



## A Quantitative Approach to the Adoption of Green Building Practices in Karachi

Aatiqa Sheikh<sup>i\*</sup>, Sara Rashid<sup>i</sup>, Arsalan Ahmed<sup>ii</sup>

i) *Masters of Business Administration, Iqra University, Karachi*

ii) *PhD Scholar, Putra Business School, UPM, Malaysia*

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### ABSTRACT

Ecological sustainability has been raising alarm bells for decades and with every passing day we are witnessing the consequences caused due to its imbalance. Resultantly, it has become an increasing concern for the majority of the population. In recent years, carbon dioxide (CO<sub>2</sub>) emission has been recorded above thirty-six billion tons. One of the major culprits? Construction industry. Due to the environmentally unfriendly habits, even in the thrust of Environmental cause, Green Building Practices lack vision. This paper intends to determine the factors that affect the Consumers' intention to adopt Green Building Practices in Karachi. In this research, the pathway chosen for data collection and analysis is the quantitative method i.e., explanatory which refers to as the theory testing approach. This is a one-time cross-sectional study using the deductive approach based on the primary data collected from the citizens of Karachi. SPSS software is used to analyze the data and find the statistical results. All the hypotheses have been proven to be accepted by the research conducted in the vicinity of Karachi, Pakistan. This data indicates the result of 120 respondents who were well informed about the Green Building concept.

## 1. Introduction

### 1.1 Overview and Background of the Study

Ecological sustainability has become an increasing concern for majority of the population. In recent years, carbon dioxide (CO<sub>2</sub>) emission has been recorded above thirty-six billion tons (Saleh et al., 2020). One of the major culprits? Construction industry. It has evidently worsened the phenomenon of climate change as it accounts for 40% of the annual carbon dioxide emission. Furthermore, globally buildings are responsible for 70% of electric consumption and 65% of waste production (National Energy Balance, 2009). As stated in (Wang & Zhang, 2008), the industry consumes 25% of steel products and 70% of cement products in many countries making it a resource-intensive industry. According to International Panel on Climate Change (IPCC), greenhouse gas emissions can go up to 15.6 billion Tons in 2030 only from buildings and building operations (construction) (Levermore, 2008). This indicates the hazards of not adopting 'greenness' in the construction industry and hence provides a pathway to consider Green Buildings

Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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The idea of Green Building and its practices first emerged in 1972 at a conference by the United Nations. The conference took place in Stockholm with an aim to alleviate the footprints of human activities that have an adverse effect on the environment by improvising the operations of constructing a building (Owensby-Conte & Yepes, 2012). The concept of Green Building is grounded on the life-cycle frame. It is so that the adverse effects on the environment, human health, or ecology could be minimized with optimal resource utilization.

The Green practices are integrated throughout the cycle: design, operation, construction, maintenance, so on (Council, U. G. B., 2009). Practically, constructing green buildings call for peculiar considerations in terms of selection of site, commute connections, accessibility to different facilities, daylight, air quality, material selection, ventilation, landscape irrigation, and urban heat islands (Gou & Lau, 2014).

Due to the environmentally unfriendly habits, even in the thrust of Environmental crusade, Green Building Practices lack vision. The construction industry Globally, and in Pakistan, faces doubts and significant challenges that require changing behavior towards environmental concerns. Conventionally constructed buildings not only impact the environment but also safety, health, comfort, thereby, overall affecting the occupants' productivity (Singh et al., 2010). Hence, Carroll Chris states in a report on WBCSD Building System Carbon Framework by Arup, "We have to consider carbon like we currently consider money" (Carroll, et al., 2021). Her concept is about how one would not invest in a project without knowing its financial standing, then why would you forgo the environment you will be living in.

Green and sustainable buildings will open pathways to educate potential customers by showcasing the eco-hazards and providing solutions to ecological concerns. This creates innovation, creativity, partnerships, prospects, and opportunities to decrease conservational impacts (Owensby-Conte & Yepes, 2012).

## 1.2 Problem Statement

Day-in and out, the issues of an unhealthy environment are increasing. Pollution, inefficient use of resources, increasing global warming, climate changes, etc. are to name a few of the adverse effects faced by the sphere. Individuals are well-aware and knowledgeable about their environs. Conventional methods of production are becoming outdated due to their negative effects on the ecosystem. As T. S. Elliot writes, "Home is where one starts from", this research covers similar aspects but in the construction industry as the emission rates from the construction industry are rising at a steady pace (UNEP, 2019), and are having a significant contribution in global warming and water and air pollution (Kibert, 2016).

The megacity Karachi, which is the research context, is the industrial and economic hub of Pakistan (Qureshi, 2010) with a soaring population reaching approximately 17 million (PopulationStat, 2022) ranking it as the 9th largest city in Asia and 13th largest globally. With rising population comes rising environmental challenges (Perring et al., 2015), which need to be addressed for eluding the environmental disaster. According to the report by IQ Air (2023), that compares the Air Quality Index (AQI) across megacities globally, Karachi ranks as the 2nd worst city with an AQI of 278 and it is consistently deteriorating with construction industry being the major culprit.

United Nation Environment Program (UNEP) highlighted the importance of changing current practices in construction industry as expansion with current rate and practices will have severe consequences on 70% of the total earth's surface by 2032. Additionally, the adoption of green building practices comes with benefits in the form of energy savings through reduce consumption of electricity and water savings ultimately having reduced carbon emissions (Mughal, 2012). Despite of the proven benefits, the adoption of green building practices in Pakistan remains low, which needs to be examined (Azeem et al., 2017).

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Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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Green building is referred to as a property designed in a way that it reduces its detrimental impact on environment and humans throughout its existence (Yudelson, 2010). It is designed in a way that it conserves energy and uses the advanced construction methods and technologies. Many countries have successfully adopted these practices while others are in the process, but in case of Pakistan, the practices are in very early stages. There are numerous factors that impacts the adoption of green building practices and they vary from country to country depending on factors ranging from demography, economy, culture, knowledge and awareness (Darko et al., 2017). This gives rise to the notion of adapting green building practices according to the country's capabilities, knowledge and needs. Literature lacks in identifying the factors responsible for green practices adoption from the consumers' perspective in Pakistan. As consumers are the final users of the green property built, thus, it is imperative to identify factors impacting consumers' intention to adopt the green building practices in Pakistan along with the role of their awareness and knowledge for promoting and implementing green building practices.

### 1.3 Research Questions

The research seeks to answer following questions:

1. What are the factors affecting the adoption of green building practices?
2. How do the awareness level and knowledge of green building practices affect consumer buying behaviour?

### 1.4 Research Aims and Objectives

The main objectives of the study are as follows:

1. To determine the factors affecting the adoption of green building practices.
2. To examine the effects of awareness level and knowledge of green building practices on consumer buying intention.

### 1.5 Significance of the Study

Furthermore, the significance of the study could be justified as Green Buildings are relatively a new concept and an untapped market in its primary stage. The research aims to provide an in-depth insight into the real estate and construction industry with regard to green buildings. Architects can take advantage of this research to pitch an innovative idea for ecologically sustainable buildings. It will benefit at convincing the constructors to build green buildings considering the customer demands and changing trends. It will also provide a different angle with the frame of reference to the whole real estate industry. The research will enable marketers to understand the customer's buying intention and insights to market ecological products with higher price tags. Lastly, the agents in this industry will be able to communicate better with laypersons and make it a vantage point for them.

### 1.6 Outline of The Study

This paper contains the purview of Green Building Practices from a local perspective. It includes the factors and aspects of green consumers and their effects on buying intention or adoption of Green Building Practices. This study is limited to the vicinity of Pakistan's metropolitan city Karachi, located in the province of Sindh. Therefore, the population is restricted to the residents, constructors, architects, or real estate consumers residing within the locality or region. This is so that the respondents could be gauged and narrowed for improved results.

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## 1.7 Definition of Key Terms

### 1.7.1 Consumer Attitude

The mental readiness of a buyer or a user that directly exerts influence on their responses (Allport, 1935).

### 1.7.2 Subjective Norms

Any behavior widely approved by society (Ham, Jeger, & Frajman Ivković, 2015), or the pressure to comply with a supportive behavior (Ajzen, 1991).

### 1.7.3 Environmental Knowledge

Identification of behaviors, symbols, or concepts concerning sustainability and ecology in accord with received information about environmental protection (Liobikienė & Poškus, 2019).

### 1.7.4 Green Building

An environmentally friendly structure or construction site (Ji & Plainiotis, 2006).

### 1.7.5 Green Building Practices

Resource efficiency throughout the process of building a structure considering environmental responsibility (Ji & Plainiotis, 2006).

## LITERATURE REVIEW

### 2.1 Theoretical Framework

#### 2.1.1 Theory of Planned Behavior

The research is focused on the theory of planned behavior along with other factors affecting the intentions to adopt. This psychological theory suggests that the main components to mold the behavioral intentions of an individual are subjective norms, perceived behavioral control and attitudes (Ajzen, 1991).

Subjective norms could be explained as the societal pressure that forces an individual to abide by a certain behavior (Saleh et al., 2020). Allport (1935) defined attitude as an individual's readiness, neural as well as mental, that employs an immediate influence on individual responses in a given situation. Perceived Behavioral Control is referred to as gauging an individual's perception of conducting certain behavior with ease or difficulty (Ajzen, 1991). This will be further touched upon later in the study.

#### 2.1.2 Environmental Knowledge (Issues and Practice)

In this variable, we will consider awareness as well as the knowledge about environment, and environmental issues. The world consists of unlimited wants that are to be catered by limited resources. The problem of optimum allocation of these resources otherwise referred to as consciousness regarding this problem could be known as awareness of environmental issues.

Environmental awareness is not only focused on the protection of the future, but it also provides the context for understanding the delicacy of our environment in the midst of detrimental threats from destructive activities (Pachamama, 2017). According to the research conducted by (Laeq et al., 2017) in India, one of the highlighted reasons and challenges against green adoption, with a mean of 3.74, was lack of awareness.

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In a study by (Abidin, 2010), a person's behavior towards ecological practices is signified, stating that awareness has a key role to promote such exercise. Considering this context, we can generalize that similar behavior is encountered in the construction or real estate industry. If contractors, architects, constructors, or consumers, are well acquainted with the benefits, and importance of green building in the future, they will emphasize the well-being of others when buying a house, constructing it, or providing blueprints rather than compromising the environment.

This statement is confirmed by (Serpell *et al.*, 2013) later, where they observed that green building practices are most likely to be implemented in environmentally aware companies, rather than their counterparts. They argue that awareness on the organizational level may bring about a company's insertion of adopting green building practices throughout the business model. However, (du Plessis, 2005) emphasized the fact that genuine adoption of green building practices will bring change only if it is motivated by personal commitment, contrary to the (Serpell *et al.*, 2013) study.

Personal commitment is attained on the basis of gained knowledge. (Badrulhisham & Othman, 2016) proposes knowledge as an individual's basis for forming a behavior or conduct. Any information, issue, or agenda could not be addressed without knowledge. A study conducted in Nigeria rooted the result stating, that adoption of green projects within the construction industry depends on the knowledgeability of clients and building professionals regarding environmental concerns (Nduka & Ogunsanmi, 2015). The study confirmed that environmental knowledge and adoption of green projects have a positive relationship (Blocker & Eckberg, 1997); (Singh & Bansal, 2012).

If professionals from the industry know the subject of green practices in said industry, for example, professionals in the field of leadership in energy and environmental design (LEED), it will help them efficiently manage and handle green projects (Robichaud & Anantamula, 2011). This knowledge can later lead to pro-environmental attitudes if practiced on a larger scale (Fisher *et al.*, 2012). So, from the above-provided literature, we can conclude that there are two main influencers that affect attitudes and behavioral intentions. Those being, personality or nature, and external factors present within his environment or surrounding (Miller, 2005). Aforementioned leads to the development of following hypothesis:

H1: Environmental Knowledge has a positive relationship with the intention to adopt green building practices.

### **2.1.3 Attitudes**

Throughout the research, the definition of attitudes has been defined in numerous diverse predicaments. The basic, and well-known study by (Allport, 1935) state that attitudes could be defined as an individual's readiness, neural as well as mental, that employs an immediate influence on individual responses in a given situation.

In (Gray *et al.*, 1985), the study of ecological beliefs and behaviors, describes that an individual's views about the connotation of natural surroundings and human kinds are a result of underlying beliefs and attitudes that in the long-term shape their behaviors towards the environment. This is also backed by the theory of planned behavior later in the chapter (Ajzen, 1991).

Similarly, according to rather recent studies, attitudes are highly affected by environmental knowledge. As discussed in (Ko & Jin, 2017), a higher level of environmental knowledge, or awareness regarding environmental issues of consumers leads them to buy more ecologically sustainable apparel in the United States of America.

Additionally, individual attitudes on the road to sustainable living are ultimately paramount for attaining 'greenness'. It could be confirmed in (Wu, 2016), where the study discusses attitudes of Green Users. Hence, the literature proposes the following hypothesis:

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Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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H2: Attitudes positively affect the intention to adopt green building practices.

#### **2.1.4 Subjective Norms**

The societal pressure that forces an individual to abide by a certain behavior refers to as subjective norms. This idea, along with attitudes and perceived behavioral control, was initially discussed in the theory of planned behavior. This psychological theory suggests that the main components to mold the behavioral intentions of an individual are subjective norms, perceived behavioral control, and attitudes (Ajzen, 1991). The Social Learning Theory of Bandura claims that individuals learn through socializing with each other via observation, imitation, and modelling. This theory of Bandura has often been prescribed as a bridge between behavioral and cognitive learning theory because it incorporates attention, memory, and motivation (Bandura, 2006). Societal pressure may influence the person's behavior through the adoption of a certain lifestyle, social activities, appearance, associations, etc.

These socially accepted touchstones provide the basis for appropriate behavior. It not only is the foundation of judgement for morals (difference from right to wrong), but also the behavioral aspects with regards to positive and negative consequences of an action (Bamberg & Möser, 2007).

Over the years of research on the subject of social norms (Han & Kim, 2010) suggest that one of the predictors for intention to behave a certain way is subjective norms. Additionally, (Dezdar, 2017), argued that subjective norms have a significant effect on the intention to practice green IT. Relating it to environmental studies, it could be implied that similar is the case with these norms reflecting a positive impact on intentions towards adopting green behaviors. Therefore, we land on the hypothesis:

**H3: Subjective norms positively affect the intention to adopt green building practices.**

#### **2.1.5 Perceived Behavioral Control**

One of the main components of the theory of planned behavior, as conceptualized by (Ajzen, 1991), is perceived behavioral control. It is the key to prognosticating the behaviors and intentions of individuals. Salehet al., (2020) defined Perceived Behavioral Control as, "people's perception of the ease or difficulty of performing the behavior of interest".

According to (Francis, et al., 2004), Perceived behavioral control could be discerned by the beliefs of an individual concerning the influence of internal as well as situational aspects that assist the behavioral conduct. It also includes gauges an individual's perception of conducting certain behavior with ease or difficulty (Ajzen, 1991).

There have been numerous studies on the subject of Green Practices that signify the relationship and impact of the variable. Kai and Haokai (2016) researched the green commuting factors in a study conducted in Beijing and Shanghai that indicates the direct influence of perceived behavioral control on green commuting behaviors.

Another research on intentions to recycle by (Botetzagias et al., 2015) signifies that perceived behavioral control is a crucial predictor of the utmost important green practice: recycling. Therefore, we develop the hypothesis:

**H4: Perceived behavioral control has a positive impact on the intention to adopt green building practices.**

#### **2.1.6 Pro-Environmental Behaviors**

The solution for today's environmental problems is rooted in human behavior (UNEP, 2016). Previously,

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in the literature, we cannot emphasize enough the importance of behaviors shaped by knowledge, awareness, subjective norms, and perceived behavioral control that can positively impact the ecosphere. This positive impact is otherwise named as Pro-Environmental Behaviors. These behaviors are essential for sustainability in the long run and are encouraged for sustainability policies such as climate change and energy efficiency designs (AAAS, 2011).

Pro-environmental Behaviors are referred to as behaviors of individuals that contribute positively to the environment, minimize the harms to the environment, and enhance the quality of the environment (Steg & Vlek, 2009).

Numerous researches have been conducted on the topic of pro-environmental behaviors. It has become the hotspot for research. As suggested by (Stern et al., 1999) a model named, Value Belief Norm, where the study argues that a personal conflict is involved when an individual pursues and/or decides between different goals. Adding to this, (Lindenberg & Steg, 2007) argued that environmental behaviors often involve a conflict between the different goals a person pursues and suggested a value belief norm model to help understand a person's environmental behaviors. It is built in an individual's nature, that when they feel their valued items or beliefs are being threatened, they consider taking an action believing that it will help restore the said values, and so, they experience an obligation to provide support (Stern et al., 1999).

This model has been applied to many researches over the years to predict pro-environmental behaviors. These various types include, but are not limited to, commute choices (Lind et al., 2015), energy efficiency behaviors at the workplace (Staddon et al., 2016), energy conservation behavior in the household (Ibtissem, 2010), green consumers: organic food buyers (Margetts & Kashima, 2017), recycling (Botetzagias et al., 2015) and willingness to pay the green price (Suki & Suki, 2015).

This takes us to the likelihood of behavioral spillovers (Thøgersen, 1999). It refers to the concept that one pro-environmental action performed by an individual increases the chances of conducting another pro-environmental behavior (Truelove et al., 2014).

However, Fujii and Kitamura (2003) suggested that costs and resource availability play an important role in carrying out the behaviors. For example, recycling paper is easier, less costly than trying to recycle plastic. Therefore, the link between the consistency of performing two pro-environmental behaviors will be negatively affected (Gneezy et al., 2012). Later it was indicated by (Suki & Suki, 2015) that individuals with the context of environmental concerns are more likely to pay extra – Green Price – for green products and services. In the light of this research, we develop the hypothesis:

*H5: Pro- Environmental Behaviors positively impact the intention to adopt green building practices.*

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Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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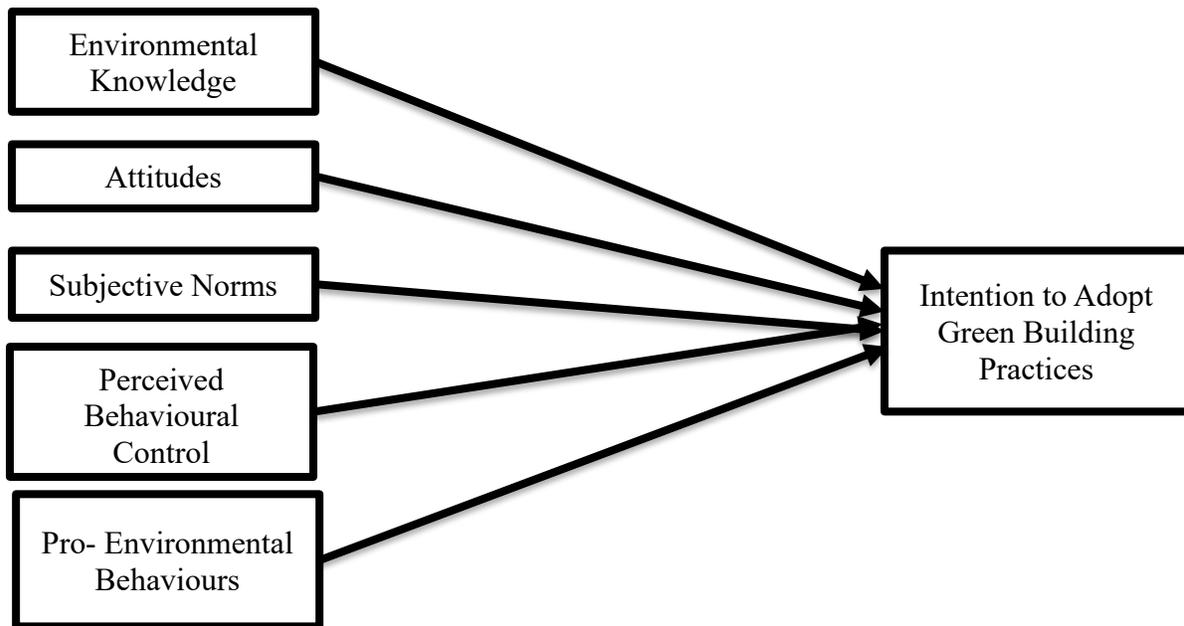
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## 1.1 Conceptual Framework



*Figure 2.1 Conceptual Framework*

## 2.3 Hypotheses Generated

*H1: Environmental Knowledge has a positive relationship with the intention to adopt green building practices.*

*H2: Attitudes positively affect the intention to adopt green building practices.*

*H3: Subjective norms positively affect the intention to adopt green building practices.*

*H4: Perceived behavioral control has a positive impact on the intention to adopt green building practices.*

*H5: Pro-Environmental Behaviors positively impact the intention to adopt green building practices.*

## RESEARCH METHODOLOGY

### 3.1 Research Approach

In this research, the pathway chosen for data collection and analysis is the quantitative method i.e., explanatory which refers to as the theory testing approach. Explanatory research answers the questions in quantitative or statistical form. The questions could be ‘what proportion’, or ‘how many, whereas, they could be answered as a simple ‘yes’ or ‘no’ or in a number form. Hence, this is a deductive approach based on research whereby, the results are quantifiable and statistically analyzed.

### 3.2 Research Design

This is a one-time cross-sectional study using the deductive approach based on the primary data collected.

The proposed research uses descriptive study for demographic purposes, as well as casual research design to test the cause-and-effect relation between the variables. This research investigates the

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different variables affecting or causing a change in consumer buying behavior. Hence, the study aims to determine variations and causality in independent variables presumed to influence the dependent variable.

### 3.3 Sampling Design and Technique

The target population for the proposed research is those consumers who are knowledgeable about the ‘Green’ concept as well as relevant to the real estate or construction industry or green building practices. Since the population size is large and the study uses purposive sampling, the sample size will be relatively smaller. The data was collected from 200 respondents sample size effectively to ensure authenticity. However, it was adjusted during the assessment due to inaccurate responses and 120 responses were deemed fit for further analysis.

### 3.4 Instrument of Data Collection

As this study is quantitative, the instrument used is a survey form. In a questionnaire with a Likert scale, close-ended questions are filled by respondents online in a controlled, well-maintained procedure. An adaptative questionnaire is developed for the collection of data. Therefore, the questionnaire does not require a reliability or validity test as it has already been tested in different studies.

The questionnaire contains six variables and demographic questions adapted from different studies. To study the variable of Environmental knowledge, four statements are taken from (Lee, 2008; Lee, 2009; Haron et al., 2005). To test the variable Attitudes and Subjective Norms, four statements respectively, for each variable are taken from (Al-Swidi et al., 2014). Four statements for variable Perceived behavioural control are taken from (Al-Swidi et al., 2014; Brown & Venkatesh, 2005). Lastly, for the variable Pro-Environmental Behaviours, four statements are adapted from (Sabar et al., 2018). Below is a chart provided.

<i>Constructs</i>	<i>Citation</i>
<i>Environmental knowledge</i>	(Lee, Gender differences in Hong Kong adolescent consumers’ green purchasing behavior., 2009) (Lee, Opportunities for green marketing: young consumers, 2008) (Haron, Paim, & Yahaya, 2005)
<i>Attitudes</i>	(Al-Swidi, Huque, Hafeez, & Shariff, 2014)
<i>Subjective Norms</i>	(Al-Swidi, Huque, Hafeez, & Shariff, 2014)
<i>Perceived behavioural control</i>	(Al-Swidi, Huque, Hafeez, & Shariff, 2014) (Brown & Venkatesh, 2005)
<i>Pro-Environmental Behaviours</i>	(Sabar, Anuar, Mutazam, Nifa, & Lin, 2018)
<i>Adoption Intention of Green Building</i>	(Al-Swidi, Huque, Hafeez, & Shariff, 2014)

### 3.5 Procedure of Data Collection

The main focus of the study is to conduct primary research from customers having knowledge regarding green building practices. The method for primary data collection is a questionnaire survey that was used

Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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to get statistical data and analyze it to get the results.

### 3.6 Statistical Techniques

SPSS software is used to analyze the data and find statistical results. The data has undergone reliability analysis, multiple regression analysis, correlation matrix, t-test, descriptive statistics, coefficients, and ANOVA.

## 4. DATA ANALYSIS AND RESULTS

This data has been collected from the participants regarding the topic of green building from various colonies of Karachi, who can comprehend the importance of building association strategy and its effect on the environment

### 4.1 Findings and Analyses of the results

#### Demographic Analysis

Table 0.1

##### Gender

	Item	Frequency	Percent	Cumulative Percent
Valid	Female	46	38.3	38.3
	Male	74	61.7	100.0
	Total	120	100.0	

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The above table identifies the gender distribution of the respondent. The analysis checked gender variation in who filled this questionnaire and found that 74 out of 120 were filled by the male which constitutes 61.7% and 38.3% filled by the female which accounts for 46 out of total 120 people.

Table 0.1

Education

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Doctorate	1	.8	.8	.8
Graduate	43	35.8	35.8	36.7
Intermediate/A level	6	5.0	5.0	41.7
Undergraduate	70	58.3	58.3	100.0
Total	120	100.0	100.0	

The above results define the education level of respondents, most of the respondents were having Undergraduate degrees, that is 70 out of 120, whose total percentage is 58.3%, while 43 out of 120 were having Graduate degrees whose total percentage is 35.8%. It means that the maximum number of respondents were educated at - at least an undergrad level. However, 5% of the 120 people held high school degrees, and less than 1% were at the Doctorate level.

Table 0.2

Occupation

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Employed	47	39.2	39.2	39.2
Other	49	40.8	40.8	80.0
Own Business	24	20.0	20.0	100.0
Total	120	100.0	100.0	

The above table indicates the occupations of the respondents. Most of the respondents were other occupations like freelancing, online business, internships, part-time jobs, etc. They accounted for 49 out of 120 whose total percentage is 40.8%. Whereas, 47 out of 120 were participants that were employees who accounted for a total percentage of 39.2%. Lastly, 24 out of 120 respondents were business owners who accounted for a total percentage of 20%.

Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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**Table 0.3**

**Meaning of the Green Building**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Buildings in Green Colour	5	4.2	4.2	4.2
	Buildings with Plants	52	43.3	43.3	47.5
	Sustainable Buildings	63	52.5	52.5	100.0
	Total	120	100.0	100.0	

The above results define the distribution of the respondents’ responses regarding the question of their understanding of the green building. Here, most of the respondents were the ones who selected ‘Sustainable Buildings’ as an answer. They accounted for 63 out of 120 whereby covering a total percentage of 52.5%. Whereas, 52 out of 120 opted for the option: ‘Building with Plants’ whose total percentage is 43.3% and 5 out of 120 opted for the option: ‘Building in Green Color’ whose total percentage is 4.2%. It is duly noted that at most times the researcher informed and briefed the respondents regarding ‘Green Buildings’ before getting the questionnaire filled.

**Table 0.4**

**Descriptive Analysis**

	N	Mean	Std. Deviation
AIGB	120	3.512	.855
EK	120	3.554	.651
A	120	3.813	.538
SN	120	2.965	.763
PBC	120	3.162	.870
PEB	120	3.572	.717
Valid N (listwise)	120		

The above table provides a descriptive analysis. The analysis shows that all of the variables are near to the Agreeing response. As the questionnaire was based on the Likert scale whereby the scale consisted of responses from 1 being “Strongly Disagree” and 5 being “Strongly Agree”. In this Table, the abbreviations for the variables are used. AIGB is Adoption Intention of Green Building, EK is Environmental Knowledge, A is Attitudes, SN is Subjective Norms, PBC is Perceived Behavioral Control, and PEB is Pro-Environmental Behavior.

Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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**Table 0.5**

**Reliability Analysis**

Constructs	N	Cronbach Alpha
AIGB (Dep.)	120	0.81
EK (Indp.)	120	0.81
A (Indp.)	120	0.71
SN (Indp.)	120	0.71
PBC (Indp.)	120	0.82
PEB (Indp.)	120	0.74
<b>Overall Reliability</b>		<b>0.95</b>

Table 4.6 is explaining the reliability of each construct separately as well as the overall reliability of the instrument. The overall reliability of this questionnaire is 0.95, which shows that the instrument is reliable for various statistical analyses. According to (Gliem & Gliem, 2003), a Cronbach Alpha value of < 0.9 is considered to be Excellent. Hence, the questionnaire containing 23 statements is Excellent to be further analyzed. Moreover, the individual reliability of each construct is < .7, which shows that each construct is considered Good for different statistical analyses. It also explains that the scale questions of each construct are aligned with each other.

**Table 0.6**

**Correlations**

		AIGB	EK	A	SN	PBC	PEB
AIGB	Pearson Correlation	1	.615**	.714**	.685**	.236**	.823**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
EK	Pearson Correlation	.615**	1	.645**	.812**	.452**	.612**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
A	Pearson Correlation	.714**	.645**	1	.427**	.475**	.211**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
SN	Pearson Correlation	.685**	.812**	.427**	1	.579**	.745**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
PBC	Pearson Correlation	.236**	.452**	.475**	.579**	1	.417**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
PEB	Pearson Correlation	.823**	.612**	.211**	.745**	.417**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table no. 4.7 shows the correlation between the variables. The correlation lies between -1, 0, & 1. These numbers define whether the variables are highly correlated at 1 being a perfect positive correlation or highly not correlated at -1 being a perfect negative correlation. In this Table, the abbreviations for the variables are used. AIGB is Adoption Intention of Green Building, EK is Environmental Knowledge,

Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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A is Attitudes, SN is Subjective Norms, PBC is Perceived Behavioral Control, and PEB is Pro-Environmental Behavior. As the result indicates, all variables are positively correlated with none of them near -1 Pearson Correlation. The dependent variable, AIGB, is at 0.01 (1-tailed) indicating the significance of the variables. The results of the correlation matrix suggests that all the independent variables affect the dependent variable in a positive manner. Therefore, the null hypothesis will be rejected and the alternate hypothesis will be accepted. That is, the said variables have a relationship with the dependent variable. However, the hypothesis will be further analyzed under more tests.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.901a	.845	.818	.45301

a. Predictors: (Constant), EK, A, SN, PBC, PEB

As the model summary indicates, the model explains 81.8% of the variance defined by Adjusted R Square.

**Table 0.7**  
**ANOVA**

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	125.014	5	25.008	76.761	.000 <sup>b</sup>
1 Residual	37.458	115	0.3247		
Total	162.472	120			

a. Dependent Variable: AIGB

b. Predictors: (Constant), EK, A, SN, PBC, PEB

As the ANOVA table suggests the value of F is 76.761 and the significance value is under the standardized value of 0.05, this model is significant and fit.

**Table 0.8**

**Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.201	.119		1.635	.000
1 EK	.389	.510	.247	.147	.001
A	.111	.014	.146	2.012	.021
SN	.443	.052	.294	3.512	.000
PBC	.366	.056	.512	5.124	.031
PEB	.324	0.27	0.147	4.125	.000

**a. Dependent Variable: AIGB**

Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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The regression analysis indicates the effect of independent variables, namely; EK, A, SN, PBC, and PEB on the dependent variable: Adoption Intention of Green Building. The unstandardized coefficients indicate that if all other variables are taken at the zero value, the dependent variable will take place at 1.201. Considering this, with every 1% change in the dependent variable, if we add EK, it will be affected by 38.9%. Similarly, variables A, SN, PBC and PEB will affect the dependent variable by 11.1%, 44.3%, 36.6%, and 32.4%, respectively. Further, this table indicated the significance level and model fit. Here, the t-value and Sig-value are of importance. The t-value indicates the nature of the relationship that the independent variable has with the dependent variable. As shown above, all the independent variables (EK: 0.147, A: 2.012, SN: 3.512, PBC: 5.124, PEB: 4.125) have a positive relationship with the dependent variable (AIGB: Adoption intention of Green Building). Lastly, the Sig-Value shows the significance of the relationship. Since the relationship could either be positive or negative, it is viable to check if it is significant to be considered or not. The regression analysis indicates that all the variables have a significant relationship since all the values in the significance column are less than 0.05.

S. No	Hypotheses	Beta	t	Sig	Empirical Conclusion
H1	Environmental Knowledge has a significant relationship with the intention to adopt green building practices.	.389	.147	.001	Accepted
H2	Attitudes significantly affect the intention to adopt green building practices.	.111	.012	.021	Accepted
H3	Subjective norms positively affect the intention to adopt green building practices.	.443	.512	.000	Accepted
H4	Perceived behavioral control has a positive impact on the intention to adopt green building practices.	.366	.124	.031	Accepted
H5	Pro-Environmental Behaviors significantly impact the intention to adopt green building practices	.324	.125	.000	Accepted

All the hypotheses have been proven to be accepted by the research conducted in the vicinity of Karachi, Pakistan. This data indicates the result of 120 respondents who are well informed about the Green Building concept. The tests are run on the SPSS software to analyze the data to provide factual information. Since the population is unknown and the sample size is henceforth, limited, the data may vary to a certain extent as provided in the test results.

Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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## DISCUSSION, CONCLUSION, POLICY IMPLICATIONS, AND FUTURE RESEARCH

### 5.1 Discussion

The data received and run through the tests on SPSS indicates that it is in accordance with that of previous research (Saleh, 2020). All hypotheses are accepted even in the Karachi city of Pakistan where there is a lack of knowledge observed. With the illiteracy rate booming in the country of Pakistan, the disparity surrounding the concept of green building is one, that is unlikely to be ignored. Even though the results indicate a positive response, that is due to the restrictions implemented while getting the responses. The general public faces difficulty to grasp the idea of the terminology as well as the concept of 'Green' (Laeq et al., 2017). Awareness plays a key role when we talk about greenness. Hence, Environmental knowledge is an important component (Abidin, 2010; Serpell et al., 2013).

While conducting the research, many questions were raised regarding the topic. As the results indicate, only a little margin of the whole population in Karachi is well aware, or simply put, familiar with the green word being used as a synonym for sustainability. As argued, people-built associations as to what is acceptable and what is not. This brings us to three of our hypotheses: subjective norm, perceived behavior control, and attitudes. Widely known as theory of planned behavior (Ajzen, 1991). These components effect an individual's views about the connotation of natural surroundings and human kinds (Gray et al., 1985; Francis et al., 2004) Their opinions are a result of underlying beliefs (Bandura, 2006). However, since the research only aimed to opt for the respondents who were knowledgeable about the topic, yet, the researcher felt the need to inform the respondents before registering their answers. This is due to the researcher's observation. It was observed that people were reluctant to answer, and somewhat felt uneasy. When asked, it came to the knowledge that the wordings in the questionnaire could have been further simplified for the understanding of a layperson.

The gist of the study is that it contains a limited scope and information as it targeted people with knowledge. These respondents indicated the need for change in the perspective regarding the concept of 'Green'. Meaning that pro-environmental thinkers were more inclined towards the concept. Which is also supported by value belief norm (Stern et al., 1999). Alongside this, they showed their affirmation towards accommodating sustainable practices, as well as incorporating further green practices within their buildings. This takes us to the likelihood of behavioral spillovers (Truelove et al., 2014).

### 5.2 Conclusion

The results indicate a positive response towards the adoption intention of Green Building Practices. The study contains information regarding Green Building shedding the light from the perspective of various countries. Pakistan however, has the least amount of focus on the subject. As mentioned before in the study, the number of green buildings in Pakistan is as low as they could be counted on two hands. The number of researches carried out in Pakistan only provide the perspective and idea from the point of view of either engineers or architects. Hereby, the main issue faced in the study is the knowledge barrier about Green Buildings. The responses indicated that the maturity of people does not understand what is meant by green building. They are unaware of the notion of what it might be, or how it may affect their lives as well as impact the environmental surroundings. Many of the respondents thought about green buildings as buildings that have plants or are buildings with green color. However, as we further move in the questionnaire, it is indicated that people are practicing green habits but they are unaware of the word green or what the word green might mean. Since it was purposive sampling the researcher felt difficulty explaining the concept of green building and green practices. To a layperson, these terminologies were rather difficult to understand. The initial responses were collected for 200 however, only 120 responses were deemed fit for the analysis.

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Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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### 5.3 Policy Implications

Due to the environmentally unfriendly habits, even in the thrust of Environmental cause, Green Building Practices lack vision. The construction industry in Pakistan and globally faces doubts and significant challenges that require changing behavior towards environmental concerns. Conventionally constructed buildings not only impact the environment but also safety, health, and comfort, thereby, overall affecting the occupants' productivity (Singh et al., 2010). Hence, Carroll Chris states in a report on WBCSD Building System Carbon Framework by Arup, "We have to consider carbon like we currently consider money" (Carroll, et al., 2021). Her concept is about how one would not invest in a project without knowing its financial standing, then why would you forgo the environment you will be living in. Pakistan currently consists of more than thirty green buildings of which twenty-three green buildings are in Karachi (The Green Building Information Gateway, 2022). Karachi currently holds two awards and twenty certifications in the field of green building. Eleven buildings are only in the area of Korangi town (The Green Building Information Gateway, 2022). Even though these facts and figures show that Karachi is moving towards achieving the SDGs by investing and establishing Green Projects, this is all in the premature stage. Government needs to take several initiatives to make people aware and conscious of their surroundings. Parties of the relevant field should be given initiatives to work on such LEED projects. Leverage should be provided to construction companies for constructing sustainable buildings, marketers should be given incentives for promoting sustainable practices, and most importantly, the government should promote green projects in such ways that it attracts investors and motivate them to invest heavily in green building projects.

### 5.4 Future Area of Research

In the near future, researchers could work on two separate, yet equally correlated paths. One of the perspectives is from the side of a constructor or a real estate agent, and the other perspective is from the side of architects, engineers, and interior designers.

Considering the markets of Karachi, there is a huge potential for this topic to gain popularity as well as show improvement. As the study repeatedly indicated that this market is yet premature and needs mass attention, it is only relevant that researchers put their time and effort into tapping and understanding new markets. A few examples here are, eco-friendly shopping bags by Carrefour was one of the initiatives in the start of an ecological mindset. Thereon, Imtiaz, textile fashion brands, as well as the federal government in Islamabad followed suit. Similarly, other brands have started these small-scale maneuvers to gain the public eye.

Customers' opinions regarding green products, the acceptability of 'Greenness' in the market, customers' willingness to invest in green projects, and the market's ability to incorporate green practices are some of the major topics to be researched. Whereas, considering this research, a foundation is laid for future research in the Green Building industry from the perspective of the general public or a layperson. Further research could be constructor oriented, real estate oriented, investor-oriented, climate change/global warming or shed light on the views of an activist. It is necessary to find the opinions of builders, their issues, their methods, as well as the conditions they are willing to work on. That will be beneficial to boost the concept and build a basic understanding of the market.

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Corresponding Author:

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Corresponding Author:

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Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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Corresponding Author:

\*Email: [aatiqa.55360@iqra.edu.pk](mailto:aatiqa.55360@iqra.edu.pk) (Aatiqa Sheikh)

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