Monroe, 1973). In other words, price sensitivity is defined as the degree to which the price of a product largely affects a person's decision to purchase that product (Hsu et al., 2017). One of the main barriers to consumers' adoption of green products remains the high acquisition costs at unaffordable market prices. Companies commonly charge a price premium for high investment ecological products. On the other hand, consumers are normally sensitive towards price and they are most inclined to purchase ecological products at low prices (Eze and Ndubisi, 2013). Price sensitivity is often associated with the long-term product's value-added gains such as savings gains from building insulation (Achtnicht and Madlener, 2014b). According to Li et al. (2018), the government subsidy incentive is imperative to secure residents, expressing more price sensitivity towards purchasing sustainable housing. Numerous researchers have examined the negative relationship between price/cost and user perceptions and evaluation as illustrated in Table 4.

4.4. The role of demographic factors affecting the usage of GBTs and eco-block

Demographic/personal variables may potentially influence the residents' decision-making process pertaining to eco-block technology use. Demographic factors may be important to analyse the environmental knowledge and individual attitudes and ultimately aid in the market segmentation of potential adopters (Nair and Mahapatra, 2010b). Table 5 illustrates the role of the demographic variables in the decision to adopt the eco-block technology.

4.4.1. Gender of household

Gender has a significant influence on energy conservation and environmental behaviour. A review was performed by (Zelezny et al., 2000), which uses a total of 13 studies, revealed that in about 70% of the researches, females were found to adopt environmental behaviour and perform more ecologically in their purchase decision in comparison to males. Contrarily, some studies reported no association between gender and respondents green and energy efficiency behaviour (Chen and Chai, 2010; Sardianou, 2007). Based on the studies, this study suggests that gender could influence the residents' decision to adopt the eco-block technology.

4.4.2. Household age

Household' age has a major influence on energy efficiency behaviour. The study investigated by Torgler et al. (2011) on a group of 33 Western European countries, reported an adverse association between a higher age group and environmental concern. Conferring to Lindén et al. (2006), the younger generation has adequate awareness about energy-efficient measures in a building than the elder generation. Conversely, older households are less susceptible to accept energy-efficient operations (Mahapatra and Gustavsson, 2008a). Similarly, Christian Michelsen & Madlener (2012) revealed that the possibility of opting for innovative technology is rather low amongst the aged households. This is due to the high perceived uncertainty and doubts on whether the initial investment would be recovered back during their length of residence. In surplus, older age groups are less concerned about technology adoption, energy conservation action and cognisance about energy renovation (Mills and Schleich, 2012). The study of Long (1993) affirmed that elderly (those >65 y) residents achieved considerable investments in energy-saving measures. According to Barr et al. (2005) residents with an average age of 55 y were more prone to perform high energy investment measures than the corresponding younger age groups. Based on the findings, age could have a considerable effect on the adoption of eco-block technology.

4.4.3. Household education level

A person's educational level may influence the adoption behaviour. Evidence indicates that level of education has a great impact on the selection of building energy efficiency (Chekima, 2016). From a survey of 5000 households across 10 EU countries, Mills and Schleich (2012) reported that greater education levels are correlated with new technology adoption and energy conservation behaviour. A similar study by Achtnicht and Madlener (2014a) on building technology, affirmed that households with higher education and those with environmental knowledge about global warming and climate change are prone to opt for the insulation idea. The association between education and energy-saving intention may also vary across countries due to differences in educational structures within a country (Mills and Schleich, 2012). Based on findings, higher educational level has a positive impact on the decision to adopt the eco-block as an energy-efficient building envelope.

4.4.4. Household income

Income is regarded as a key variable in the adoption of high investment building insulation. High-income group consumers are more capable to pay for high price premium investment measures due to strong purchasing power (Achtnicht and Madlener, 2014b). On the other side, the low-income groups could barely afford those ecological measures because of huge capital investments such as the procurement of the building insulation. On the contrary, Barr et al. (2005) indicated no association between income and energy investment behaviour. Based on the facts, income has a significant impact on the decision to adopt eco-block building technology.

5. The adoption decision framework and discussions

As discussed above, a comprehensive adoption decision framework is proposed in Fig. 4. From the content analysis, it is observed that research in the area of green building consumption is still exploratory, further investigations in terms of designing conceptual frameworks are required to elucidate the significance of the influencing factors. The paper attempts to bridge the literature gap by developing a comprehensive framework that has not previously been explored, and the uniqueness of the model forms the main contribution to the literature on the adoption of GBTs. This framework was designed in the context of eco-block purchase intention and the same framework can be used as a point of reference in the study of other types of GBTs.

In the adoption framework, the influential factors are composed of a set of psychological factors while some of them such as (consumer innovativeness, energy concern, trust in eco-block suppliers and price sensitivity) have received little attention in the literature. The psychological factors are combined with contextual and demographic factors to form an original comprehensive adoption framework which has effectively helped to address the research questions in sections (5.1–5.4). The adoption decision model is indeed useful for various stakeholders to gain a comprehensive insight into the various factors affecting eco-block acceptance and to understand the different stages involved in the resident decision-making process. The framework could eventually generate feedback to stakeholders in the view to develop effective communication strategies to raise the adoption rate of the insulation alternative in the different market segments.

5.1. R1: what are the contextual factors impacting residents' decision to adopt the eco-block technology for building insulation?

To answer the first research question, the contextual factors were identified through the literature search as depicted in Table 3. The literature highlights the importance of contextual factors on residents' choice of building insulation. Evidence shows that building age could significantly influence the adoption of eco-block as a new construction technique. Residents are more inclined to adopt the insulation technology due to the low energy efficiency of conventional houses and the poor house condition, demanding sustainable walls when constructing and renovating their houses (Nair and Mahapatra, 2010b). In tropical countries, the hot indoor temperature leads to a range of heat-related symptoms like thirst, fatigue, weakness, dehydration through sweating, salt imbalance, fainting or decrease mental ability and death in severe cases (Latha et al., 2015). In addition, thermal discomfort causes decrements in vigilance, short-term memory, visual tracking, low response time and auditory discrimination (Latha et al., 2015). In this aspect, the need for greater thermal comfort in buildings to counteract the effect of the heat-related symptoms could further trigger the occupant adoption of the eco-block investment measures to enhance the indoor air quality and improve health status (Hu et al., 2016). As reported by Nair and Mahapatra (2010b) residents having a high perception of their energy cost associated with the cooling and heating appliances, are more likely to adopt the building envelope strategies such as the eco-block product to diminish the energy usage and energy cost. Literature shows that past investment in energy efficiency improvements in the dwellings could raise residents' trust in further adopting building sustainability. Previous investments could also

Table 5
Findings of the demographic factors in relevance to the eco-block purchase decision.

Demographic factors	Findings in general	Expected findings based on eco-block
Gender of household	- A review was performed by Zelezny et al. (2000), which revealed that most women were found to adopt environmental behaviour and behave sustainably in their purchase judgement as compared to men. - Conferring to Pelenur & Cruickshank (2012), there is a strong association between gender and decision to incline towards energy-efficient technologies - A few research demonstrated no correlation between gender and green consumption behaviour (T. Chen and Chai, 2010; Sardianou, 2007).	The current study suggests that gender could significantly influence the residents' decision to adopt the eco-block technology
Household age	- According to Ameli and Brandt (2015) investments in energy-efficient windows and wall insulation largely depend on the different age groups - Older households are less susceptible to accept energy-efficient operations (Baldini et al., 2018). This is due to the high perceived uncertainty and doubts on whether the initial investment would be recovered back during their length of residence. - Elder age groups are less concerned about the adoption of new technology, energy conservation behaviours and cognisance about energy renovation (Mills and Schleich, 2012). - Perceived image of energy investment measures vary across the older and younger members in households. The older generation primarily links an image with individual benefits and practical (performance). The younger generation associates image with a collective benefit (sustainability) (Rizzo, 2018).	Based on the research findings, residents' age could have a considerable effect on the decision to incline towards the eco-block technology. The younger generation is more likely to adopt the eco-block technology due to their longer period of building occupancy.
Household educational level	- From the survey of 5000 residents across 10 EU countries, Mills & Schleich (2012) reported that top education levels are correlated with new technological product adoption and energy conservation behaviour. - The study by Achtnicht and Madlener (2014a) on building technology, affirmed that homeowners with a top-level of education and those with environmental knowledge about global warming are prone to select the insulation idea. - People with a higher level of education are mostly inclined towards energy-efficient technologies (Baldini et al., 2018) and eco-friendly homes (Hong, 2013)	In light of research findings, a greater level of education has an optimistic impact on the household decision to adopt the eco-block as an energy-efficient building technology
Household income	- High-income group consumers are more capable to pay for high price premium investments due to their strong purchasing power (Achtnicht and Madlener, 2014b). - Low-income groups cannot afford investment measures due to their financial constraints. Income has a low impact on the acceptance of EE appliances (Baldini et al., 2018). - High-income households have the ability to invest in energy technologies (Ameli and Brandt, 2015) and ecological dwellings (Hong, 2013) rather than low-income households and renters.	Based on the facts, high income has a significant influence on the decision to adopt the eco-block technology. High-income households are more capable to purchase the eco-block technology.

discourage further adoption of the eco-block technology due to financial constraints, or probably some households have reserved their savings for other specific projects or have perceived a low actual payback than expected from past energy-intensive investments (Kaveh, 2018). Ultimately, the home characteristics could have a major impact on the decision to adopt the eco-block building. For instance, in developing countries such as Mauritius, extended families with a large number of households and young couples may prefer to select the eco-block technology in comparison to conventional blocks when constructing their new residence to promote green building and sustainability.

5.2. R2: what are the demographic factors impacting residents' decision to adopt the eco-block technology for building insulation?

Studies revealed that residents' adoption behaviour can be characterised by personal/demographic factors such as gender, age, education and income. A review by Zelezny et al. (2000), concluded that in 70% of 13 studies, females were found to engage in ecological behaviour as compared to males. Conferring to Pelenur and Cruickshank (2012), there is a strong association between gender and the decision to incline towards energy-efficient technologies. In contrast, Chen and Chai (2010) confirmed no correlation between gender and energy conservation intention. The literature also indicates that investments in energy-efficient technologies and wall insulation largely depend on the different age groups (Ameli and Brandt, 2015). The elder generation is less susceptible to invest in building energy efficiency (Mahapatra and Gustavsson, 2008a). This is due to their perceived uncertainty and risk in terms of the payback period, moreover, they are less concerned about the energy situation, and they have low knowledge about building energy efficiency such as wall insulation (Mills and Schleich, 2012). Empirical studies reveal that a higher level of education strongly impacts the acceptance of green measures as reported in the study of (Mills and Schleich, 2012) from a dataset of 5000 households. People with a higher level of education are mostly inclined towards GBTs (Baldini et al., 2018) and eco-friendly homes (Hong, 2013). Eventually, the majority of studies reported that high-income group consumers are more capable to pay for high price premium investment measures due to strong purchasing power in comparison to the low-income households and renters (Achtnicht and Madlener, 2014b; Ameli and Brandt, 2015). On the basis of the above findings, demographic factors play a significant role in the residents' decision to adopt the eco-block building technology.

5.3. R3: what are the psychological factors impacting residents' decision to adopt the eco-block technology for building insulation?

As reported in the literature, researchers have focused on a set of psychological factors to extend theoretical models to statistically represent powerful models in explaining consumers' intended behaviours in the building sector. From the content analysis, it is found that green building experts and researchers have failed to probe further into

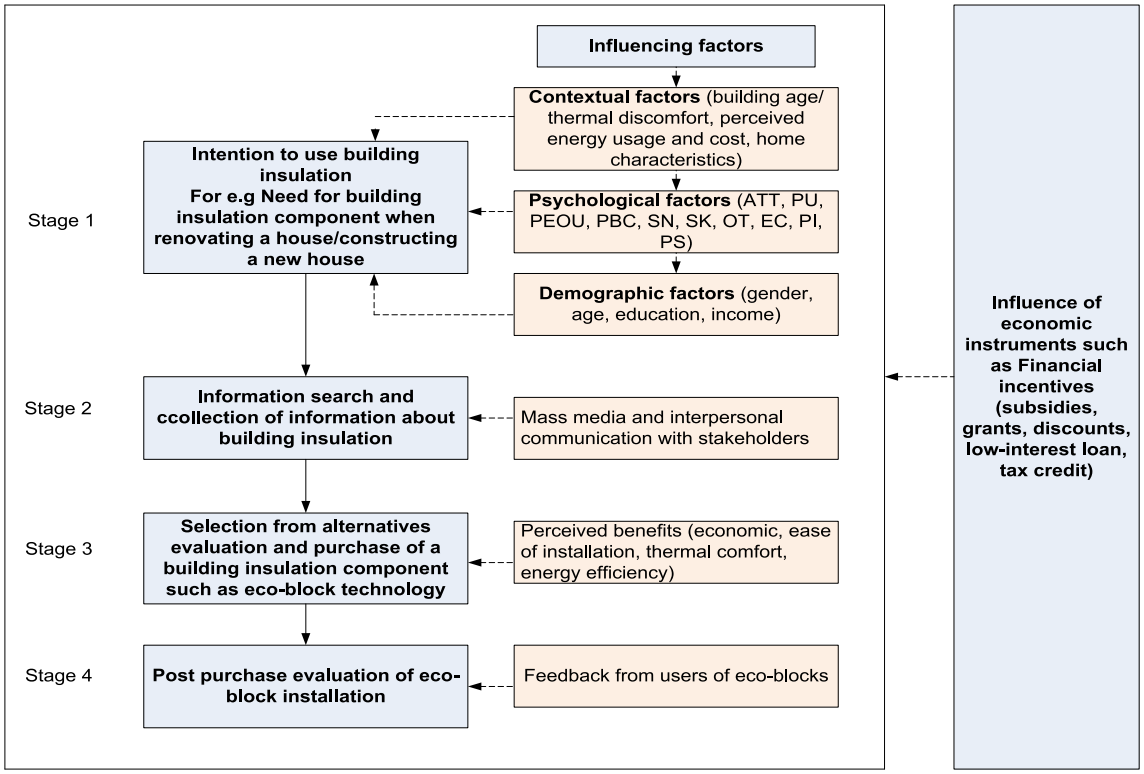


Fig. 4. -The comprehensive adoption decision framework (Author's construct).

potential psychological variables such as (personal/consumer innovativeness, energy concern, organisational trust and price sensitivity). Table 4 summarises the findings of previous studies in relation to the psychological factors influencing the usage of GBTs with a focus on eco-block technology, which is further discussed below.

Attitude is one of the main psychological variables impacting users purchase intention. Attitudes towards a behaviour have a significant impact on behavioural intention (Ajzen, 1991). For instance, if individuals have positive attitudes towards eco-block technology, they are inclined to accept the technology. On the other side, negative attitudes are more prone to discourage product adoption. The study of Liu et al., (2018) affirmed that attitude positively influenced the adoption intention towards ecological building technologies. In addition, Wang (2019) reported that attitudes towards energy-saving products have a substantial effect on a person purchase intention. The findings of Zhang et al. (2020) portrayed that consumers' attitudes toward buying energy-efficient products strongly influence WTP a price premium. In general, positive attitudes could positively impact the eco-block adoption intention.

Perceived usefulness (PU) is considered a major psychological variable affecting usage intention. Based on past reviews, some studies have employed this parameter to assess green building consumption (Liu, 2019; Rajaee and Malekmohammadi, 2019). The literature reported that PU has a strong influence on the attitudes towards technological and ecological products, leading to the intention to adopt the eco-block building (Rajaee and Malekmohammadi, 2019). PU has a positive influence on the purchase decision of GBTs (Liu et al., 2018), smart home adoption (Schill, 2019), energy-efficient products (Akroush, 2019), purchase of green dwellings (Tan and Goh, 2018) as well as willingness to pay a cost premium for green building (Ofek & Portnov, 2020). Based on the research findings, it could be deduced that PU could positively influence the adoption of the eco-block technology.

Another psychological variable identified is the Perceived ease of use (PEOU) and this factor is correlated with people's previous experiences (Sun et al., 2010). Research results portray that PEOU has an indirect effect on the adoption decision through perceived usefulness and attitudes towards behavioural intention (Rajaee and Malekmohammadi, 2019). PEOU was confirmed to significantly influence the attitudes towards smart home adoption (Shin et al., 2018) and small-scale green energy usage (Alam, 2014). With reference to empirical studies, PEOU impacts directly the attitudes towards using the eco-block technology.

Subjective/social norm (SN) is another potential variable, having a considerable influence on eco-block usage. Research demonstrates that subjective norm is crucial in the initial stage of innovation adoption (Swinerd and McNaught, 2015) as it forms a positive attitude (Choi, 2014). Past research confirmed the positive role of social influence on behavioural intention (Al-Shafi and Weerakkody, 2010). The findings of (Judge et al., 2019) found that SN has a huge impact on eco-house purchase intention with the conclusion that housing purchases are reliant on the desires and needs of family members and the opinion of one's spouse. SN had a major impact on WTP green roofs (Zhang et al., 2019) and the adoption intention of smart household technologies (Perri et al., 2020). Contrarily, SN has no impact on attitudes towards energy-efficient building technologies and adoption intention as a result of contrasting peer opinions (Ali, 2019; Rajaee and Malekmohammadi, 2019). In line with research evidence, SN could have a significant impact on the decision to use eco-block.

Perceived behavioural control (PBC) is recognised as the most influential factor and is closely linked to behavioural intention. For instance, if individuals exert significant control over themselves, they are more likely to have a stronger intention to engage in that specific behaviour (Webber et al., 2015). In line with this, if individuals are confident and capable to purchase eco-block technology through their financial resources and they have sufficient knowledge and skills in using the product, the possibility of using eco-block would be higher. Research findings reported that PBC was positively corroborated with the adoption of smart home technologies (Perri et al., 2020) and green building retrofits (He, 2019). Other studies confirmed that PBC has no significant influence on green housing purchase decision (Lin Zhang et al., 2018) and energy-saving behaviours (Ru et al., 2018). Based on

these discussions, it can be deduced that PBC is an essential variable to be explored in the context of the resident decision to adopt the eco-block technology.

Residents' knowledge (SK) about the benefits of GBTs is crucial in creating motivation and intention to adopt the technology. Residents with greater knowledge about GBTs tend to influence the adoption decision. The literature reveals that there is a lack of awareness pertaining to the preferences for GBTs and this acts as a barrier to motivate local members in their decision-making process (Portnov, 2018). Subjective Knowledge about the advantages and benefits of the ecological block is correlated to the perceived benefits of that technology (Wang and Hazen, 2016). According to Ofek and Portnov (2020), residents having sufficient knowledge and express familiarity with green building benefits are WTP about 10% of GB price premium as compared to those who are less acquainted with green building benefits are WTP 7% less. The positive influence of knowledge is discerned amongst those citizens with awareness on climatic change and energy information (Alam, 2014). In line with previous research, SK about eco-block could positively impact consumers' attitudes towards the technology, the perceived value of the technology and their willingness to pay a price premium for the new product. Indeed, limited knowledge about eco-block could hinder the acceptance of the product, where resident expresses no familiarity with the technology and its benefits, the associated energy cost-saving and the paybacks.

Past research works demonstrated that trust in the organisation (OT) is a fundamental determinant in the adoption of GBTs. People are extremely lacking in terms of sufficient information on science and technology (such as insulation in buildings, eco-block technology and other green approaches), or they lack adequate resources (such as time and abilities) to sort out a decision (Rajaee and Malekmohammadi, 2019). Under these situations, triggering social trust in the organisation/supplier of eco-block is the best solution. The social trust would initiate readiness to incline towards the desired technologies by relying on those organisation having the obligation for decision-making associated with the control of technology and public safety (Siegrist et al., 2000). As long as users establish their confidence in responsible organizations for green technology, they appreciate the quality and develop a positive attitude towards the desired innovation (Liu et al., 2018). With reference to research findings, it can be deduced that as long as individuals place their trust in the suppliers of eco-block, the chance of using the product increases.

Energy concern (EC) could certainly impact eco-block technology purchase intention. Despite environmental concern has been commonly utilised as a general concept in investigating pro-environmental behaviours, energy concern is a more specific term in the assessment of energy-saving behavioural intention as in the case of the eco-block material. The existing study argues that since eco-block is both an environment-friendly and energy-saving product, the study argues that energy concern for the environment most specifically predicts the intended behaviour in the product adoption. Only one study investigated by Chen et al. (2017) reports the positive effect of energy concern on the adoption intention. An individual energy concern for the environment leads to positive attitudes, and ultimately influencing the adoption decision of eco-block product.

Personal innovativeness (PI) is another potential psychological determinant in the study of eco-innovation adoption. Personal innovativeness is defined as those individuals being the first to incline towards using new and innovative products while becoming a technology pioneer and leader (Parasuraman, 2000). People exhibiting a high level of innovativeness are early adopters, are encouraged to try and accept the latest technologies, and have a positive attitude regarding the new technology. Such individuals have a positive perception of the benefits of technology and they are willing to adopt it though its advantages and perceived values are uncertain (Rahman, 2017). Three studies have affirmed that personal innovativeness positively influenced the adoption of eco-innovative products, such as smart home acceptance (Nikou, 2019) and energy-saving products (Ali, 2019; Alzubaidi et al., 2020). In a developing country such as Mauritius, an innovative consumer could have a positive influence on eco-block usage since it is a new method for building construction. From past reviews, it is noted that scholars and researchers have exclusively ignored this potential determinant in the evaluation of green building consumption.

Price sensitivity (PS) is a prominent psychological factor in this study since the purchase of building insulation requires considerable investment from a resident perspective. Price sensitivity implies that the value of technology ought to be greater than its economic cost for a user to adopt it (Venkatesh and Xu, 2012). Empirical studies emphasise that price sensitivity has an indirect association with the acceptance of a new technology (Kuo and Yen, 2009). For instance, Rajaee and Malekmohammadi (2019) indicated that perceived cost has an undesirable influence on the usage of GBTs as well as the acceptance of smart home technology (Nikou, 2019) and attitudes towards energy conservation (Gadenne, 2011). Price sensitivity is included in the conceptual framework as a key determinant in the eco-block purchase decision. From the findings, it can be deduced that highly price-sensitive residents may be reluctant to pay a price premium of at least 50% more to buy eco-block in comparison to the conventional one.

5.4. R4: how to link all the above-mentioned factors in a framework in the effort to understand the resident decision-making process to purchase eco-block for building insulation?

As showcased in Fig. 4, a comprehensive adoption decision framework was designed that links the potential factors affecting the resident's usage of eco-block as well as to understand the stages involved in the resident's decision-making process of eco-block. The different stages in the framework and the influencing factors involved in the eco-block purchase intention are further discussed below.

5.4.1. Stage 1: need for building insulation

The first stage is the need for building insulation when renovating or constructing a new house. Potential adopters usually consider adopting an innovation when a need arises, and engage in actions that best satisfy the requirement (Hawkins, 2007). The need for using energy-efficient measures in building arises due to current experience in conventional buildings, poor thermal insulation, hot air ingress and consequent severe impact on health status. In building energy efficiency, this need depends on several factors which can lead to the intention to use building insulation, and subsequently towards the purchase decision and actual usage of the innovation (Higueras-Castillo et al., 2019). These aforesaid factors are categorised into contextual factors (building age, thermal comfort needs, perception of energy usage and energy cost, previous energy investment in building and home characteristics), psychological factors (ATT, PU, PEOU, PBC, SN, SK, OT, EC, PI and PS) and personal factors (gender, age, education and income). All the underlying factors have been explicitly discussed above in the first, second and third research questions.

5.4.2. Stage 2: information search and collection of information

In the second stage, potential adopters normally search and collect information about alternatives, in this context the adoption of eco-block technology, from various sources to satisfy the needs. The information search could be either *internal* (from memory) or *external* (from external sources) (Hawkins, 2007). Normally, high investment decisions like building insulation entail external searches such as from the interpersonal channels and mass media. These information sources affect residents' behaviour through an alteration in their attitudes (Mahapatra and Gustavsson, 2008b). The role of interpersonal sources and mass media differs among groups of potential adopters. Mass media communications such as newspapers, television and advertisements are mostly influenced by innovators and early adopters, those constituting a small fraction of the group of potential adopters (Rogers, 2003). Interpersonal sources

such as direct communication with companies and energy advisers are essential for the early majority of other adopters. In the study undertaken by Nair et al. (2010a), respondents perceive construction companies and energy experts as fundamental sources of information when deciding on their decision to adopt wall insulation. On the other side, respondents gave the next priorities sources of information to the internet, villa magazine and visiting a house to see the installation.

5.4.3. Stage 3: selection and purchase of a building envelope component

In the third stage, potential adopters process the collected information before deciding on the product adoption. They normally compare various alternatives based on their perception of the characteristics of the alternatives: environmental factors, energy efficiency, economic factors and ease of construction. The measures which have more perceived benefits than others are certain to be selected. Adoption decisions normally depend on perceptions because prospective adopters are controlled by bounded rationality; that is, they have a low ability to obtain, store, and analyse the large quantity of information needed to reach the decision (Nair et al., 2012). For instance, in a developing country such as Mauritius, the alternatives to the eco-block technology are; insulated concrete foam, structural insulated panels, vacuum insulation panel, aerogels, fibreglass and rock wool insulation (Aditya, 2017). Notably, residents have a limited set of alternatives in selecting the most appropriate insulation measure since most of the insulation methods have not yet been established in the developing country.

5.4.4. Stage 4: post-purchase evaluation of the eco-block installation

In the long-term consequences, dissatisfied residents are more likely to confirm their purchase decision through interpersonal communication in contrast to satisfied customers (Nair et al., 2012). For instance, if the concern is due to low thermal comfort, prospective customers' post-purchase evaluation of the eco-block technology could discourage other people to adopt the technology from their unpleasant feedback (Kaveh, 2018). Based on the fact, if there is a huge discrepancy between the expected performance and actual performance of eco-block usage, residents may be strongly dissatisfied and develop undesirable attitudes toward their purchases (Achtnicht and Madlener, 2014b). Residents who are dissatisfied with the performance of the eco-block technology may adversely influence the corporate image of the manufacturers or suppliers. Interpersonal advertisement is crucial for manufacturers and suppliers of eco-block to gather feedback on the post-purchase evaluation of residents (Nair et al., 2012). In the event that a resident is dissatisfied with the new type of building technology, the manufacturer will need to spend more resources and time to satiate such residents (Pardalis, 2019). As a result, it becomes difficult for suppliers of eco-block to recommend the product due to the dissatisfaction of residents. For policy makers, the post-purchase behaviors of residents are equally essential because it may directly impact on the regulations to increase the adoption rate of eco-block for building insulation.

5.4.5. Influence of economic instruments

Potential adopters may not perceive the benefits of using building insulation, as such external factors play a crucial role. Marketing campaigns, regulatory policies, and economic incentives are some of the promotional measures (Nair and Mahapatra, 2010b). In some countries, economic policy instruments such as subsidies, grants, discounts, low-interest loans and other schemes are established, particularly in the early phases of the diffusion process, to endorse high investment innovations. For example, the government Green Deal policy in the UK permitted loans to support residents for improving the energy efficiency of walls, double glazing and renewable energy generation (Kaveh, 2018). Likewise, Lester (2013) proposed a policy for state and US government to use real estate transfer taxes to motivate homebuilders to perform energy retrofit projects at the time of sale. Similarly, Delmastro et al. (2016) states that the interest rate initiated by the Italian government is a prominent means for encouraging building energy renovation. The study by Nair et al. (2010a) reported that the Swedish government subsidy has an influence on energy renovation in the residential building envelope. In China, He et al., (2019) and Zhang (2018) confirmed that governmental incentives (tax incentives, direct grants, soft loans) are the external drivers in promoting green housing and green retrofitting. In Hong Kong, Wong and Lau (2013) argued that incentive programs by the government are important for the successful implementation of the green roof project. In tropical settings such as Mauritius, grants and low-interest loans were implemented in usage of renewable energy and technology, but subsidies for wall insulation have not yet been established. With reference to the above research findings, government incentives play a significant role on the intention to adopt the eco-block technology.

6. Policy implications and application suggestions

The comprehensive adoption decision framework could serve as a roadmap to assist policymakers and all stakeholders in the building sector such as (manufacturers, suppliers, marketers, contractors, building consultants, building experts and architects) to effectively understand the barriers and influential factors for promoting the acceptance of GBTs such as the eco-block product in developing countries. As for application suggestions, policymakers and stakeholders play external roles in influencing residents in their purchase decision towards the eco-block technology.

In regards to past reviews, limited knowledge and trust in the responsible organisation are the potential psychological barriers to GBTs acceptance, there is a need to prioritise those factors. In the effort to raise the residents' awareness of the novel technology and eventually lead to their acceptance, national education and information dissemination campaigns should be established. For instance, the local government can issue certain reports to familiarise citizens with the concept of eco-block technology and its related social advantages such as future energy saving, thermal comfort, environmental protection and short paybacks. Policymakers and responsible organizations can invest in communication campaigns such as providing information on GBTs through mass media, several sources of information (billboards, television shows, print media, radio programs) and dedicated websites. Mass media can help residents to obtain accurate and reliable information during their information search and collection stage and eventually guide them in their purchase decision especially in the early phases of the diffusion process. Besides, policy measures and promotions strategies should be oriented towards the different target groups (innovators, early adopters, early majority, late majority and laggards) and demographic variables (age, education, income). For instance, the opinion of building experts or credible evidence is required to convince the elderly generation. On the side, information on the new building technologies should be diffused effectively amongst the young generation, married couples and larger households since they are the prospective buyers of building insulation technologies and promotion strategies should mostly focus on these target segments.

Building industry companies working in collaboration with government can organise green construction workshops to inform the public about the social benefits and significance of building insulation technologies to generate awareness and their interests in new building technology. These types of workshops are crucial for the less educated people, especially those with limited knowledge about climate change, ecological concern, green products, energy-saving products and energy conservation behaviours. Maintaining the transparency of building development programs, through residents' interaction, could raise the reliability and trustworthiness of responsible organizations, while significantly impacting public attitude towards green building products. After gaining sufficient knowledge and trust in the new building system, the responsible authorities can further emphasise that the additional upfront cost invested in the eco-block technology can be recovered in terms of future cost energy savings within a reasonable payback period.

Additionally, the provision of government incentives such as (direct grants, soft loans and tax reduction) could certainly have a major impact on the high price-sensitive target groups and significantly affecting their purchase intention through their WTP a price premium for eco-block usage. Eventually, it could be suggested that government agencies and the responsible organisation must assure community involvement in green building projects to obtain their constant feedback and responses from post-purchase evaluation of product usage, which can form an important criterion in the development of effective marketing strategies.

In light of the above discussions on policy implications, the application suggestions for policymakers can be further arranged in three categories; information strategy, economic strategy and technology strategy (Ding, 2018). These three strategies have their respective own benefits and shortcomings; as such both policymakers and stakeholders in the building arena need to emphasise the benefits while overcoming the pitfalls as far as possible. The first strategy represents the Information strategies (such as public education on climate change, energy conservation and building insulation, mass media communication about building insulation, information feedback on eco-block usage, spreading knowledge on building insulation technologies). These information strategies have the advantages in the way that the residents' no longer express their bounded rationality, so they are more capable to obtain, store, and analyse the large quantity of information needed to reach the decision in favour of the eco-block purchase intention. On the other hand, the challenge of information strategies is that residents may no longer consistently express their concern in the long run and they may neglect the importance of building insulation.

The second strategy represents the economic strategies (such as subsidies, tax and price signals), which have the benefits that external incentives act as a major motivational factor. However, the disadvantage of external incentives is that they can represent only a small fraction of the total price of technology and in severe cases, it can be temporary due to economic crisis within a country, as such the residents are required to contribute entirely for the total cost of the technology. In the case that the economic incentives are ceased by the regulatory bodies, the resident behaviour is more likely to dissolve. In this paper, it is suggested to employ the information strategies along with the economic strategies at the same time to increase the adoption rate of the eco-block technology in the long run.

The third strategy represents the technology strategies (such as GBTs and products, energy-efficient building products, energy-saving products) that are essential to promote adoption intention and eco-block usage. Policymakers should take into consideration the characteristics of residents in the development of technology; else it will hinder the effects. Policymakers must consider the participation enthusiasm of the different attributes of residents, which can vary, given that residents are influenced by the contextual factors (like home characteristics, household ownership), psychological factors (such as subjective knowledge, trust, attitude) and demographic factors (like age, income). The paper proposes that the technology strategy can be incorporated with other strategies (including information strategy, economic strategy) to enhance residents' involvement. Ultimately, policymakers should carefully consider the attributes of the residents and assess the benefits and challenges of various strategies in practices to foster the adoption of GBTs such as the eco-block technology.

7. Conclusion and future research directions

Green building technologies such as thermal insulation are one of the most important strategies for decreasing the global building energy consumption to enhance the environmental sustainability of the building. This paper conducts a comprehensive review of the factors influencing residents' decision to adopt green building technology with an emphasis on eco-block technology in developing countries. In this research, an adoption decision framework was suggested, which incorporates the contextual factors, psychological factors and demographic factors throughout the stages of the framework. The idea of performing this review is primarily because conventional building technique is still dominant in emerging economies due to a lack of public awareness about the novel mode of building method and this information has not been diffused successfully throughout the various communication strategies. Conferring to the research database on green building consumption, the paper has reviewed a range of theoretical models.

Only a few studies have employed the adoption decision framework, which is broadly based on the Rogers DOI theory to understand the consumer decision-making process in the building sector. The adoption decision framework was designed from an exhaustive literature search and the uniqueness of the model contributes to the existing literature on green building consumption. Future research studies could explore further on the basis of the adoption framework and analyse the relationship between the variables on the adoption decision. This framework could eventually assist the building experts and policymakers to comprehend the steps involved in the individual's decision-making process with regards to the adoption of the eco-block building. This paper suggests that the responsible organisation must assure community involvement in green building projects to obtain their constant feedback from post-purchase evaluation of product usage, which can form an important criterion in the development of effective marketing strategies.

The authors in this paper have reviewed the factors, including the drivers and barriers affecting the adoption of the eco-block technology. More than 105 articles were identified from the last 10 y, out of which 45 peer-reviewed articles were used in the analysis. The trend of publication in this field of study starts to propagate from 2018. A systematic method of content analysis was employed to improve the reliability and validity of the results. The content analysis and review has unveiled that psychological factors such as (personal innovativeness, energy concern, trust in organisation and price sensitivity), have not been adequately addressed in past studies. Lack of subjective knowledge about eco-block, lack of trust in the suppliers of eco-block, high price sensitivity of residents, poor education, low-income households, previous high energy-intensive investment in buildings, larger households with a contrasting opinion about eco-block and house renters, all the underlying parameters were recognised as the main barriers to the adoption of the eco-block technology. From this review, it was found that consumers having sufficient knowledge about green building benefits are WTP about 10% of ecological building price premium (Ofek and Portnov, 2020). On the other hand, Judge et al. (2019) confirmed that if the payback period for green building technology is greater than two (2) y, consumers were less WTP a price premium of 12.5% for sustainable housing. The implication of external policy measures (government subsidies, tax reduction) and the influence of mass media communication through (dedicated websites, TV, billboard, television shows, print media and radio programs) were discussed. The notion is to provide society with reliable information on eco-block to obtain sufficient trust in the system, mitigating the effect of the barriers towards eco-block product adoption. The application suggestions for policymakers can such as (information strategy, economic strategy and technology strategy) were elucidated to ensure the consistent establishment of building insulation and eco-block in the long run through public participation in green building projects.

Eventually, this review paper has identified some probable future research avenues:

- The comprehensive adoption decision framework is composed of several contextual, psychological and demographic factors. As compared to the other factors, the psychological factors have mostly been investigated in areas affecting the adoption of GBTs from a resident perspective. Psychological variables such as (personal norms, sense of responsibility, perceived image, perceived risk in terms of eco-block performance, perceived payback period, anchoring price, self-identity and self-efficacy) have not been extensively studied under the field of this study, creating more

research opportunities. For the contextual factors, future research could investigate factors such as; type of dwellings (detached, flat, farmhouse), residence (ownership, renters), previous experiences in eco-block dwellings whilst for the demographic factors emphasis could be placed on the marital status (single, married, divorce), type of profession (self-employed, working in a government department or private companies), ethnicity and nationality (Mauritian, Indian, Chinese), and country of origin.

- As identified in this review, only a limited number of papers have used theoretical frameworks such as TPB, TAM and DOI in the field of green building consumption. This establishes an explicit need to probe research further in this direction.
- Past studies mainly emphasise the behavioural intention of the general green building products and energy-saving products. More comparative studies should be performed on specific influencing factors affecting GBTs adoption (such as the eco-block technology, green roof, energy-efficient windows) and general GBTs adoption to bridge the literature gap.
- Within the green building context, collection of primary data through proper research design (experimental, survey, case studies) and sampling method (e.g convenience sampling, random sampling, stratified sampling) is needed to test the relationship of the variables on the purchase decision to use eco-block. For instance, to find out if there is an association between the demographic variables (age, income) and the intention to purchase eco-block technology. To measure purchase intention and actual behaviour, a longitudinal study is more suitable for future studies.
- More research should be undertaken on several groups of residents to affirm the determinants affecting their choice of building insulation or comparing different population groups such as from cultural diversities across developing countries.
- Discussion should be made on the parameters that impact the consistency of eco-block technology adoption in the long term. It is equally crucial to find solutions to the time effect on information policies and economic policies which are normally established by regulatory bodies for a short time-lapse.
- The model is explicitly composed for the adoption of building insulation or energy-efficient building envelope. This conceptual framework can be utilised to analyse the adoption of a plethora of specific energy-efficient technologies at home that have both environmental and social benefits. Some of the examples include; energy-efficient insulated window glass, adoption of green and insulated roofs, usage of renewable energy technologies at home (renewable heating system, solar water heaters, solar PV), and energy-saving products at home (such as green electronics, eco-bulbs/energy-saving light bulbs, AC, refrigerators). Future studies could employ the adoption decision framework and conduct behavioural analysis on these specific energy-efficient technologies. This could ultimately help the responsible organisation to enhance their marketing strategies for a particular energy-efficient building technology.
- The role of various stakeholders (such as suppliers of eco-block, building experts) at each phase of the resident decision-making process has research potential as it is important for stakeholders to guide the residents throughout their purchase decision as well as to obtain resident feedback from the post-purchase evaluation of eco-block usage.

The authors conclude by reiterating that residents play a crucial role in the promotion of GBTs in society. Amongst all the various stakeholders, residents exert the highest influence since they are the ones demanding sustainable products and finally adopting the products (Darko and Chan, 2017). Without a strong market demand, implementation of eco-block and green building technologies programs will not be successful. Resident-oriented policies should be built on residents' prime intervention, their perceptions, socio-psychological, demographical and contextual behavioural factors in the process of promoting development in the building sector.

Declaration of competing interest

None as mentioned above.

Acknowledgement

The research work, which is part of Hashita Joyrams doctorate degree at the Open University of Mauriitus has gained financial support from the Higher Education Commission of Mauritius and the United Basalt Products of Mauritius.

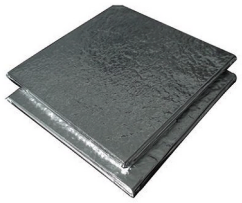
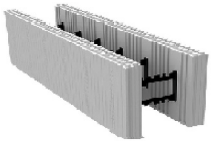
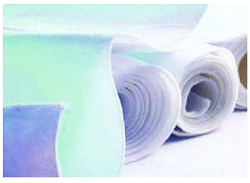
APPENDIX A

Table A
Benefits of the different types of building insulation

Building insulation type	Benefits	Illustration
Fibreglass insulation	- The findings of Shekarchian (2012) inferred that fibreglass is a good insulation material that can decrease the CO_2 emission by 20% annually. - The upfront amount invested can be recovered within 5 y Al-Homoud (2005).	
Structural insulated panel (SIP)	- Medina et al. (2008) stated that the daily heat transfer reduction is 35% with SIP and this is reliant upon the thickness of the polystyrene core. - SIP has an average payback period of 5 y (Aditya, 2017)	

(continued on next page)

Table A (*continued*)

Building insulation type	Benefits	Illustration
Vacuum insulated panels (VIP)	- Uriarte (2019) revealed that VIP insulation has significantly caused a reduction in the space heating requirement and associated dioxide (CO_2) emissions by approximately 38% after building renovation - VIPs have an average payback period of 10 y (Schiavoni, 2016).	
Insulated concrete blocks and insulated concrete form.	The empirical findings of Caruana (2014), reported that the polystyrene core embedded in the eco-block has considerably caused a reduction in the heat flow rate across the building envelope. - Eco-block is a feasible alternative given that it is 3 times more efficient in terms of thermal resistance than conventional block. - According to Papadopoulos (2005), the polystyrene core generates recycling options and savings potential up to 4 t of CO_2 - The cost analysis undertaken by Al-awsh (2020) has deduced that the payback period can be achieved within 4 y since the polystyrene core is a cheap insulator.	 
Aerogel enhanced system for building insulation	- Aerogel-enhanced insulation technology is a high thermal resistance material and the installation of this technology in the building envelope generates energy potential savings about 34% with limited impact on the building performance (Berardi, 2017). - The high costs of aerogel-enhanced products pose a barrier to building the system whilst the payback period is over 17 y (Berardi, 2017).	

APPENDIX B

Table B
Research findings in the field of green building consumption

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
Rezaei and Ghofranfarid (2018)	Rural households' renewable energy usage intention in Iran: Extending the unified theory of acceptance and use of technology	UTAUT model	Awareness, Attitude (ATT) Social norm, Moral norms, Relative advantage, Perceived Behavioural Control (PBC)	Surveying 280 households in Iran through the Multistage sampling method	Structural Equation Modelling (SEM) was employed to test the research hypotheses	- Empirical findings revealed that relative advantage, awareness about renewable energy, PBC and moral norms were positively associated with the acceptance of renewable energy. - Social norm has no significant relationship with renewable energy adoption intention -Attitude was the mediating variable for relative advantage, awareness and moral norms
(Liu et al., 2018)	Promoting green residential buildings (GRBs): Residents' environmental attitude, subjective knowledge, and social trust matter	TAM model	Extension of TAM with three additional psychological factors: (environmental attitude, subjective knowledge and social trust in an organisation)	342 residents in China was surveyed through Convenience sampling via online survey	Structural Equation Modelling (SEM) was used to test the research hypotheses	- From the empirical results, it can be deduced that subjective knowledge about GRBs, attitude towards green buildings, environmental attitude, social trust and PU are the potential psychological determinants for fostering

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
						the acceptance of green dwellings. - Research found that most residents have limited subjective knowledge and lacking social trust from residents' part could act as psychological barriers, hindering their preferences towards green dwellings
(Rajaee and Malekmohammadi, 2019)	Proposing a socio-psychological model for adopting green building Technologies (GBT): A case study from Iran	TAM model component: attitudes (ATT), Perceived ease of use (PEOU), Perceived usefulness (PU)	Extension of TAM with additional factors; (subjective knowledge (SK), environmental attitude (ATT), social influence (SI), and trust in responsible organizations (OT), perceived cost (PC)	Surveying 301 green building experts through the stratified sampling method	SEM: partial least squares path modelling (PLS) was used to test the research hypotheses	The research inferred that SK is a strong predictor of intention to adopt GBT and but this variable has no impact on attitude towards GBT and PU. - Attitudes, perceived cost and social trust have considerable influence on the preference to use GBT. - PU has a strong association with both attitude towards GBT and intention. - PEOU has a direct impact on PU and attitude towards GBT
Shin et al. (2018)	Who will be smart home users? An analysis of adoption and diffusion of smart homes	TAM model	Extending TAM with compatibility and privacy factors Demographic variables: Age, sex, income, education were the moderating variables	Surveying 310 Korean smart home users	A multivariate Probit model was adopted to explain the adoption and smart homes diffusion	- The study concluded that compatibility, PEOU, and PU have a higher impact on the inclination towards smart home technologies - Older generation are more probable to purchase smart home technologies than the younger ones
Chen et al. (2017)	Between the technology acceptance model and sustainable energy technology acceptance model: Investigating smart meter acceptance in the United States	A proposed research model to study the influence of potential parameters on the smart meter acceptance	Technology attributes: usefulness, cost, privacy Individual differences: trust, problem perception, democrat	An online survey was done through Amazon Mechanical Turk (MTurk) and 711 valid responses were obtained		The study deduced that PU and privacy factors had a direct impact on the adoption of smart meter installation - Perceived cost had no impact on the acceptance of smart technology - Individual confidence in the companies and problem perception linked to energy issues have a direct influence on the support towards smart meter installation - Democrats revealed a greater level of trust in smart meter installers and problem perception in contrast to the non-Democrats
(Alam, 2014)	Small-scale household's renewable energy usage intention: Theoretical development and empirical settings	A combination of three theoretical models: TPB, TAM and DOI	All variables in TAM, TPB and DOI	200 households in Malaysia were surveyed via the Convenience sampling method	Multiple regression analysis was used to test research hypotheses	Overall, the researchers discovered that awareness, relative advantage, PEOU, PBC, and cost reduction positively impacted the renewable energy usage intention
(Schill, 2019)	Consumers' intentions to purchase smart home objects: Do environmental issues matter?	A model adapted from TAM	Perceived usefulness, environmental beliefs, environmental concern Moderating factors: Success, Happiness	Questionnaires were distributed in diverse public places. The respondents' having at least 18 y of age, were eligible to participate. A total	Structural Equation Modelling (SEM) was used to test the research hypotheses	- Empirical findings inferred that environmental concern and perceived usefulness have a strong influence on consumers' decision to buy smart home objects.

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
				of 641 responses were obtained.		- Both happiness and success negatively moderate the effect of environmental concern on consumers' intentions to purchase smart home object
Li et al. (2018)	Differences and influencing factors for Chinese urban resident willingness to pay for green housings: Evidence from five first-tier cities in China	A model adapted from TPB	Attitudes, SN, PBC, anchoring price, values, risk factors, Demographic factors are the moderating variables	2937 Chinese residents were surveyed through the Simple random sampling method	One-way ANOVA was used to test the research hypotheses	The paper concluded that there is no association between willingness to pay (WTP) for comfort, housing type, home characteristics and education. - WTP varies across demographic characteristics. Female residents express the highest WTP. Residents with a rather low educational background express a decline in their WTP. Middle-income residents express the greatest WTP, rather than those with higher income and professional type - High-educated residents are not influenced by price anchoring, as they normally make rational decision making on their purchase of high investment such as the investment in green bousing. On the other hand, low-educated citizens are more susceptible to be anchored given that they are more dependent on external information before deciding on their green housing purchase.
Chen et al. (2017)	Thermal comfort or money-saving? Exploring intentions to conserve the energy among low-income households in the United States	TPB model	An extension of TPB with additional psychological variables (frugality attitudes, energy concern, thermal comfort (needs for coolness and warmness) and bill consciousness	248 households were surveyed in the U.S. An online survey questionnaire was distributed via Amazon's Mechanical Turk (MTurk).	A hierarchical regression model was used to test the hypothesised relationship between the variables	- Empirical findings revealed that the TPB variables (attitudes toward energy-conservation, SN, and PBC) strongly influence the intention to conserve energy. -Attitudes toward energy- savings and PBC are the strongest variables for predicting the intention to conserve energy. - Bill consciousness positively impacted the intention to save energy - Needs for warmness and coolness has a negative association with the energy conservation intention. - Gender and climate zones have a significant effect on the energy conservation behaviours
Perri et al. (2020)	Smart users for smart technologies: Investigating the intention to adopt smart energy consumption behaviours	TPB model	Variables of TPB with the addition of resistance to change as one more variable	173 smart users in Italy were surveyed through the Random sampling method	Structural Equation Modelling (SEM) was used to test the research hypotheses	- The findings demonstrated that attitude, SN, and PBC have strong effects on the acceptance of smart consumption.

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
						- Resistance to change has a drastic association with the adoption of smart energy behaviours
(Prete, 2017)	Determinants of Southern Italian households' intention to adopt energy efficiency measures in residential buildings	TPB model	Variables of TPB with the addition of environmental concern as one more variable Demographic variables: income, education, age are the moderating variables	128 Households in Apulia were surveyed through the Random sampling method	Structural Equation Modelling (SEM) was used to test the research hypotheses	- The results inferred that attitude is the major factor of households' adoption intention and their WTP for energy efficiency measures. - SN, PBC and environmental concern have a significant impact on household age, education and income level.
Ru et al. (2018)	Exploring the effects of normative factors and perceived behavioural control on individual's energy-saving intention: An empirical study in eastern China	TPB model	An extension of TPB with extrinsic and intrinsic normative factors	450 responses were received through the Convenience sampling method	Structural Equation Modelling (SEM): PLS was used to test the research hypotheses	- The research works deduced that PBC is the most crucial determinant for promoting the energy-saving intention from an individual dimension - Attitude towards energy-saving behaviours and personal moral norms are influencing parameters with regards to the energy-saving intention. - PBC and personal norms are negatively correlated to energy conservation intention. - Social norm raises the energy-saving intention of individuals especially those exhibiting a low PBC
(Wang, 2019)	Purchasing intentions of Chinese consumers on energy-efficient appliances: Is the energy efficiency label effective?	TPB model	The information label is included in the model as the external factor. The impact of trust on the path of information label and economy are investigated	369 residents in China were surveyed via online survey tools	SEM was used to test the research hypotheses	- The study indicated that information label has the greatest influence on consumers' purchasing intentions towards energy-saving appliances at home. - Still, doubts on the label information and financial constraints obstruct consumers' acceptance of these appliances - Consequence awareness and responsibility attribution have a direct impact on personal norms and indirectly affect the decision to buy energy-efficient home appliances through personal norms. - Consumers' norms, attitudes towards energy-saving products and subjective norms exert significant influence on the consumers' acceptance of energy-saving products.
(Jabeen, 2019)	Consumers' intention-based influence factors of renewable power generation technology utilization: A structural equation modelling approach	TPB model	TPB is extended with additional constructs: Awareness Environmental knowledge, Environmental concern, Relative advantage, Cost of technology	230 Pakistani households were surveyed	SEM-based partial least squares (PLS) technique was utilised for data analysis	- From the findings, it can be concluded that attitudes, SN, PBC, lack of electricity access and relative advantage exert positive effects on the consumption of power technologies. - Conversely, the cost of the technology represents the

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
						main obstacle to the consumption of energy-efficient technologies. - Awareness, environmental knowledge, environmental concern, moral norms, environmental do not affect the consumption of energy-efficient technologies
Judge et al. (2019)	Using the theory of planned behaviour to predict intentions to purchase sustainable housing	TPB model	Variables of TPB with the addition of green consumer identity as the moderating variable	330 Australian Homebuyers were selected from an online panel agency	Hierarchical multiple regression employed for predicting purchase intentions and willingness to pay	- Findings revealed that attitudes, SN, PBC and green consumer identity are strong predictors of sustainable housing purchase intention. - Green consumer identity considerably moderated the influence of SN on the intention to buy sustainable housing. - Familiarity with sustainability certifications and SN are the two strongest parameters of WTP for sustainable housing.
(He, 2019)	Factors Influencing Residents' Intention toward Green Retrofitting of Existing Residential Buildings	TPB model	Additional variables include: green retrofit cognition, policy factors	Surveying 507 Chinese residents' Data was collected through field interception research. Small tokens were provided to the participants.	Structural Equation Modelling (SEM) was used to test the hypothesised relationship	- From the research, it can be deduced that policy factors, cognition of green retrofitting, SN and PBC are the most important determinants impacting residents' choice toward green building retrofits. - Policy factors directly influence residents' acceptance toward green building retrofits and indirectly affect their acceptance through PBC - Residents' awareness or cognition of green retrofits exhibit no direct influence on their preferences toward green retrofits, but cognition indirectly impacts their choice preferences through subjective norms.
(Zhang, 2018)	Investigating Young Consumers' Purchasing intention of Green Housing in China	TPB model	Additional variables include: environmental concern (EC), Subjective knowledge (SK), governmental incentives	241 responses were obtained through the Convenience sampling Method	Structural Equation Modelling (SEM) was used to test the research hypotheses	- The research findings portrayed that governmental incentive plays a crucial role towards the green housing purchase intention - Consumers' express a positive attitude toward green housing along with the optimistic influence of subjective norms on purchase intention. - PBC has a neutral influence on the decision to purchase green housing. - SK has an indirect impact on green housing adoption through attitude.

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
						- EC affirms an indirect association toward green housing adoption through attitude
Zhang et al. (2019)	Households' willingness to pay for a green roof for mitigating heat island effects in Beijing (China)	TPB model	All variables in TPB Demographic variables (gender, education, family size, age, previous knowledge)	The data were collected from a contingent valuation survey. A double discrete choice was used.	The Spike model was used to assess and validate the data.	-The findings confirmed the suitability of the spike model. The mean household is WTP about 150 Chinese yuan/y - Attitude, PBC, and SN considerably affect respondents' WTP along with the demographic variables like household income and education. - This research deduced that government and trustworthiness of stakeholders are major external factors that can promote society involvement in green housing projects and their WTP for green roof
Kapoor and Dwivedi (2020)	Sustainable consumption from the consumer's perspective: Antecedents of solar innovation adoption	DOI theory	Variables of DOI theory: Relative advantage Compatibility Complexity Observability	320 Indian households were surveyed using a cross-sectional field survey method	Structural equation modelling and logistic regression	The study affirmed that relative advantage, observability and compatibility have a positive influence on the preference to use an energy-efficient product such as solar equipment while complexity did not influence the adoption intention
Nikou (2019)	Factors driving the adoption of smart home technology: An empirical assessment	A combination of the DOI model and TAM model	All Variables of DOI theory, All variables in TAM, and extended with other factors; perceived cost and Consumer perceived innovativeness (CPI)	156 respondents in Finland were surveyed through the convenience sampling method	Structural equation modelling to test hypotheses	- The findings demonstrated that PU, compatibility and PEOU are the major influencing determinants on acceptance of smart home technology. - Trialability showed no direct impact on smart home technology adoption, but it indirectly impacts intention through PU and PEOU. - Perceived cost negatively affects the acceptance of the technology. - CPI has a considerable optimistic influence on the preference to adopt smart home technology
Ofek and Portnov (2020)	Differential effect of knowledge on stakeholders' willingness to pay green building price premium: Implications for cleaner production	A conceptual framework was built with an emphasis on the motivation of consumers, developers and architects and their WTP for green building	Knowledge Personal attitudes Price premium	438 potential homebuyers were surveyed via the internet panel	One-way ANOVA and regression analysis were used to test data	- Consumers who express familiarity with green building benefits are WTP about 10% of the green building price premium - Consumers expressing low familiarity with the advantages of green building are WTP about 7% extra costs - The findings reported that knowledge about the advantages of green building varies across the various groups of stakeholders
(Portnov, 2018)	Factors affecting homebuyers' willingness to pay	N/A	Familiarity with the green building concept and its	438 potential homebuyers were	Multiple regression analysis	- Results inferred that familiarity with the GB concept, perceived

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
	green building price premium: Evidence from a nationwide survey in Israel		specific benefits Motivational factors (grants, loans, tax reduction)	surveyed via the internet panel		benefits, perceived maintenance savings have a positive correlation with the cost premium - Findings indicated homebuyers are WTP a reasonable PP between 7 and 10%. - Financial incentives, including (subsidized loans and tax breaks), resulted in lesser WTP for PP. As a result, homebuyers generate opposite responses to financial incentives, as such, a long-term governmental obligation to sustain the performance of GB is a necessity. - The research proposes a combination of both financial and non-financial GB motivations to attract prospective house buyers.
(Zhang, 2016)	The role of public information in increasing homebuyers' willingness-to-pay for green housing: Evidence from Beijing	Experimental design: Selection of green and non- green buildings	Knowledge of green building	Informational experimental design and Surveying 240 households in Beijing. Two pairs of residential complexes were selected, whereby one is green and the other non-green	Logit models to analyse respondent housing choices	- The research revealed that dwellers residing in green housing show a greater WTP for greenness after the information delivery. - Dwellers residing in the non-green building express a greater WTP for greenness than the green dwellers. - From this finding, it can be deduced that households are inclined to invest in green home projects as long as they are being provided with more credible information.
(Fornara, 2016)	Predicting intention to improve household energy efficiency: The role of value-belief-norm theory, normative and informational influence, and specific attitude	VBN theory	Values, Environmental beliefs, Attitudes towards green energy, Social trust, Moral norm, Ascription of responsibility, Awareness of consequences	432 homeowners, were recruited through a quota sampling procedure depending on gender and age	Structural equation modelling to test hypotheses	- Evidence showed that informational influence (such as trust in family, neighbours and friends) and moral norms are the main influential parameters for predicting the usage intention of energy efficiency devices. - These factors have mediating effects on social norms, which has an indirect impact on the decision to adopt energy efficiency devices.
(Ali, 2019)	Determinants of Consumer Intentions to Purchase Energy-Saving Household Products in Pakistan	TPB model Technology Readiness Index (TRI)	Optimism, Innovativeness, Discomfort and Insecurity	396 valid questionnaires were obtained	The hypothesis was done by using the Partial Least Square (PLS) path modelling approach	- The results inferred contributors of technology readiness have a strong influence on the residents' attitude towards energy-saving products. On the other hand, inhibitors of technology readiness have a negative association with energy-saving intention - Attitude and PBC have a positive impact on the intention to buy energy-

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
						saving household products. - SN do not influence the purchase intention as a result of contrasting peer opinions - Innovativeness and optimism have a strong impact on households' attitudes towards a preference for energy-saving products. - Discomfort and insecurity have a negative association with attitude towards the acceptance of energy-saving products.
(Gadenne, 2011)	The influence of consumers' environmental beliefs and attitudes on energy saving behaviours	Conceptual framework of consumer environmental behaviour	Environmental factors, Social influence, Govt subsidy	A total of 218 responses were obtained through an online survey	A Multivariate Analysis of Variance (MANOVA) was performed to test the research hypothesis	The research concluded that general environmental beliefs significantly impact norms - SN and community influence have an association with environmental attitudes - There is a strong correlation between environmental attitudes and energy conservation intentions. - Perceived cost negatively influence the attitudes towards energy conservation. - Energy conservation attitudes are negatively impacted by government policies such as subsidies.
(Kaveh, 2018)	An investigation into retrofitting the pre-1919 owner-occupied UK housing stock to reduce carbon emissions	Mixed-methods approach.	economic viability, social viability, and technical viability	Overall, 43 respondents participated in the research. Both quantitative data and qualitative semi-structured data were collected. Convenience and snowball sampling approach was used to increase the rate of response.	The data collected were analysed under the three main viability: economic viability, social viability, and technical viability	- Results findings revealed that limited capital, the perceived payback period for the investment, seeking a credible and trained installer and disturbance in daily lifestyle are the main barriers to the energy retrofits adoption. - The study reported that homeowners are mostly concerned to improve home comfort and reduce energy bills instead of diminishing carbon emissions. - Homeowners are inclined to implement retrofit measures for financial support which may comprise government grants and added property value. - The paper concludes that the best opportunity of retrofitting ancient homes might be through greater awareness, better financial resources, economic benefits, policy support and social influence

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
(Rizzo, 2018)	Exploring the perceived image of Energy Efficiency Measures (EEMs) in residential buildings: Evidence from Apulia, Italy	The Research framework consists of a perceived image and socio-demographic factors that influence the usage intention	Perceived image Demographic factors (age income, education)	132 households were surveyed through the simple random technique	Structural equation modelling approach was used to test the hypothesis	Results revealed that the perceived image of EEMs is not diffused efficiently; including the installation of energy-efficient technologies and adoption of ecological practices - EEMs' variables such as (performance and sustainability) have a considerable influence on energy consumption at home. - EEMs' perceived image varies across the older and younger members in households. The older generation primarily links the image with individual benefits and practical (performance). The younger generation links image with a collective benefit (sustainability).
Pelenur and Cruickshank (2012)	Closing the Energy Efficiency Gap: A study linking demographics with barriers to adopting energy efficiency measures in the home	Study of contextual and demographic variables	Sex, age, educational level, household income, marital status, type of dwelling, number of occupants in household, residence, location	In total, 198 semi-structured interviews were conducted whilst 75 interviews were used in the data analysis	Chi-square test of association was used to test data	The findings demonstrated that there exists a strong association between demographics such as gender, education, marital status, number of building occupants, type of dwelling, residence (renters/ ownership), and location. - The barriers to the adoption of an energy-efficient home include: (information, cost, house-mate/family/partner, landlord-tenant, personal behaviour and property itself).
Baldini et al. (2018)	The impact of socioeconomic and behavioural factors for purchasing energy-efficient (EE) household appliances: A case study for Denmark	Demographic, socioeconomic and behavioural variables.	Age, Number of people living in a house, Housing type, Housing size, Year (y) built, Income, Investment in EE appliances	340 sampling size	A discrete choice model and a logistic regression model was employed to test the predictive ability of the explanatory variables.	The findings indicated that housing type, number of people living in house, household age and post usage behaviour are the positive determinants for household choice of EE appliances. - Income has a low impact on the acceptance of EE appliances. - Awareness campaigns have been mostly unsuccessful in driving energy-intensive in-vestments despite having a relatively high average national income and educated population - The research emphasises the significance of information campaigns by aiming at potential demographic segments.
Zhang et al. (2020)	Willingness to pay (WTP) a price premium for energy-saving appliances: Role of perceived value and energy efficiency labelling	A comprehensive model was constructed based on the TPB and the addition of the consumer perceived value variable	Attitudes, Subjective norm, Emotional value, Perceived effectiveness, institutional mechanism, Environmental awareness, Quality value,	327 valid responses were received. An online format of the questionnaire was distributed through WeChat	Data were analysed using PLS	- The findings portrayed that consumers' attitudes toward buying energy-efficient products strongly influence WTP a price premium. - Consumer environmental values, emotional value, perceived quality and

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
			Environmental value, Media publicity, PBC, Price value, Social value, Personal norm, Willingness to pay a price premium			price value have a considerable effect on consumers' purchasing attitudes. - Perceived effectiveness of energy labels and personal norms potentially affect a person purchasing attitude. - Environmental awareness, media publicity and social value impart no impact on consumers' attitude toward buying energy-saving appliances.
Hong (2013)	Determinants of intention to inhabit eco-friendly homes in Malaysia	TPB model	Environmental attitudes, social referents, PBC, self-identity	250 returned completed survey. This represents a response rate of 56%.	Regression analysis was utilised to analyse data	The findings demonstrate that a positive attitude, great control in the capacity to buy eco-friendly homes, and green consumer identity represent major factors to the intention of inhabiting such homes. - Social referents' opinion was not significantly associated with inhabiting eco-friendly homes. - Households of detached dwellings, higher income and educational background, and housing costs have a significant association with the intention to inhabit ecological homes
(Akroush, 2019)	Determinants of purchasing intentions of energy-efficient products (EEP): The roles of energy awareness and perceived benefits	A proposed research framework is built to analyse the effect of influencing factors on purchase intentions of EEP.	Consumers' attitudes, perceived benefits, energy awareness and perceived price	Hand-delivered surveys were distributed through the convenience sampling method. 474 responses were valid for the analysis.	Exploratory and confirmatory factor analyses were conducted to assess the research reliability and validity. Structural path analysis was then used to test the hypothesised data.	The study shows that consumers' attitudes have the greatest impact on the decision to purchase EEPs. - Energy awareness and perceived advantages have an influential impact on consumers' attitudes. - Perceived benefits positively influence consumer attitudes and intention to purchase EEPs. - Energy awareness is negatively associated with perceived price. - The perceived price has a negative association with perceived benefits and consumers attitudes. - Results reveal that 50% of the variation of the intention to purchase EEP was triggered by perceived benefits–consumers' attitudes–energy awareness path.
Tan and Goh (2018)	The role of psychological factors in influencing consumer purchase intention towards the green residential building	An extension of the TPB model with psychological factors	Attitudes towards the green residential building, SN, PBC, environmental concern, PI, perceived moral obligation, perceived self-identity, perceived risk	Overall, 304 respondents contributed to the survey through the convenience sampling method	The Statistical Package for the Social Sciences (SPSS) and partial least square structural equation modelling (PLS-SEM) analyses	The findings indicated that attitude towards GBs, perceived value, environmental concern, perceived self-identity, perceived moral obligation and financial risk have an important association

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
			(including; performance risk, financial risk psychological risk), perceived value, WTP		were performed on the latent variables	towards the green building purchase intention - On the other side, SN, PBC, psychological risk and performance risk have an opposite influence on the acceptance of green dwellings. - Purchase intention was reported to be an important parameter for an individual's WTP for a green housing project.
(Sang, 2020)	Influencing factors of consumers' willingness to purchase green housing: a survey from Shandong Province, China	The research model was combined with the TPB model and NAM model	Component of TPB: ATT, SN, PBC Component of NAM: personal norm, Awareness of consequences, Ascription of responsibility	355 valid responses from a questionnaire were received	PLS structural equation model analysis was used to test the research hypothesis	- The study discovered that personal norm and PBC have a direct influence on consumers' WTP in a green home. - SN has an indirect effect on personal norm through PBC, and awareness of consequences has an indirect influence on personal norm via ascription of responsibility. - The incorporation of both the TPB model and NAM model, altruism (moral), aspects and self-interest (rational) showed significant improvement in the predictive ability of the theoretical framework.
(Zahan, 2020)	Green purchase behaviour towards green housing: an investigation of Bangladeshi consumers	Extension of the TPB model	ATT, SN, PBC, Environmental knowledge and concern, green housing purchase intention	319 valid responses were obtained. A convenience sampling together with a judgmental sampling method was used to gather data.	SEM approach was used to validate research hypotheses	- The results implied that attitudes and PBC are significant predictors of green housing consumption - On the contrary, SN, environmental knowledge and have no direct effect on green housing consumption. - Instead, environmental knowledge and environmental concern indirectly affect the green housing purchase intention.
Management (2010)	Ecological awareness, price and psychological wellbeing as main dimensions of senior citizens' green sheltered housing buying intentions	A research framework is built to examine the effect of influencing parameters on the buying intentions of green sheltered home	Cultural orientation, Ecological awareness, price perception with the mediating role of psychological determinants on elderly citizens decision to purchase green sheltered housing	Only 54 valid questionnaires were returned through the convenience sampling method	Correlation analysis	- Findings demonstrate that ecological awareness is the major determinant influencing the elderly generation towards the purchase of green sheltered housing -On the other hand, negative cultural orientation, (including conservatism and collectivism) cause a decline in the buying intentions of the elderly households
Nair, Gustavsson and Mahapatra (2010a)	Factors influencing energy efficiency investments in existing Swedish residential buildings	A research conceptual framework was built around influencing determinants such as personal and contextual factors to analyse	Personal factors (such as Awareness about energy efficiency measures, Attitude to reduce energy use, gender, age, education, income, skills	Surveying 3000 home owners through the stratified sampling method. Questionnaires were sent via emails	Chi-square test was used to analyse the relationship between variables and the acceptance of energy-intensive	Empirical evidence showed that personal factors (including age, education and income) along with the contextual factors, (including past investment, thermal discomfort, building age and perceived

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
		homeowner's adoption of high energy efficiency investments at home	Contextual factors (such as Past investment, Thermal comfort, Building age, Perceived energy cost, Location)		investments in buildings	energy cost) have major influences on the homeowners' preferences for a specific energy-efficient measure in building.
(Nair and Mahapatra, 2010b)	Owners perception on the adoption of building envelope energy efficiency measures in Swedish detached houses	A conceptual framework was designed to identify the different stages involved in the homeowner's decision to select an energy-efficient building envelope along with some influencing parameters on the adoption decision	Demographic factors, Perceived energy cost, Perceived advantages of the new building envelope (cost, energy efficiency, ease of installation), Influence of media and government policy instrument like subsidies	A total of 3059 homeowners filled the questionnaire survey. Data was collected via the stratified random sampling method. The response rate is 36%.	Chi-square and Wilcoxon the signed-rank test were used to analyse and test research data	The empirical findings inferred that nearly 70–90% of the household had no purpose to purchase a building envelope measure for the next 10 y. This is because the household was quite satisfied with the physical characteristics of their building and the year (y) of construction as well as the thermal performance of their current building envelope material - A greater percentage of residents have the perception that attic insulation has more benefits in comparison to wall insulation and energy-efficient windows. - Economic factors were given a high priority level by homeowners as they decide to purchase a particular building envelope measure. - Results suggest that interaction and communication with construction specialists, suppliers of sustainable materials and energy advisers could provide information to homeowners as they decided to purchase their building envelope technology.
Nair et al. (2012)	Implementation of energy-efficient windows in Swedish single-family houses	A conceptual framework was designed to identify the different stages involved in the homeowner's decision to adopt energy-efficient windows	Demographic variables, Physical condition of old window installation, cold air ingress, energy cost, sound insulation, perceived advantages of new window installation, (economic, environmental, energy efficient) Influence of media and marketing activities of window installers	A questionnaire survey of 1010 homeowners was received.	Chi-square and Wilcoxon signed-rank test were used to test the hypothesised relationship between the variables	- The empirical findings demonstrated that the energy cost savings, physical characteristics of the windows and household age were discovered to be the most crucial determinants for fostering the decision to replace windows. - About 80% of the household has substituted their existing windows with windows energy efficiency, having a U-value of 1.2 W/m^2K. - Lack of knowledge about energy-efficient windows (windows with lower U-values), perceived high cost and condensation issues were regarded as the obstacles to the non-adoption of energy-efficient windows.

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
Achtnicht (2011)	Do environmental benefits matter? Evidence from a choice experiment among house owners in Germany	The study of some influential determinants on the choice to embrace energy retrofits and energy-efficient technologies	Acquisition cost, Period of guarantee, Annual energy-saving potential, Public funding, Payback period, Opinion of energy adviser	In the experiment, 400 house owners were sampled. The survey was conducted by a market research company.	Standard and mixed logit specifications were used to examine the choice data	- Results concluded that people are more responsible and have a great desire to engage in environmental protection activities. Environmental benefits significantly impacted the choices of heating systems. On the contrary, homeowners express their reluctance in terms of insulation choices. - The finding indicated that people with a high WTP for CO_2 savings, impacted the heating choices instead of the insulation choices despite using a similar elicitation technique. This might be due to limited knowledge on insulation measures, psychological reasons, or some strong preferences of the surveyed individuals which needs to be investigated in future research. - There are some barriers to promoting the acceptance of energy-efficient technologies. As such, people are unaware of the trend of future energy prices, the CO_2 savings of emerging technologies, the payback period of these investments and their length of time in their current residence
Achtnicht and Madlener (2014a)	Factors influencing German house owners' preferences on energy retrofits	The study of some influential determinants on the choice to embrace energy retrofits and energy-efficient technologies	Acquisition cost, Period of guarantee, Annual energy-saving potential, Public funding, Payback period, Opinion of energy adviser	Data were examined from a 2009 survey, consisting of more than 400 owner-occupiers of Semi-detached, detached and single-family	Standard and mixed logit was used to analyse the choice data	- Empirical findings revealed that most households wait until their building structures have attained the end of their building life cycle, before seeking possibilities for replacement or renovation - House owners valuate whether the extra costs invested in energy-efficient technologies are reasonable and the pay-backs are guaranteed. This behaviour can be regarded as rational from the household perspective. - Financial support such as public subsidies reduce the energy retrofits costs for individual household and increase their chance of selecting an energy measure. However, free-rider problems may pose a threat to the efficiency of funding measures. - Expert energy advice could raise the acceptance

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
						for building energy technologies - Overall, results concluded that house owners are most probable to undertake energy retrofit activities due to their awareness of energy cost savings and payback period. Households may have adequate financial capabilities and future opportunities may arise such as the renovation of their building envelope.
Tan (2013)	Use of Structural Equation Modelling to Predict the Intention to Purchase Green and Sustainable Homes in Malaysia	TPB model	Attitudes towards green and sustainable home, SN, PBC, perceived self-identity, purchase intention	252 responses were used for the analysis. Prospective homebuyers, who were interested to purchase new houses, were invited to inspect several sustainable house units by real estate agencies.	SEM analysis using AMOS was used to estimate the measurement and structural model for quality and fit	- Evidence showed that attitudes towards sustainable homes, PBC and perceived self-identity are positively associated with adoption intentions of such homes - Social influence has no impact on the green home purchase intention. - The findings propose that the relationship among psychological variables integrated within the TPB have significantly predicted green and sustainable homes purchase intention.
Ameli and Brandt (2015)	Determinants of households' investment in energy efficiency and renewable: evidence from the OECD survey on household environmental behaviour and attitudes	Choice experiment to study the influential determinants on households' decision to invest in efficiency and renewables	Home ownership, income, social context and household energy conservation practices	The survey data were collected through an online questionnaire. 12,000 respondents were surveyed across 10 countries	A discrete choice modelling framework is employed. The empirical analysis is grounded on the estimation of binary logit regression models	The research results concluded that some factors such as; household ownership, income, social norm and household energy-saving actions are the main determinants influencing households' intention to invest in energy technologies. - Demographic characteristics of households discuss the investment in energy-efficient technologies. For instance, investments in energy-efficient windows and wall insulation largely depend on age. High-income households can invest in energy technologies rather than low-income households and renters. - Environmental attitudes and energy-saving practices act as major factors for promoting technology adoption.
Hu et al. (2016)	Personal values that drive the choice for green apartments in Nanjing China: the limited role of environmental values	The means-end theory and the laddering technique was employed to assess the impact of environmental values in homebuyer's choice preferences for green apartments	Personal values of 6 green features: Non-toxic construction materials, thermal and sound insulation, energy and water efficiency, ventilation	Two teams of home-buyers were analysed. The target team reside in a green-house while the control group in a conventional. 25 interviews were conducted until the saturation point was reached.	Hierarchical regression analysis and descriptive analyses	- The findings indicate that both conventional and green residents have relatively low environmental values. - Raising environmental values might not be powerful in the effort to convince homebuyers to purchase green apartments.

(*continued on next page*)

Table B (*continued*)

Author(s)	Research Journal	Theoretical model/ Conceptual model	Psychological/ demographic/ contextual Variables	Sample size and data collection	Data analysis method	Research findings
						- Focusing on the benefits of green building such as; thermal comfort and improvement in health are the important factors driving the choice for green apartments.

References

Abrahamse, Steg, 2011. 'Factors Related to Household Energy Use and Intention to Reduce it: the Role of Psychological and Socio-Demographic Variables', *Human Ecology Review*. Society for Human Ecology, pp. 30–40. https://doi.org/10.2307/24707684.

Achtnicht, 2011. Do environmental bene fi ts matter ? Evidence from a choice experiment among house owners in Germany. Ecol. Econ. 70 (11), 2191–2200. https://doi.org/10.1016/j.ecolecon.2011.06.026.

Achtnicht, Madlener, 2014a. Factors influencing German house owners' preferences on energy retrofits. Energy Pol. https://doi.org/10.1016/j.enpol.2014.01.006.

Achtnicht, Madlener, 2014b. Factors influencing German house owners' preferences on energy retrofits. Energy Pol. 68, 254–263. https://doi.org/10.1016/j.enpol.2014.01.006.

Aditya, et al., 2017. A review on insulation materials for energy conservation in buildings. Renew. Sustain. Energy Rev. 73, 1352–1365. https://doi.org/10.1016/J.RSER.2017.02.034.

Ajzen, 1985. From intentions to actions: a theory of planned behavior. In: Action Control. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 11–39. https://doi.org/10.1007/978-3-642-69746-3_2.

Ajzen, 1991. The Theory of Planned Behavior, ORGANIZATIONAL BEHAVIOR and HUMAN DECISION PROCESSES.

Akroush, et al., 2019. Determinants of purchasing intentions of energy-efficient products: the roles of energy awareness and perceived benefits. Int. J. Energy Sect. Manag. 13 (1), 128–148. https://doi.org/10.1108/IJESM-05-2018-0009.

Al-awsh, et al., 2020. Jo ur of. J. Clean. Prod., 124624 https://doi.org/10.1016/j.jclepro.2020.124624.

Al-Homoud, 2005. Performance characteristics and practical applications of common building thermal insulation materials. Build. Environ. 40 (3), 353–366. https://doi.org/10.1016/j.buildenv.2004.05.013.

Al-Shafi, Weerakkody, 2010. Factors affecting e-government adoption in the state of Qatar. Available at: https://bura.brunel.ac.uk/handle/2438/4395.

Alam, et al., 2014. Small-scale households renewable energy usage intention: theoretical development and empirical settings. Renew. Energy 68, 255–263. https://doi.org/10.1016/j.renene.2014.02.010, 2014.

Ali, et al., 2019. Determinants of consumer intentions to purchase energy-saving household products in Pakistan. Sustainability 11 (5), 1–20. https://doi.org/10.3390/su11051462.

Alzubaidi, Slade, Dwivedi, 2020. Examining antecedents of consumers' pro-environmental behaviours: TPB extended with materialism and innovativeness. J. Bus. Res. 1–15. https://doi.org/10.1016/j.jbusres.2020.01.017 (January).

Ameli, Brandt, 2015. Determinants of households' investment in energy efficiency and renewables: evidence from the OECD survey on household environmental behaviour and attitudes. Environ. Res. Lett. 10 (4) https://doi.org/10.1088/1748-9326/10/4/044015.

Amin, Rezaei, Abolghasemi, 2014. User satisfaction with mobile websites: the impact of perceived usefulness (PU), perceived ease of use (PEOU) and trust. Nankai Bus. Rev. Int. 5 (3), 258–274. https://doi.org/10.1108/NBRI-01-2014-0005.

Arli, et al., 2018. Exploring consumers' purchase intention towards green products in an emerging market: the role of consumers' perceived readiness. Int. J. Consum. Stud. 42 (4), 389–401. https://doi.org/10.1111/ijcs.12432.

Asdrubali, Moncada, Rotili, 2014. 'Influence of New Fac Tors on Global Energy Prospects in the Medium Term: Compar Ison Among the 2010, 2011 and 2012 Editions of the IEA's World Energy Outlook Reports'. ECONOMICS AND POLICY OF ENERGY AND THE ENVIRONMENT, pp. 67–89. https://doi.org/10.3280/EFE2013-003003, 3.

Baldini, Trivella, Wente, 2018. The impact of socioeconomic and behavioural factors for purchasing energy efficient household appliances: a case study for Denmark. Energy Pol. 120 (October 2017), 503–513. https://doi.org/10.1016/j.enpol.2018.05.048.

Bamberg, 2003. How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. J. Environ. Psychol. 23 (1), 21–32. https://doi.org/10.1016/S0272-4944(02)00078-6.

Barr, Gilg, Ford, 2005. The household energy gap: examining the divide between habitual- and purchase-related conservation behaviours. Energy Pol. 33 (11), 1425–1444. https://doi.org/10.1016/j.enpol.2003.12.016.

Berardi, 2017. The benefits of using aerogel-enhanced systems in building retrofits. Energy Proc. 134, 626–635. https://doi.org/10.1016/j.egypro.2017.09.576.

Bowden, Corkindale, 2005. Identifying the initial target consumer for innovations: an integrative approach. In: Marketing Intelligence and Planning. Emerald Group Publishing Limited, pp. 562–573. https://doi.org/10.1108/02634500510624129.

Caruana, et al., 2014. Overview of Testing Methodologies for Thermally Improved Hollow-Core Concrete Blocks, vol. 62. Energy Procedia, pp. 180–189. https://doi.org/10.1016/J.EGYPRO.2014.12.379.

Chan, et al., 2018. Critical barriers to green building technologies adoption in developing countries: the case of Ghana. J. Clean. Prod. 172, 1067–1079. https://doi.org/10.1016/j.jclepro.2017.10.235.

Chekima, et al., 2016. Examining green consumerism motivational drivers: does premium price and demographics matter to green purchasing? J. Clean. Prod. 112, 3436–3450. https://doi.org/10.1016/j.jclepro.2015.09.102.

Chen, 2014. Assessing the effects of customer innovativeness, environmental value and ecological lifestyles on residential solar power systems install intention. Energy Pol. 67, 951–961. https://doi.org/10.1016/j.enpol.2013.12.005, 2014.

Chen, Chai, 2010. Attitude towards the environment and green products:consumers' perspective. Manag. Sci. Eng. 4 (2), 27–39. https://doi.org/10.3968/j.mse.1913035X20100402.002.

Chen, Knight, 2014. Energy at work: social psychological factors affecting energy conservation intentions within Chinese electric power companies. Energy Res. Social Sci. 4 (C), 23–31. https://doi.org/10.1016/j.erss.2014.08.004.

Chen, Xu, Frey, 2016. Who wants solar water heaters and alternative fuel vehicles? Assessing social-psychological predictors of adoption intention and policy support in China. Energy Res. Social Sci. 15, 1–11. https://doi.org/10.1016/j.erss.2016.02.006.

Chen, Xu, Arpan, 2017a. Between the technology acceptance model and sustainable energy technology acceptance model: investigating smart meter acceptance in the United States. Energy Res. Social Sci. 25, 93–104. https://doi.org/10.1016/j.erss.2016.12.011.

Chen, Xu, Day, 2017b. Thermal comfort or money saving? Exploring intentions to conserve energy among low-income households in the United States. Energy Res. Social Sci. 26, 61–71. https://doi.org/10.1016/j.erss.2017.01.009.

Cheng, Lam, Hsu, 2006. Negative word-of-mouth communication intention: an application of the theory of planned behavior. J. Hospit. Tourism Res. 30 (1), 95–116. https://doi.org/10.1177/1096348005284269.

Choi, et al., 2014. The influence of national culture on the attitude towards mobile recommender systems. Technol. Forecast. Soc. Change 86, 65–79. https://doi.org/10.1016/J.TECHFORE.2013.08.012.

Darko, Chan, 2017. Review of barriers to green building adoption. Sustain. Dev. 25 (3), 167–179. https://doi.org/10.1002/sd.1651.

Davis, 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 13 (3), 319. https://doi.org/10.2307/249008.

Delmastro, Mutani, Corgnati, 2016. A supporting method for selecting cost-optimal energy retrofit policies for residential buildings at the urban scale. Energy Pol. 99, 42–56. https://doi.org/10.1016/j.enpol.2016.09.051.

Ding, et al., 2018. Factors affecting low-carbon consumption behavior of urban residents: a comprehensive review. Resour. Conserv. Recycl. 132 (August 2017), 3–15. https://doi.org/10.1016/j.resconrec.2018.01.013.

Eze, Ndubisi, 2013. Green buyer behavior: evidence from asia consumers. J. Asian Afr. Stud. 48 (4), 413–426. https://doi.org/10.1177/0021909613493602.

Fazio, 2007. Attitudes as object-evaluation associations of varying strength. Soc. Cognit. 25 (5), 603–637. https://doi.org/10.1521/soco.2007.25.5.603.

Fornara, et al., 2016. Predicting intention to improve household energy efficiency: the role of value-belief-norm theory, normative and informational influence, and specific attitude. J. Environ. Psychol. 45, 1–10. https://doi.org/10.1016/j.jenvp.2015.11.001.

Fujii, 2006. Environmental concern, attitude toward frugality, and ease of behavior as determinants of pro-environmental behavior intentions. J. Environ. Psychol. 26 (4), 262–268. https://doi.org/10.1016/j.jenvp.2006.09.003.

Gadenne, et al., 2011. The influence of consumers' environmental beliefs and attitudes on energy saving behaviours. Energy Pol. 39 (12), 7684–7694. https://doi.org/10.1016/j.enpol.2011.09.002.

Govindan, Shaw, Majumdar, 2021. Social sustainability tensions in multi-tier supply chain: a systematic literature review towards conceptual framework development. J. Clean. Prod. 279, 123075 https://doi.org/10.1016/j.jclepro.2020.123075.

Hawkins, 2007. In: Consumer Behavior: Building Marketing Strategy, tenth ed. McGraw-Hill/Irwin, New York.

He, et al., 2019. Factors influencing residents' intention toward green retrofitting of existing residential buildings. Sustainability 11 (15), 1–23. https://doi.org/10.3390/su11154246.
Higueras-Castillo, et al., 2019. Evaluating consumer attitudes toward electromobility and the moderating effect of perceived consumer effectiveness. J. Retailing Consum. Serv. 51 (May), 387–398. https://doi.org/10.1016/j.jretconser.2019.07.006.
Hong, 2013. Eco-friendly homes in Malaysia. J. Green Build. 8 (4), 146–163.
Hsu, Chang, Yansritakul, 2017. Exploring purchase intention of green skincare products using the theory of planned behavior: testing the moderating effects of country of origin and price sensitivity. J. Retailing Consum. Serv. 34, 145–152. https://doi.org/10.1016/J.JRETCONSER.2016.10.006.
Hu, Geertman, Hooimeijer, 2016. Personal values that drive the choice for green apartments in Nanjing China: the limited role of environmental values. J. Hous. Built Environ. 31 (4), 659–675. https://doi.org/10.1007/s10901-016-9494-5.
Huijts, Molin, Steg, 2012. Psychological Factors Influencing Sustainable Energy Technology Acceptance: A Review-Based Comprehensive Framework. Renewable and Sustainable Energy Reviews. Elsevier Ltd, pp. 525–531. https://doi.org/10.1016/j.rser.2011.08.018.
Jabeen, et al., 2019. Consumers' intention-based influence factors of renewable power generation technology utilization: a structural equation modeling approach. J. Clean. Prod. 237, 117737 https://doi.org/10.1016/j.jclepro.2019.117737.
Joshi, Rahman, 2015. Factors affecting green purchase behaviour and future research directions. Int. Strat. Manag. Rev. 3 (1–2), 128–143. https://doi.org/10.1016/J.ISM.2015.04.001.
Judge, Warren-Myers, Paladino, 2019. Using the theory of planned behaviour to predict intentions to purchase sustainable housing. J. Clean. Prod. 215, 259–267. https://doi.org/10.1016/j.jclepro.2019.01.029.
Kapoor, Dwivedi, 2020. Sustainable consumption from the consumer's perspective: antecedents of solar innovation adoption. Resour. Conserv. Recycl. 152 (May 2019), 104501 https://doi.org/10.1016/j.resconrec.2019.104501.
Kaveh, et al., 2018. An investigation into retrofitting the pre-1919 owner-occupied UK housing stock to reduce carbon emissions. Energy Build. 176, 33–44. https://doi.org/10.1016/j.enbuild.2018.06.038.
Kim, Han, 2010. Intention to pay conventional-hotel prices at a green hotel – a modification of the theory of planned behavior. J. Sustain. Tourism 18 (8), 997–1014. https://doi.org/10.1080/09669582.2010.490300.
Kowalska-Pyzalska, 2018. An empirical analysis of green electricity adoption among residential consumers in Poland. Sustainability 10 (7), 2281. https://doi.org/10.3390/su10072281.
Kuhe, Bisu, 2019. Influence of situational factors on household's energy consumption behaviour: towards an effective energy policy. Int. J. Energy Sect. Manag. 14 (2), 389–407. https://doi.org/10.1108/IJESM-03-2019-0017.
Kuo, Yen, 2009. Towards an understanding of the behavioral intention to use 3G mobile value-added services. Comput. Hum. Behav. 25 (1), 103–110. https://doi.org/10.1016/J.CHB.2008.07.007.
Kylili, Fokaides, 2017. Policy trends for the sustainability assessment of construction materials: a review. In: *Sustainable Cities and Society*. Elsevier Ltd, pp. 280–288. https://doi.org/10.1016/j.scs.2017.08.013.
Latha, Darshana, Venugopal, 2015. Role of building material in thermal comfort in tropical climates - a review. J. Build. Eng. 3, 104–113. https://doi.org/10.1016/j.jobe.2015.06.003.
Lester, 2013. Dedicating new real estate transfer taxes for energy efficiency: a revenue option for scaling up Green Retrofit Programs. Energy Pol. 62, 809–820. https://doi.org/10.1016/j.enpol.2013.07.050.
Li, Long, Chen, 2018. Differences and influencing factors for Chinese urban resident willingness to pay for green housings: evidence from five first-tier cities in China. Appl. Energy 229 (August), 299–313. https://doi.org/10.1016/j.apenergy.2018.07.118.
Lindén, Carlsson-Kanyama, Eriksson, 2006. Efficient and inefficient aspects of residential energy behaviour: what are the policy instruments for change? Energy Pol. 34 (14), 1918–1927. https://doi.org/10.1016/j.enpol.2005.01.015.
Liu, et al., 2018. Promoting green residential buildings: residents' environmental attitude, subjective knowledge, and social trust matter. Energy Pol. https://doi.org/10.1016/j.enpol.2017.10.020.
Liu, et al., 2019. Promoting green residential buildings by increasing homebuyers' willingness to pay: evidence from Sino-Singapore Tianjin Eco-city in China. J. Clean. Prod. 238, 117884 https://doi.org/10.1016/j.jclepro.2019.117884.
Long, 1993. An econometric analysis of residential expenditures on energy conservation and renewable energy sources. Energy Econ. 15 (4), 232–238. https://doi.org/10.1016/0140-9883(93)90012-G.
Lopes, et al., 2019. A new model for assessing industrial worker behavior regarding energy saving considering the theory of planned behavior, norm activation model and human reliability. Resour. Conserv. Recycl. 145 (February), 268–278. https://doi.org/10.1016/j.resconrec.2019.02.042.
Mahapatra, Gustavsson, 2008a. An adopter-centric approach to analyze the diffusion patterns of innovative residential heating systems in Sweden. Energy Pol. 36 (2), 577–590. https://doi.org/10.1016/j.enpol.2007.10.006.
Mahapatra, Gustavsson, 2008b. An adopter-centric approach to analyze the diffusion patterns of innovative residential heating systems in Sweden. Energy Pol. 36 (2), 577–590. https://doi.org/10.1016/j.enpol.2007.10.006.
Management, 2010. Ecological awareness , price and psychological wellbeing as main dimensions of senior citizens ' green sheltered housing buying intentions Israel Boxer * Hanna Oirik Menahem Gábor Rekettye. Business 12 (1), 86–101.
Medina, King, Zhang, 2008. On the heat transfer rate reduction of structural insulated panels (SIPs) outfitted with phase change materials. PCMs 33, 667–678. https://doi.org/10.1016/j.energy.2007.11.003.
Michelsen, Christian, Madlener, 2012. Homeowners' preferences for adopting innovative residential heating systems: a discrete choice analysis for Germany. Energy Econ. 34, 1271–1283. https://doi.org/10.1016/j.eneco.2012.06.009.
Mills, Schleich, 2012. Residential energy-efficient technology adoption, energy conservation, knowledge, and attitudes: an analysis of European countries. Energy Pol. 49, 616–628. https://doi.org/10.1016/j.enpol.2012.07.008.
Monroe, 1973. Buyers' subjective perceptions of price. J. Market. Res. 10 (1), 70. https://doi.org/10.2307/3149411.
Nair, Gustavsson, Mahapatra, 2010b. Owners perception on the adoption of building envelope energy efficiency measures in Swedish detached houses. Appl. Energy 87 (7), 2411–2419. https://doi.org/10.1016/j.apenergy.2010.02.004.
Nair, Gustavsson, Mahapatra, 2010a. Factors influencing energy efficiency investments in existing Swedish residential buildings. Energy Pol. 38 (6), 2956–2963. https://doi.org/10.1016/j.enpol.2010.01.033.
Nair, Mahapatra, Gustavsson, 2012. Implementation of energy-efficient windows in Swedish single-family houses. Appl. Energy 89 (1), 329–338. https://doi.org/10.1016/j.apenergy.2011.07.040.
Nikou, 2019. Factors driving the adoption of smart home technology: an empirical assessment. Telematics Inf. 45 (May), 101283 https://doi.org/10.1016/j.tele.2019.101283.
Ofek, Portnov, 2020. Differential effect of knowledge on stakeholders' willingness to pay green building price premium: implications for cleaner production. J. Clean. Prod. 251, 119575 https://doi.org/10.1016/j.jclepro.2019.119575.
Papadopoulos, 2005. State of the art in thermal insulation materials and aims for future developments. Energy Build. 37 (1), 77–86. https://doi.org/10.1016/J.ENBUILD.2004.05.006.
Parasuraman, 2000. Technology readiness index (Tri). J. Serv. Res. 2 (4), 307–320. https://doi.org/10.1177/109467050024001.
Pardalis, et al., 2019. Swedish house owners' intentions towards renovations: is there a market for one-stop-shop? Buildings 9 (7), 1–16. https://doi.org/10.3390/buildings9070164.
Pelenur, Cruickshank, 2012. Closing the Energy Efficiency Gap: a study linking demographics with barriers to adopting energy efficiency measures in the home. Energy 47 (1), 348–357. https://doi.org/10.1016/j.energy.2012.09.058.
Peng, 2016. Calculation of a building's life cycle carbon emissions based on Ecotect and building information modeling. J. Clean. Prod. 112, 453–465. https://doi.org/10.1016/J.JCLEPRO.2015.08.078.
Perri, Giglio, Corvello, 2020. Smart users for smart technologies: investigating the intention to adopt smart energy consumption behaviors. Technol. Forecast. Soc. Change 155 (February), 119991. https://doi.org/10.1016/j.techfore.2020.119991.
Pisello, et al., 2016. Experimental in-lab and in-field analysis of waterproof membranes for cool roof application and urban heat island mitigation. Energy Build. 114, 180–190. https://doi.org/10.1016/J.ENBUILD.2015.05.026.
Portnov, et al., 2018. Factors affecting homebuyers' willingness to pay green building price premium: evidence from a nationwide survey in Israel. Build. Environ. 137 (February), 280–291. https://doi.org/10.1016/j.buildenv.2018.04.014.
Prato, Schiavi, 2015. Sound insulation of building elements at low frequency: a modal approach. Energy Proc. 78, 128–133. https://doi.org/10.1016/J.EGYPRO.2015.11.127.
Prete, et al., 2017. Determinants of Southern Italian households' intention to adopt energy efficiency measures in residential buildings. J. Clean. Prod. 153 (13), 83–91. https://doi.org/10.1016/j.jclepro.2017.03.157.
Rahman, et al., 2017. Technology acceptance among micro-entrepreneurs in marginalized social strata: the case of social innovation in Bangladesh. Technol. Forecast. Soc. Change 118, 236–245. https://doi.org/10.1016/j.techfore.2017.01.027.
Rajaee, Hoseini, Malekmohammadi, 2019. Proposing a socio-psychological model for adopting green building technologies: a case study from Iran. Sustain. Cities Soc. 45 (May 2018), 657–668. https://doi.org/10.1016/j.scs.2018.12.007.
Rezaei, Ghofranfarid, 2018. Rural households' renewable energy usage intention in Iran: extending the unified theory of acceptance and use of technology. Renew. Energy 122, 382–391. https://doi.org/10.1016/j.renene.2018.02.011.
Rizzo, et al., 2018. Exploring the perceived image of energy efficiency measures in residential buildings: evidence from apulia, Italy. J. Clean. Prod. 197, 349–355. https://doi.org/10.1016/j.jclepro.2018.06.149.
Rogers, 2003. In: Diffusion of Innovations, fifth ed. Free Press, New York.
Rogers, Shoemaker, 1971. Communication of Innovations; A Cross-Cultural Approach. The Free Press, 866 Third Avenue, New York, N. Y, 10022 ($10.95).
Roy, 2007. Can consumers save energy? Results from surveys of consumer adoption and use of low and zero carbon technologies. Available at: https://www.researchgate.net/publication/42793604. (Accessed 11 April 2020).
Ru, Wang, Yan, 2018. Exploring the effects of normative factors and perceived behavioral control on individual's energy-saving intention: an empirical study in eastern China. Resour. Conserv. Recycl. 134 (96), 91–99. https://doi.org/10.1016/j.resconrec.2018.03.001.
Sang, et al., 2020. Influencing factors of consumers' willingness to purchase green housing: a survey from Shandong Province, China. Environ. Dev. Sustain. 22 (5), 4267–4287. https://doi.org/10.1007/s10668-019-00383-8.
Sardianou, 2007. Estimating energy conservation patterns of Greek households. Energy Pol. 35 (7), 3778–3791. https://doi.org/10.1016/j.enpol.2007.01.020.
Sayadi, et al., 2016. Effects of expanded polystyrene (EPS) particles on fire resistance, thermal conductivity and compressive strength of foamed concrete. Construct. Build. Mater. 112, 716–724. https://doi.org/10.1016/J.CONBUILDMAT.2016.02.218.
Schiavoni, et al., 2016. Insulation materials for the building sector: a review and comparative analysis. Renew. Sustain. Energy Rev. 62, 988–1011. https://doi.org/10.1016/J.RSER.2016.05.045.

Schill, et al., 2019. Consumers' intentions to purchase smart home objects: do environmental issues matter? Ecol. Econ. 161 (October 2018), 176–185. https://doi.org/10.1016/j.ecolecon.2019.03.028.
Shekarchian, et al., 2012. The cost benefit analysis and potential emission reduction evaluation of applying wall insulation for buildings in Malaysia. Renew. Sustain. Energy Rev. 16 (7), 4708–4718. https://doi.org/10.1016/j.rser.2012.04.045.
Shin, Park, Lee, 2018. Who will be smart home users? An analysis of adoption and diffusion of smart homes. Technol. Forecast. Soc. Change 134 (January), 246–253. https://doi.org/10.1016/j.techfore.2018.06.029.
Siegrist, Cvetkovich, Roth, 2000. Salient value similarity, social trust, and risk/benefit perception. Risk Anal. 20 (3), 353–362. https://doi.org/10.1111/0272-4332.203034.
Suki, Mohd, 2016. Consumer environmental concern and green product purchase in Malaysia: structural effects of consumption values. J. Clean. Prod. 132, 204–214. https://doi.org/10.1016/J.JCLEPRO.2015.09.087.
Sun, Tai, Tsai, 2010. Perceived ease of use in prior e-commerce experiences: a hierarchical model for its motivational antecedents. Psychol. Market. 27 (9), 874–886. https://doi.org/10.1002/mar.20362.
Swinerd, McNaught, 2015. Comparing a simulation model with various analytic models of the international diffusion of consumer technology. Technol. Forecast. Soc. Change 100, 330–343. https://doi.org/10.1016/J.TECHFORE.2015.08.003.
Tan, 2013. Use of structural equation modeling to predict the intention to purchase green and sustainable homes in Malaysia. Asian Soc. Sci. 9 (10), 181–191. https://doi.org/10.5539/ass.v9n10p181.
Tan, Goh, 2018. The role of psychological factors in influencing consumer purchase intention towards green residential building. Int. J. Hous. Mark. Anal. 11 (5), 788–807. https://doi.org/10.1108/IJHMA-11-2017-0097.
Torgler, Garcia-Valiñas, Macintyre, 2011. Differences in preferences towards the environment: the impact of a gender, age and parental effect. SSRN Electron. J. https://doi.org/10.2139/ssrn.1105320.
Tovar, 2012. The structure of energy efficiency investment in the UK households and its average monetary and environmental savings. Energy Pol. 50, 723–735. https://doi.org/10.1016/j.enpol.2012.08.019.
UBP, 2015. Technical Specifications- Concrete Blocks Production. The United Basalt Products Ltd, Mauritius.
Urban, Ščasný, 2012. Exploring domestic energy-saving: the role of environmental concern and background variables. Energy Pol. 47, 69–80. https://doi.org/10.1016/j.enpol.2012.04.018.
Uriarte, et al., 2019. Energy & Buildings Vacuum insulation panels in construction solutions for energy efficient retrofitting of buildings . Two case studies in Spain and Sweden. Energy Build. 197, 131–139. https://doi.org/10.1016/j.enbuild.2019.05.039.
Vahdat, et al., 2020. Would you like to shop via mobile app technology? The technology acceptance model, social factors and purchase intention. Australas. Market J. (xxxx), 1–10. https://doi.org/10.1016/j.ausmj.2020.01.002.
Venkatesh, 2000. Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. Inf. Syst. Res. 11 (4), 342–365. https://doi.org/10.1287/isre.11.4.342.11872.
Venkatesh, Thong, Xu, 2012. Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2002388. (Accessed 12 June 2019).
Veríssimo, 2016. Enablers and restrictors of mobile banking app use: a fuzzy set qualitative comparative analysis (fsQCA). J. Bus. Res. 69 (11), 5456–5460. https://doi.org/10.1016/j.jbusres.2016.04.155.
Wang, et al., 2019. Purchasing intentions of Chinese consumers on energy-efficient appliances: is the energy efficiency label effective? J. Clean. Prod. 238, 117896 https://doi.org/10.1016/j.jclepro.2019.117896.
Wang, Hazen, 2016. Consumer product knowledge and intention to purchase remanufactured products. Int. J. Prod. Econ. 181, 460–469. https://doi.org/10.1016/J.IJPE.2015.08.031.
Webber, Gouldson, Kerr, 2015. The impacts of household retrofit and domestic energy efficiency schemes: a large scale, ex post evaluation. Energy Pol. 84, 35–43. https://doi.org/10.1016/J.ENPOL.2015.04.020.
White, Baker, Al-Gahtani, Hubona, 2007. The effects of gender and age on new technology implementation in a developing country. Inf. Technol. People 20 (4), 352–375. https://doi.org/10.1108/09593840710839798.
Wong, Lau, 2013. From the "urban heat island" to the "green island"? A preliminary investigation into the potential of retrofitting green roofs in Mongkok district of Hong Kong. Habitat Int. 39, 25–35. https://doi.org/10.1016/j.habitatint.2012.10.005.
Ye, et al., 2015. Developments of Green Building Standards in China. Renewable Energy. https://doi.org/10.1016/j.renene.2014.05.014.
Zahan, et al., 2020. Green purchase behavior towards green housing: an investigation of Bangladeshi consumers. Environ. Sci. Pollut. Control Ser. 27 (31), 38745–38757. https://doi.org/10.1007/s11356-020-09926-3.
Zelezny, Chua, Aldrich, 2000. New ways of thinking about environmentalism: elaborating on gender differences in environmentalism. J. Soc. Issues 56 (3), 443–457. https://doi.org/10.1111/0022-4537.00177.
Zhang, et al., 2016. The role of public information in increasing homebuyers' willingness-to-pay for green housing: evidence from Beijing. Ecol. Econ. 129, 40–49. https://doi.org/10.1016/j.ecolecon.2016.05.010.
Zhang, et al., 2018. Investigating young consumers' purchasing intention of green housing in China. Sustainability 10 (4), 1–15. https://doi.org/10.3390/su10041044.
Zhang, Fukuda, Liu, 2019. Households' willingness to pay for green roof for mitigating heat island effects in Beijing (China). Build. Environ. 150 (December 2018), 13–20. https://doi.org/10.1016/j.buildenv.2018.12.048.
Zhang, Xiao, Zhou, 2020. Willingness to pay a price premium for energy-saving appliances: role of perceived value and energy efficiency labeling. J. Clean. Prod. 242, 118555 https://doi.org/10.1016/j.jclepro.2019.118555.
Zuo, Zhao, 2014. Green building research-current status and future agenda: a review. Renew. Sustain. Energy Rev. 30, 271–281. https://doi.org/10.1016/J.RSER.2013.10.021.