

A Systematic Review of Literature on Household Consumers' Intentions of Buying Energy-saving Home Appliances

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Abstract

Growing economies, better living standards and technological advancements are all fueling the energy demand. Rampant energy consumption is driving the big wheel of environmental deterioration. To counter the ascending carbon footprints and achieve the sustainability, household sector can make valuable contribution by using environment friendly, energy-saving home appliances. Motive behind this study is to interrogate the existing literature on household consumers' purchase intentions towards energy-saving appliances, to highlight emerging issues and map out landscape for future researchers. A three stage approach of systematic review was employed by scoping the subject area, executing the research plan and reporting the results. After careful scrutiny of publications from the recent decade, selected studies were analyzed and summarized. The results show that the extant literature covers limited behavioral antecedents and geographical limitations. This study contributes to the body of knowledge by finding gaps in research methodology, highlighting theoretical and geographical limitations and providing suggestions for future research.

Keywords: Energy saving behavior; Household economics; Energy Efficient Household Appliances; Consumer Purchase Intentions; Systematic Review; Consumer Behavior.

Introduction

World is at the forefront of technological advancement with the aim of building systems that are smart, affordable and efficient. 21st century has witnessed computers size of a room turning into smart chips fitted in the palms of our hands (Rojas-Méndez, Parasuraman, & Papadopoulos, 2017). Similarly home appliances industry is entering a new era of technological innovation followed by a multibillion dollar increase in demand every year (Research & Markets, 2018). Increasing ownership of these appliances is directly adding to energy consumption worldwide. This poses serious challenges for environment conservation and achieving sustainability goals (Ali, Ullah, Akbar, & Akhtar, 2019).

Growing economies, better living standards, technological innovations and changes in social structure all are catalyst for billions of household appliances owned around the globe (Urge-Vorsatz et al., 2018; Wang, Wang, Guo, et al., 2017). Every year alone in China, 5

million TVs and 4 million refrigerators are being replaced (speed, Ma, speed, & Zhang, 2013). Major household appliances' (AC, TV, Refrigerator, and Fan) ownership rates are more than 85% per home in developed countries like USA, EU, etc. Similar trends are now expected in other developing countries e.g., India, home to more than 1 billion people is projected to have electric fans, mobile phones, TV and refrigerators in every household by 2030 (Parikh & Parikh, 2016).

At the value of \$7 trillion, energy sector is most valuable market on earth (International Energy Agency, 2017). Household sector is contributing 31% of total energy consumption in the world (Ali et al., 2019; Urge-Vorsatz et al., 2018). A recent research projects that global home appliances industry will reach the value of 342.82 billion USD till 2022 by growing at 6% annually (Research & Markets, 2018). Prior researches point that major demand of these home appliances will be generated from developing countries. Furthermore, climate change and its awareness among masses is dramatically transforming this industry where consumers are demanding environment friendly and energy efficient appliances (Orbis Reseach, 2018; Research & Markets, 2018).

Energy consumption is one of the main reasons of environmental deterioration and billions of these home appliances are adding to this grave threat by consuming electricity and emitting harmful greenhouse gases in the air (Oreskes, 2005; Skogen, Helland, & Kaltenborn, 2018). Combating climate change and achieving sustainability is top priority for current and future generations (Environmental Protection Agency, 2018; Rafique & Rehman, 2017). Researchers have pointed that use of energy efficient home appliances is one of the quickest and most effective solution towards the pursuit of sustainability (Sorrell, 2015; Zhou & Yang, 2016).

Given the volume of this multibillion dollar industry, transforming trends in demand and as a solution towards environmental conservation, a number of researchers have burnt their energies to understand "residents' behavioral antecedents towards energy efficient household appliances". Despite a recent influx of studies on this topic, there is a deficiency to provide an overview of research findings anchoring the synthesis of investigations to understand residents' buying intentions of such appliances, their actual usage, energy saving potential and estimates of greenhouse gases reduction by use of these appliances. Furthermore, a thorough investigation is required to illuminate the unique context of developing countries, where energy demand is increasing manifold. Domestic consumers' behavior towards energy efficient appliances as a topic of research demands for a broader perspective examination. In pursuit of this goal, our study aims to

provide a road map of the existing knowledge and empirical evidence from scholastic work by employing a systematic review of available academic literature. Hence, this study will not only present the existing research gap but also provide future research directions for academicians and practitioners.

Methodology

To evaluate current literature, investigate existing research gaps and suggest paths for future studies, this review paper has adopted systematic review method. This type of review provides an entire and comprehensive synopsis of literature on a specific research topic by accessing relevant articles from different research databases (Kim & Lee, 2018). A systematic comprehension and synthesis of prior studies (Okoli, 2015) will enable us to sketch an array of factors affecting residents' intention to buy and actual use of energy efficient household appliances, and their impact on environment. This will eventually guide us to identify gaps from a broader landscape. Review method by Tranfield, Denyer and Smart (2003) by conducting review in three stages was followed. Further, instructions by Siddaway (2014) were applied for this systematic review. At the first stage 'planning and scoping' of the research topic in broader terms was done and then execution of plan, searching, screening and synthesis was done at the second stage. Finally at the third stage results were compiled and reported.

In the planning phase, main concept covering area of interest namely "residents' behavioral antecedents towards energy efficient household appliances" was identified; further search terms were created in order to collect all applicable research articles. Search terms included "household energy saving behavior", "energy efficient household appliances", "electricity saving potential of household appliances", "consumer intentions to buy energy efficient household appliances", "Contribution of household energy efficient appliances towards environmental conservation" and "sales of energy efficient household appliances". For "household" alternative terms "Residents" and "Domestic users" were also used in order to find all relevant papers.

At next stage, initial search was conducted in major databases known as Web of Science, Science Direct and Taylor & Francis but was extended to other databases like MDPI, Emerald, and Springer. Finally we employed Google Scholar so that all relevant research articles should be collected (Ali, Halim, & Bt, 2016). Exclusion process was executed by following screening criteria: articles not written in English, articles in which the terms "consumer behavior", "energy efficiency" and "household appliances" were not studied as a major theme or just treated as a marginal topic. The data capturing time period was set from 2009 till June 2019. This screening process eventually resulted in collection of 21 articles on which we performed full text

review.

Literature Review

Ek and Soderholm Patrik (2010) investigated the relationship between household energy saving behavior and role of information in Sweden. To know the household intentions of saving energy, economic and norm based motivators were employed by targeting 1200 Swedish homes. Costs of energy efficient appliances, environmental attitudes of residents and social interactions were found to have strong impact on household towards such behavior. Further, bounded rationality and status quo were also proved as important influencers. Empirical evidence supported that by increasing useful information, positive energy saving household behavior can be achieved.

Bradford and Mills (2009) conducted a study in Germany to examine the relationship between energy labeling and purchase propensity of energy efficient household appliances. Findings reveal that lack of knowledge towards energy labeling negatively influence the purchase propensity of household consumers. Given that residents have proper knowledge of energy consumption labeling, higher electricity prices positively influence residents to buy energy saving appliances but residents' socio economic profiles play very less role in this regard. To identify the factors that constraint the adoption of residential energy-efficient practices, Niemeyer (2010) investigated 800 households in Nebraska USA. Knowledge, attitudes, beliefs, economic constraints and financial needs were taken as predicting variables. Results of the study indicate that behavioral practices are main constraint towards using energy efficient. Author also found that behavioral intentions are often inconsistent with attitudes. In order to overcome these constraints, educational programs can play a vital role by shaping positive attitudes and norms.

Sonnenberg, Erasmus and Donoghue (2011) focused on how environmental sustainability issues are impacting consumer choices of buying energy efficient household appliances. Study focused 446 urban households in South Africa. Findings of this research show that consumers prefer functionality of the product over its aesthetic appearance and price. They are also concerned about how these products can save the deteriorating environment. Product durability, running costs and energy saving potential of such products influence their buying decisions. But consumers have less favorable attitude towards recycled products. Chinese households' attitudes on energy-saving appliances were examined by Ma, speed and Zhang (2011). Data collected from urban residents indicate that in general, household consumers are well aware of energy related issues and government policies. But when it comes to specific knowledge of these challenges and policies, they are not fully knowledgeable. Although residents had positive

response towards energy saving behavior yet they are not willing to sacrifice their comfort in this pursuit. In order to overcome this obstacle, author concluded that government should provide incentives to energy efficient appliances manufacturer and household consumers.

Research by Gaspar and Antunes (2011) seek to understand the characteristics and factors that influence purchase of electrical home appliances in Europe. Authors found that household consumers' general attitudes towards environment have no relationship with their intention to buy energy efficient appliances. Same was the case with their education level. But specific knowledge towards energy issues, consumption problems, and peculiar ecology concerns have positive association with such purchase behaviors. Further it is found that trained sales person also positively lead towards buying intentions of energy saving home appliances.

To predict South Korean household consumers' intentions of purchasing energy efficient appliances, Ha and Janda (2012) conducted a study by extending "Theory of reasoned Action" (TRA). Consumers' knowledge and beliefs towards energy efficient home appliances, environmental awareness and confidence of sequence were included in classic model of TRA. Findings of study revealed that Attitude is the most significant predictor of household consumers' intentions of buying energy saving appliances. Further that consumer beliefs and confidence on consequences positively influence attitude. Speed et al., (2013) focused energy efficient household appliances in China through investigation of consumer attitudes towards energy savings. Results showed that residents had very little knowledge of energy saving behavior at home and the potential of energy savings by the use of efficient home appliances. They were also not aware of government incentive policies for the purchase of energy saving products. But household consumers showed willingness to use such appliances depending upon different factors. Two of which are economic (discounts) and high prices of electricity.

Taking their research further, Mills et al., (2013) conducted another study in 2013 to examine how energy conservation knowledge and attitudes impact adoption of energy efficient technologies in household sector. They targeted a larger data set of 5000 households from European Union countries. Knowledge of energy saving technologies and energy consumption found to have association with energy conservation practices but it did not found to contribute towards adoption of energy saving products. On the other hand household characteristics and socio economic factors proved to be strong influencer. For example, younger consumers found to have favorable attitude towards adoption of energy efficient appliances as they care more for environment while older people focused on financial

savings only. Households from less developed EU countries had lower levels of energy efficiency adoption as compared to developed countries of EU. Results also indicate that education plays an important role as respondents with higher education levels showed favorable response towards adoption of energy saving household appliances.

Alam et al., (2014) examined the households' renewable energy usage intentions in Malaysia. A theoretical triangulation was employed by integrating TPB and "technology acceptance model" (TAM). Results predicted that perceived ease of use and perceived behavioral control (PBC) positively impact households' intentions to use energy saving home products. Moreover, lesser costs and higher knowledge of such products had also positive impact on usage intentions. Wang, Zhang, and Li (2014) applied an extension of "theory of planned behavior" (TPB). They selected urban household population of Beijing for data collection purpose and results of empirical analysis highlighted key determinants of such intentions namely as subjective norms, PBC and environment related attitudes. Researchers also analyzed demographic factors but found no positive association with intentions of buying energy efficient home appliances.

A noteworthy contribution in the context of potential savings by energy efficient household appliances was done by Parikh and Parikh (2016). But this study does not focus the behavioral aspect towards such appliances. Authors have focused past data to estimate the potential of energy savings by using efficient home appliances and reductions in greenhouse gases in India. Authors selected four main electric home appliances namely air conditioners, refrigerators, televisions and fans. Results of study show that these four appliances can save 52 bKwh to 145 bKwh by 2030 which accumulates 10 to 27% energy savings. Similarly, a 30% of reduction can be achieved in carbon emissions by 2030 by the use of energy efficient version of these four appliances.

Nguyen and Lobo (2016) studied energy efficient household appliances in the context of emerging markets. 682 Vietnamese residents participated in a survey to investigate purchase behavior towards the energy efficient products. An integration of motivational and cognitive predictors was employed and results of study show that residents' with egoistic values are negatively intended to buy energy efficient appliances while biospheric and altruistic values positively influence such intentions. Moreover, attitude and knowledge also plays significant positive role. Pro environmental behavior is examined in the context household energy saving behavior by Pothitou, Hanna and Chalvatzis, (2016) in United Kingdom. Authors tried to understand the impact of environment and energy saving related knowledge of residents on their energy saving

behavior. Results of data analysis indicated positive correlation between environment related knowledge, values and residents energy saving attitudes & behaviors. Further analysis showed that ownership of energy efficient home appliances varies according to gender and employment status.

In Malaysia, Tan, Ooi and Goh (2017) extended TPB by adding moral norms, environmental concern and knowledge. Results showed that attitude and PBC are key determinant of consumers' purchase intentions towards energy efficient household appliances. But subjective norms were not proved to have any significant influence on such intentions. In order to understand motivations that drive sustainable energy saving behavior, Park and Jib (2017) conducted a study in South Korea. Data was collected from 1050 household consumers by using interviews and survey method. Results indicate that intention of using energy efficient appliances leads towards their actual usage. And perceived value of products is positively associated with intentions of buying energy saving home appliances.

Wang, Wang, and Guo (2017) analyzed whether government subsidies for buying energy efficient home appliances work or not. Urban population of 22 Chinese provinces was targeted and data was collected from 436 households. Findings show that Chinese government's environmental policy, subsidies and media propaganda for energy savings did not have much impact on residents' intention of buying energy efficient appliances. On the other hand, past experience of buying such products and social relationships are significantly correlated with such purchase intentions. Analysis of demographic factors indicates that younger age and higher level of education also exert positive influence on such buying intentions. Authors suggested that government subsidies should be used by keeping in mind certain factors like timing (season), method and object of subsidy. These can improve the impacts of subsidies on consumer intentions of buying energy efficient home appliances.

Elsamen, Akroush and Asfour (2018) added environmental awareness, perceived performance risk and perceived financial risk in the classic model of TRA. Attitude was again found to be the main influencer while positive impact of environmental awareness on subjective norms found to reduce perceived risk of performance and finance. Li, Li, Jin and Wang (2019) focused purchase intentions of residents of Shanxi, China by applying TPB. H. Li and Shanyong (2019) employed TPB and TAM and collected online data from Chinese household consumers. Perceived ease of use along with other variables of TPB was proved to have strong impact on household consumers' purchase intentions towards energy-saving appliances.

To check how residents' technology readiness impact their energy-saving intentions Ali et al., (2019) integrated 'Technology Readiness Index' (TRI) into TPB. Data was collected from urban centers of Pakistan and PLS-SEM was employed for data analysis purpose. The results of this empirical study showed that technological aspects of consumers' behavior are very important to predict the

households' intention of buying energy-saving appliances. "Innovativeness and Optimism" found to have positive influence while "Discomfort and Insecurity" proved to be an inhibitor towards intentions of buying environment friendly electric appliances.

Table 1: List of Reviewed Studies

Author	Country	Title	Findings
Ek and Soderholm Patrik (2010)	Sweden	"The devil is in the details: Household electricity saving behavior and the role of information"	Results of study indicate that cost of energy efficient household appliances, residents' environmental attitudes and social interactions play important role towards their energy saving behavior.
Niemeyer (2010)	USA	"Consumer voices: adoption of residential energy-efficient practices"	Authors found that behavior is often inconsistent with attitudes. There is a range of psychological factors that become a barrier towards adoption of energy saving technologies, products and behavior.
Bradford and Mills (2009)	Germany	"What's Driving Energy Efficient Appliance Label Awareness and Purchase Propensity"?	Energy Labeling on electricity products plays an important role in forming residents' knowledge of such products which eventually positively associate their intentions of actual purchase while socioeconomic factors play little role towards such intentions.
Sonnenberg et al., (2011)	South Africa	"Significance of environmental sustainability issues in consumers' choice of major household appliances in South Africa"	Researchers found that functionality of energy saving appliances and environmental friendliness were main factors influencing purchase decisions. But price and aesthetic features of products did not have much impact.

Ma et al., (2011)	China	“Study on Chinese consumer attitudes on energy-saving household appliances and government policies: based on a questionnaire survey of residents in Chongqing, China”	Findings of this study reveal that three factors affect household consumers' intention of using energy efficient appliances, including brand of product, price and energy consumption index.
Gaspar and Antunes (2011)	Europe	“Energy efficiency and appliance purchases in Europe: Consumer profile and choice determinants”	Authors identified three main factors which affect purchasing decisions of household appliances, cost, quality and energy consumption levels. Further, environmental attitude is negatively associated with energy label class.
Ha and Janda (2012)	South Korea	“Predicting consumer intentions to purchase energy-efficient products”	The authors of this study found that household consumers' attitudes are the main determinant of their intention to buy energy saving products. These attitudes are positively formed by beliefs and knowledge of such products and environment.
Speed et al., (2013)	China	“Chinese consumer attitudes towards energy saving: The case of household electrical appliances in Chongqing”	Results of this study show that citizens are very less informed about energy saving behaviors and benefits of energy efficient appliances. But they are willing to use such products without compromising their comfort and convenience.

Mills et al., (2013)	Europe	“Residential Energy-Efficient Technology Adoption, Energy Conservation, Knowledge, and Attitudes: An Analysis of European Countries”	Consumer characteristics like age, income and education explain their energy efficient technologies adoption behavior. Knowledge of such appliances is positively associated with energy saving practices.
Alam et al., (2014)	Malaysia	“Small-scale households renewable energy usage intention: Theoretical development and empirical settings”	Perceived ease of use, awareness, perceived behavioral control and environmental knowledge have positive impact on residents' intention of buying energy efficient appliances.
Wang et al., (2014)	China	“Determinants of energy-saving behavioral intention among residents in Beijing: Extending the theory of planned behavior”	Researchers assert that demographic factors are not determinants of energy saving behavior. But subjective norms, attitude, information publicity and life style significantly impact such behavior.
Parikh and Parikh (2016)	India	“Realizing potential savings of energy and emissions from efficient household appliances in India”	Authors projected the potential of electricity savings by using energy efficient appliances and its effect on carbon emissions. They concluded that these appliances can save 10 -27% electricity and can reduce upto 30% carbon emissions.
Nguyen and Lobo (2016)	Vietnam	“Energy efficient household appliances in emerging markets: the influence of consumers' values and knowledge on their attitudes and purchase behavior”	Residents' with egoistic values are negatively intended to buy energy efficient appliances while biospheric and altruistic values positively influence such intentions. Attitude and knowledge also play significant positive role.

Pothitou et al., (2016)	United Kingdom	“Environmental knowledge, pro-environmental behaviour and energy savings in households: An empirical study”	Results based on empirical survey show that residents with positive environmental values and greater environmental knowledge are more likely to display energy saving behavior and have intentions of using energy efficient products at home.
Tan, Ooi, and Goh (2017)	Malaysia	“A moral extension of the theory of planned behavior to predict consumers’ purchase intention for energy-efficient household appliances in Malaysia”	Study revealed that attitude is the strongest predictor of consumers' intention of buying energy efficient appliances, while perceived behavioral control is also an important determinant of such intention.
Park and Jib (2017)	South Korea	“What motivations drive sustainable energy-saving behavior?: An examination in South Korea”	The results of this empirical study indicate that perceived value of energy efficient appliances is main determinant of actual usage and it is strengthened by social responsibility. While perceived value and perceived risk moderates each other.
Wang, Wang, and Guo, (2017)	China	“Policy implications of the purchasing intentions towards energy-efficient appliances among China’s urban residents: Do subsidies work”?	Environment policy and media propaganda did not had much impact on sales of energy efficient household appliances but past purchase experiences, environmental awareness, age, education level and social relationships have direct positive impact on such purchase intentions.

Elsamen, Akroush, and Asfour (2018)	Jordan	"Understanding contextual factors affecting the adoption of energy-efficient household products in Jordan"	A positive association between attitude and residents' purchase intentions for energy-saving appliances was confirmed. While positive impact of environmental awareness on subjective norms found to reduce perceived risk of performance and finance.
Li et al., (2019)	China	"Influence of Environmental Concern and Knowledge on Households' Willingness to Purchase Energy-Efficient Appliances: A Case Study Shanxi, China"	Study showed that environmental concern and knowledge indirectly affect residents' willingness by positively and directly affecting their attitudes to buy energy saving home products. Furthermore, PBC also significantly shapes this behavior in positive direction.
Ali et al., (2019)	Pakistan	"Determinants of Consumer Intentions to Purchase Energy-Saving Household Products in Pakistan"	The results of this empirical study showed that contributors of technology readiness "Innovativeness and optimism" positively influence residents' attitude while inhibiting traits "discomfort and insecurity" negatively impact attitude towards purchase of energy-saving home appliances.
Li and Shanyong (2019)	China	"Antecedents of Consumers' Intention to Purchase Energy- Efficient Appliances: An Empirical Study Based on the Technology Acceptance Model and Theory of	Consumers' personal consumption behaviors are negatively impacting environment. "Perceived ease of use along with other variables of TPB have positive effect on household consumers' purchase intentions towards energy - saving appliances.

Results and Research Gaps

Review of above studies presents different valuable insights into the factors explaining the determinants of consumer intentions towards buying energy-saving household appliances. However, given the importance of energy efficient household appliances to residential, environmental, industrial, economic and social well-being, considerable opportunities are there to further explore the antecedents that propel consumers' intentions to buy these appliances. Systematic review of existing literature enables us to find notable gaps that can be addressed in future research under consumer behavior domain.

Over the last two decades, much has been written about the predictors of consumer intentions to adopt energy saving home appliances in developed countries e.g., Ireland, Sweden, USA, Germany, Europe, South Korea, and United Kingdom (See Table 1). Apart from above studies, few notable researches have been conducted in China, Malaysia, Vietnam and South Africa. Yet developing nations have been predominately ignored so far. According to International Energy Agency (2017), World energy demand has grown from 10000 (Mtoe) in 2000 to 13760 (Mtoe) in 2016 and it is expected to rise at 30% until 2040. Most of this will come from China, India, developing Asian, African and Latin American countries. So far there have been very few studies conducted in India regarding energy efficient household appliances and that too focused the energy saving potential of these appliances (Parikh & Parikh, 2016). Hence there is a need to investigate the determinants of household consumers' intentions to buy such appliances in developing nations of India, Pakistan, Bangladesh, Mexico, Nigeria and other developing nations. Many Researchers have found that results of previous studies cannot be generalized from one country to other because of differences in socioeconomic conditions, cultural, political and country specific contexts (Alam et al., 2014; Park & Kwon, 2017).

In terms of demographic influencers towards adoption of energy saving home appliances, researchers have observed that young people tend to have favorable attitudes than other age segments (Mills & Schleich, 2013). Yet prior studies have targeted multiple age groups. But there is a need to specifically study young consumers' behavior towards eco friendly energy saving home appliances. From the methodological standpoint, a large body of previous research on this topic has collected data from urban population and rural areas have been neglected so far. Yet they form a considerable portion of total world population (UNDSEA, 2018; United Nations, 2013). So future researches can draw a mix sample from both urban and rural centers and try to identify how they differ in terms of their preferences to purchase energy efficient home appliances.

Researchers have observed that technological advancements have given birth to new consumer behaviors (Parasuraman & Colby, 2015; Walczuch, Lemmink, & Streukens, 2007) and energy saving household appliances are a result of technological advancements (Lester, 2015). Majority of the pro environmental, energy saving behavior research has focused on the role of values, attitudes, beliefs, and personal norms in shaping household electricity saving behavior. However, among these studies, a less-studied research area is an individual's readiness to use new technological oriented energy efficient household appliances. So there is need to understand residents' energy saving behavior by applying technology related personality traits. Moreover, researchers can also apply traditional personality models (like big five personality traits) to enhance their understandings of what factors motivate and drive consumer intentions to buy these appliances.

To date, past consumer behavior researchers have employed the “theory of reasoned action” (TRA) and “theory of planned behavior” (TPB) to investigate contextual antecedents of behavior (Alam et al., 2014; Ha & Janda, 2012; Park & Kwon, 2017; Tan et al., 2017; Wang, Wang, & Guo, 2017; Wang et al., 2014). So, future researchers can use other well known information system (IS) theories to further explore antecedents of this behavior. There can be several missing motivations that may show significant effects on consumers' adoption behavior. Tajamul Islam (2016) has pointed that religion also plays important role in forming pro environmental behavior. This creates an acute area of interest for future studies to investigate that how religion impacts household' intentions of buying energy efficient appliances. To further explore this subject area, future researchers can also try to investigate household residents' decision making styles while purchasing energy-saving appliances.

References

- Alam, Syed Shah, Nik Hazrul Nik Hashim, Mamunur Rashid, Nor Asiah Omar, Nilufar Ahsan, and Md Daud Ismail. 2014. “Small-Scale Households Renewable Energy Usage Intention: Theoretical Development and Empirical Settings.” *Renewable Energy* 68: 255–63. <https://doi.org/10.1016/j.renene.2014.02.010>.
- Ali, Saqib, Fairol Halim, and Norzieiriani Bt. 2016. “The State of Halal Cosmetic Research on Consumer Behavior? : A Systematic Review of the Literature and Future Research Directions” 1 (4): 40–51.
- Ali, Saqib, Habib Ullah, Minhas Akbar, and Waheed Akhtar. 2019. “Determinants of Consumer Intentions to Purchase Energy-Saving Household Products in Pakistan,” *Sustainability* 1–20.

<https://doi.org/10.3390/su11051462>.

- Amjad A. Abu-Elsamen, Mamoun N. Akroush, Nermeen A. Asfour, Hana Al Jabali. 2018. "Understanding Contextual Factors affecting the Adoption of Energy-efficient Household Products in Jordan." *Sustainability* <https://doi.org/10.1108/SAMPJ-05-2018-0144>.
- Andrews-speed, Philip, Guo Ma, Philip Andrews-speed, and Jiandong Zhang. 2013. "Chinese Consumer Attitudes towards Energy Saving? : The Case of Household Electrical Appliances in Chongqing Chinese Consumer Attitudes towards Energy Saving? : The Case of Household Electrical Appliances in Chongqing." *Energy Policy* 56 (January 2018): 591–602. <https://doi.org/10.1016/j.enpol.2013.01.024>.
- Ek, Kristina, and P. Söderholm Patrik. 2010. "The Devil Is in the Details: Household Electricity Saving Behavior and the Role of Information." *Energy Policy* 38 (3): 1578–87. <https://doi.org/10.1016/j.enpol.2009.11.041>.
- Environmental Protection Agency. 2018. "Global Greenhouse Gas Emissions Data | Greenhouse Gas (GHG) Emissions | US EPA." <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>.
- Gaspar, Rui, and Dalila Antunes. 2011. "Energy Efficiency and Appliance Purchases in Europe: Consumer Profiles and Choice Determinants." *Energy Policy* 39 (11): 7335–46. <https://doi.org/10.1016/j.enpol.2011.08.057>.
- Ha, Hong Youl, and Swinder Janda. 2012. "Predicting Consumer Intentions to Purchase Energy-Efficient Products." *Journal of Consumer Marketing* 29 (7): 461–69. <https://doi.org/10.1108/07363761211274974>.
- International Energy Agency. 2017. "World Energy Outlook 2017." INTERNATIONAL ENERGY AGENCY Together Secure Sustainable Executive: 13. [https://doi.org/10.1016/0301-4215\(73\)90024-4](https://doi.org/10.1016/0301-4215(73)90024-4).
- Kim, Minjin, and Heejin Lee. 2018. "Mobile Financial Services , Financial Inclusion , and Development? : A Systematic Review of Academic Literature," . *The Electronic Journal of Information Systems in Developing Countries* 84, no. 5 (2018): e12044. <https://doi.org/10.1002/isd2.12044>.
- Lester, Paul. 2015. "Future Home Tech: Energy-Saving Solutions on the Horizon | Department of Energy." United States Department of Energy: Washington, DC, USA, 2015. <https://www.energy.gov/articles/future-home-tech-8-energy-saving-solutions-horizon>.
- Li, Guomin, Wei Li, Zihan Jin, and Zhihao Wang. 2019. "Influence of Environmental Concern and Knowledge on Households' Willingness to Purchase Energy-Efficient Appliances: A Case Study in Shanxi, China." *Sustainability (Switzerland)* 11 (4): 1–18. <https://doi.org/10.3390/su11041073>.
- Li, Hua, and Wang, Shanyong. 2019. "Sustainability, Vol. 11, Pages 2994: Antecedents of Consumers' Intention to Purchase Energy-Efficient Appliances: An Empirical Study Based on the Technology Acceptance Model and Theory of Planned Behavior." *Sustainability*. <https://doi.org/10.3390/su11102994>.
- Ma, G, P Andrews-speed, and J D Zhang. 2011. "Study on Chinese Consumer Attitudes on Energy-Saving Household Appliances and Government Policies? : Based on a Questionnaire Survey of Residents in Chongqing , China" 5: 445–51. <https://doi.org/10.1016/j.egypro.2011.03.077>.
- Mills, Bradford F.; Schleich, Joachim (2009) : What's driving energy efficient appliance label awareness and purchase propensity?, Working paper sustainability and innovation, No. S1/2009, Fraunhofer ISI, Karlsruhe, <http://nbn-resolving.de/urn:nbn:de:0011-n-907333>
- Mills, Bradford, and Joachim Schleich. 2013. "Analysis of Existing Data: Determinants for the Adoption of Energy-Efficient Household Appliances in Germany." In *Sustainable Energy Consumption in Residential Buildings*, 39–67. Springer.
- Mills, Bradford, and Joachim Schleich 2013. "Residential energy-efficient technology adoption, energy conservation, knowledge, and attitudes: An analysis of European countries." *Energy Policy* 49 (2012): 616-628
- Nguyen, The Ninh, and Antonio Lobo. 2016. "Energy Efficient Household Appliances in Emerging Markets? : The Influence of Consumers ' Values and Knowledge on Their Attitudes and Purchase Behaviour" 00: 1–11. <https://doi.org/10.1111/ijcs.12323>.
- Niemeyer, Shirley. 2010. "Consumer Voices: Adoption of Residential Energy-Efficient Practices." *International Journal of Consumer Studies* 34 (2): 140–45. <https://doi.org/10.1111/j.1470->

6431.2009.00841.x.

- Okoli, Chitu. 2015. "A Guide to Conducting a Standalone Systematic Literature Review." *Communications of the Association for Information Systems* 37.
- Orbis Research. 2018. "Global Smart Home Appliances Market Analysis 2012-2017 and Forecast 2018-2023." <https://www.orbisresearch.com/reports/index/global-smart-home-appliances-market-analysis-2012-2017-and-forecast-2018-2023>.
- Oreskes, Naomi. 2005. "ESSAY on Climate Change." *Science* 306 (January): 2004–5. <https://doi.org/10.1126/science.1103618>.
- Parasuraman, A., and Charles L. Colby. 2015. "An Updated and Streamlined Technology Readiness Index: TRI 2.0." *Journal of Service Research* 18 (1): 59–74. <https://doi.org/10.1177/1094670514539730>.
- Parikh, Kirit S, and Jyoti K Parikh. 2016. "Realizing Potential Savings of Energy and Emissions from Efficient Household Appliances in India." *Energy Policy* 97: 102–11. <https://doi.org/10.1016/j.enpol.2016.07.005>.
- Park, Eunil, and Sang Jib Kwon. 2017. "What Motivations Drive Sustainable Energy-Saving Behavior?: An Examination in South Korea." *Renewable and Sustainable Energy Reviews* 79 (February): 494–502. <https://doi.org/10.1016/j.rser.2017.05.150>.
- Pothitou, Mary, Richard F. Hanna, and Konstantinos J. Chalvatzis. 2016. "Environmental Knowledge, pro-Environmental Behaviour and Energy Savings in Households: An Empirical Study." *Applied Energy* 184: 1217–29. <https://doi.org/10.1016/j.apenergy.2016.06.017>.
- Rafique, M Mujahid, and S Rehman. 2017. "National Energy Scenario of Pakistan – Current Status, Future Alternatives, and Institutional Infrastructure?: An Overview." *Renewable and Sustainable Energy Reviews* 69 (October): 156–167. <https://doi.org/10.1016/j.rser.2016.11.057>.
- Research and Markets. 2018. "Global Household Appliances Market - By Products, Region - Market Size, Demand Forecasts, Industry Trends and Updates(2016-2022)."
- Rojas-Méndez, José I., A. Parasuraman, and Nicolas Papadopoulos. 2017. "Demographics, Attitudes, and Technology Readiness." *Marketing Intelligence & Planning* 35 (1): 18–39. <https://doi.org/10.1108/MIP-08-2015-0163>.
- Siddaway, Andy. 2014. "What Is a Systematic Literature Review and How Do I Do One." *University of Stirling*, no. 1: 1.
- Skogen, Ketil, Håvard Helland, and Bjørn Kaltenborn. 2018. "Concern about Climate Change, Biodiversity Loss, Habitat Degradation and Landscape Change? : Embedded in Different Packages of Environmental Concern??" *Journal for Nature Conservation* 44 (August 2017): 12–20. <https://doi.org/10.1016/j.jnc.2018.06.001>.
- Sonnenberg, Nadine C., Alet C. Erasmus, and Suné Donoghue. 2011. "Significance of Environmental Sustainability Issues in Consumers' Choice of Major Household Appliances in South Africa." *International Journal of Consumer Studies* 35 (2): 153–63. <https://doi.org/10.1111/j.1470-6431.2010.00964.x>.
- Sorrell, Steve. 2015. "Reducing Energy Demand: A Review of Issues, Challenges and Approaches." *Renewable and Sustainable Energy Reviews* 47: 74–82. <https://doi.org/10.1016/j.rser.2015.03.002>.
- Tajamul Islam, Uma Chandrasekaran. 2016. "Effect of religiosity on ecologically conscious consumption behaviour." *Journal of Islamic Marketing* 7, no. 4 (2016): 495-507.
- Tan, Chin Seang, Hooi Yin Ooi, and Yen Nee Goh. 2017. "A Moral Extension of the Theory of Planned Behavior to Predict Consumers' Purchase Intention for Energy-Efficient Household Appliances in Malaysia." *Energy Policy* 107 (January 2016): 459–71. <https://doi.org/10.1016/j.enpol.2017.05.027>.
- Tranfield, David, David Denyer, and Palminder Smart. 2003. "Towards a Methodology for Developing Evidence informed Management Knowledge by Means of Systematic Review." *British Journal of Management* 14 (3): 207–22.
- United Nations. World Population Projected to Reach 9.7 Billion by 2050. Available online: <http://www.un.org/en/development/desa/news/population/2015-report.html> (accessed 1 November 2018).
- United Nations. 2013. Statistical Year Book for Asia and Pacific. Available Online: <https://www.unescap.org/publications/statistical-yearbook-asia-and-pacific-2013>
- Ürge-Vorsatz, Diana, Nick Eyre, Peter Graham, Danny

- Harvey, Edgar Hertwich, Yi Jiang, Christian Kornevall, et al. 2018. "Energy End-Use: Buildings." *Global Energy Assessment (GEA)*, 649–760. <https://doi.org/10.1017/CBO9780511793677.016>.
- Walczuch, Rita, Jos Lemmink, and Sandra Streukens. 2007. "The Effect of Service Employees ' Technology Readiness on Technology Acceptance §" 44: 206–15. <https://doi.org/10.1016/j.im.2006.12.005>.
- Wang, Zhaohua, Xiaomeng Wang, and Dongxue Guo. 2017a. "Policy Implications of the Purchasing Intentions towards Energy-efficient Appliances among China ' s Urban Residents? : Do Subsidies Work? ." *Energy Policy* 102 (November 2016): 430–39. <https://doi.org/10.1016/j.enpol.2016.12.049>.
- Wang, Zhaohua, Xiaomeng Wang, Dongxue Guo, Bin Zhang, Guo Li, Syed Shah Alam, Nik Hazrul Nik Hashim, et al. 2017. "A Moral Extension of the Theory of Planned Behavior to Predict Consumers' Purchase Intention for Energy-Efficient Household Appliances in Malaysia." *Energy Policy* 39 (2): 140–45. <https://doi.org/10.1016/j.rser.2017.05.150>.
- Wang, Zhaohua, Bin Zhang, and Guo Li. 2014. "Determinants of Energy-Saving Behavioral Intention among Residents in Beijing: Extending the Theory of Planned Behavior." *Journal of Renewable and Sustainable Energy* 6 (5): 1–18. <https://doi.org/10.1063/1.4898363>.
- Zhou, Kaile, and Shanlin Yang. 2016. "Understanding Household Energy Consumption Behavior: The Contribution of Energy Big Data Analytics." *Renewable and Sustainable Energy Reviews* 56: 810–19. <https://doi.org/10.1016/j.rser.2015.12.001>.