

Determining the Designer's Awareness of Sustainable Interior Materials in Saudi Arabia

by

Arig Alotibi

A Thesis Presented in Partial Fulfillment  
of the Requirements for the Degree  
Master of Science in Design

Approved November 2019 by the  
Graduate Supervisory Committee:

Diane Bender, Chair  
John Takamura, Member  
Lori Brunner, Member

ARIZONA STATE UNIVERSITY

December 2019

## ABSTRACT

The main aim of this thesis is to study the Saudi Arabia designers level of awareness about sustainable interior materials and to what extent are Saudi Arabia designers specifying sustainable interior materials in their interior designs? The problem statement relies on understanding how does this may impact the Saudi Arabia environment. In order to comply with these objectives, a telephone interviews were built, to test the designer's knowledge about sustainable interior materials. The results showed that the Saudi Arabia interior designers are not fully aware of sustainable interior materials and there is a lack of interest in applying sustainable interior materials in their projects.

## ACKNOWLEDGMENTS

First, and most of all, thank Allah for establishing me to complete this thesis.

I would like to thank Professor. Diane Bender, for her kindness and patience with me, without your help this paper would not been possible. I'm so grateful to have her as my Chair, her expertise, assistance, and guidance in writing this thesis was beyond expectations.

I would thank my committee members, professor John Takamura and professor Lori Brunner for their support and suggestions.

Thank my family for their encouragements through this process. I owe an enormous debt of gratitude to my mother who supported, contributed me. I owe an enormous debt of gratitude

Lastly, I would like to thank my friends and everyone else who helped me get through it.

## TABLE OF CONTENTS

	Page
LIST OF TABLES.....	v
LIST OF FIGURES.....	vi
CHAPTER	
1 INTRODUCTION.....	1
1.0 Background of the Study.....	1
1.1. Justification.....	4
1.2 Scope& Limitations.....	5
1.3 Data Collected.....	5
2 LITERATURE REVIEW.....	6
2.1 Definition of Sustainable Materials.....	9
2.2 Awareness About Sustainable Interior Materials in Saudi Arabia.....	14
2.3 Use of Sustainable Materials in Saudi Arabia.....	15
2.4 Benefits of Sustainable Interior Materials.....	15
3 METHODOLOGY.....	28
3.1 Research Questions.....	31
4 STUDY AND DISCUSSION OF RESULTS.....	33
4.1 Study Limitations.....	42
5 CONCLUSIONS.....	43
5.1 Implications and Future Research.....	44
REFERENCES.....	46

	Page
APPENDIX	
A FIRST INTERVIEW RESPONSES.....	51
B SECOND INTERVIEW RESPONSES.....	53
C THIRD INTERVIEW RESPONSES.....	55
D FOURTH INTERVIEW RESPONSES.....	57
E FIFTH INTERVIEW RESPONSES.....	59
F SIXTH INTERVIEW RESPONSES.....	61
G SEVENTH INTERVIEW RESPONSES.....	63
H EIGHTH INTERVIEW RESPONSES.....	65
I NINTH INTERVIEW RESPONSES.....	68
J TENTH INTERVIEW RESPONSES.....	70
K ELEVENTH INTERVIEW RESPONSES.....	73
L TWELFTH INTERVIEW RESPONSES.....	75
M IRB APPROVAL FOR HUMAN SUBJECT TESTING.....	77

## LIST OF TABLES

Table	Page
Table 1: Interview Questions.....	31
Table 2: General Information.....	34
Table 3: Questions Codes.....	35

## LIST OF FIGURES

Figure	Page
Figure 1: Conceptual Framework.....	3
Figure 2: Coco Tile.....	10
Figure 3: Leather Tile.....	11
Figure 4: Strandwoven Bamboo Flooring.....	11
Figure 5: Bio-Glass.....	11
Figure 6: Migrations Biobased Tile.....	11
Figure 7: Natura Paint.....	12
Figure 8: Traditional Veneer Cork Flooring.....	12
Figure 9: Bronze Art Tile.....	12
Figure 10: EcoRock.....	13
Figure 11: ShowerCork.....	13
Figure 12: Varia Ecoresin.....	13
Figure 13: Mulberry Panels.....	13
Figure 14: Top 10 Countries & Regions for LEED Outside the U.S. ....	23
Figure 15: Designers Awareness of Sustainable Interior Materials. ....	33
Figure 16: Designers Interest in Implementing Sustainable Interior Materials in their Work.....	37

# CHAPTER 1

## INTRODUCTION

### 1.0. Background of the Study

The world has started to acknowledge the importance of a healthy environment and how it can impact people's health. However, to support a good healthy life, one needs to start by choosing natural interior materials within the environment. Sustainable interior components such as wood, natural stone, metal, and glass can play a significant role in accomplishing a healthy environment. On the other hand, artificial interior materials can harmfully impact the environment. However, it can provide economic enhancement through creating a long lasting interior, lowering maintenance costs, and saving energy. There is an interconnectedness between economic growth and environment. It is predicted that traditional forms of economic development are limited to the overexploitation of natural resources, at the same time, this causes great pressure on the environment. In the 1990s, most countries in the world paid close attention to the issues of environmental protection and sustainable development (Toman, 2003). This concern was not born in a vacuum. Environmental voices called for reducing the environmental effects of various human activities, to reduce waste and contaminants, while preserving the natural resource base for generations to come. According to Our Common Future book, and known as the Brundtland Report (Commission, 1987) the meaning of sustainability is meeting the needs of current generations without compromising the ability of future generations to meet their need. There are many ways to achieve sustainability. One of these ways is building green environments by using sustainable materials both for the interiors and exteriors of structures. In the Middle Ages, designers were using sustainable interior materials to build



and decorate, and some of those buildings still existed today, such as Hagia Sophia Museum in Istanbul, Taj Mahal in India, Cathedral of Santa Maria in Florence, and Chartres Cathedral in Chartres. Reliance on using sustainable materials in building may change the world to a better one, impact the environment, and protect the health of occupants and visitors within buildings.

Some countries have been championing the use of sustainable materials such as China, the Scandinavian countries, and the United States of America. Other countries are still trying to catch up, such as Saudi Arabia. The Kingdom of Saudi Arabia is experiencing a vigorous infrastructure expansion, especially with respect to residential buildings (Taleb, Sharples, 2011). Saudi Arabia is seeking sustainability by 2030. In July 2018, Saudi Arabia's Voluntary National Review to the United Nations High-Level Political Forum on Sustainable Development presented their 2030 vision by stating that the Saudi Future Cities Program is a technical cooperation program between the Ministry of Municipal and Rural Affairs and the United Nations Human Settlements Program (UN-Habitat, 2014). The program seeks to develop a new vision and strategic planning framework for a sustainable urban future in Saudi Arabia following international standards that are in line with the new strategic transformation plan of the Ministry of Municipal and Rural Affairs. The main objective of the program is to provide prosperous, productive, equitable, socially inclusive and environmentally sustainable cities with adequate infrastructure and a high quality of life. The National Urban Strategy for the Kingdom's Vision 2030 objectives has been updated at the level of the regions, cities and villages of the Kingdom and incorporates the Sustainable Development Goals and the objectives of the New Urban Agenda into its

hierarchical spatial development policies . Designers in Saudi Arabia may have an increased awareness about using sustainable interior materials in their work.

The aim of this research is to investigate the level of awareness of Saudi Arabian designers on sustainable interior materials. It is crucial to understand the benefits of sustainable interior design and how it can affect the health of users, as interior designers can direct influence client selection of sustainable materials. (See conceptual framework in Figure1).

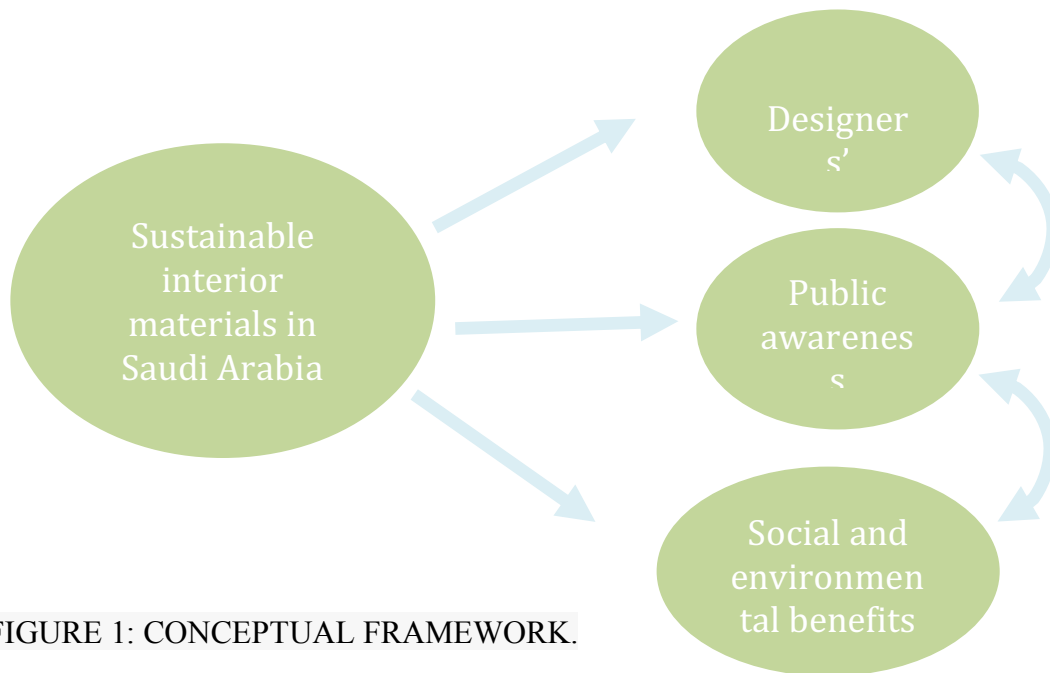


FIGURE 1: CONCEPTUAL FRAMEWORK.

While the Scandinavian countries are in the top 10 greenest countries (Peter, 2018) Saudi Arabia is yet planning for sustainability in its 2030 vision. An assurance in the improvement of work efficiency, institutionalization and streamlining of stakeholders' efforts are among the areas of development in the full-fledged system of

governance that will effectively sustain the realization of Vision 2030 and the progress monitoring of its objectives. His Majesty the King has therefore bestowed on the Minister of Economy and Planning (MEP) the responsibility of following up the dossier on the Sustainable Development (UN High-Level Political Forum, 2018).

The practice of interior design in different countries is closely ingrained in its society, where the design can affect the community members' livelihood through its associated standards of meaning, value, and culture. It is hypothesized that a high awareness of sustainable design also known as green design may improve design concepts in Saudi Arabia. This design method can play a substantial role in the interior designer's decision-making process in Saudi Arabia. The development process in Saudi Arabia ever since its inception has put an increasing importance in sustainable development; this is evident in its strategic alignment towards major long-term highlights in the country's progress (UN High-Level Political Forum, 2018).

### 1.1 Justification

The built environment is one of the key areas for impacting climate change. Actions are considered good if they help reduce more than 40% of a society's energy consumption and greenhouse gas emissions. The German government set a greenhouse gas reduction target of 40 percent by 2020, compared to 1990 levels, in line with the Intergovernmental Panel on Climate Change's (Appunn, Wettengel, 2019). Sustainable residential buildings can also offer competitive advantages to homeowners by attracting sustainable conscious tenants who would like to experience cost savings from the sustainable use of building materials. Community Resource Exchange CRE organizations

that have made their buildings more energy efficient—whether by lighting upgrades, heating, ventilation, and air condition HVAC improvement, or any other measure, may be eligible to earn money for the permanent reduction of their electric demand. “Green Buildings Attract Happy Tenants and Bring Green Earnings to the Commercial Real Estate Industry” (Snyder, 2018). This cannot, however, happen without the developers, interior designers and architects having full knowledge of sustainable building materials and the best practices for constructing buildings using sustainable architecture. Research is necessary to identify whether interior designers in Saudi Arabia are knowledgeable and ready to embrace sustainable development.

### 1.2. Scope & Limitations

This study will examine a designer’s knowledge of sustainable interior materials in Saudi Arabia, from project conception through to the project completion. The study will be based and limited to major developments in the city of Riyadh, which is the capital of Saudi Arabia. Interior designers in these key areas will be interviewed by phone to assess their knowledge on sustainable interior materials.

### 1.3.Data collected

This exploratory research is expected to use sampling research design in which data will be collected by telephone interview. Interviews will entail in-depth and semi-structured questions, which will enable the researcher to collect data in a cost-effective way. This will allow the researcher to obtain detailed information regarding opinions, perceptions and personal feelings. The method also has a high response rate and enables one to clarify ambiguities when they arise (Creswell, Poth, 2018).

## CHAPTER 2

### LITERATURE REVIEW

Since prince Mohammed bin Salman became the Crown Prince of the Kingdom of Saudi Arabia, he has been focusing on enhancing the sustainability in the country by protecting and improving the local environment, as well as diversifying economic activity, for a healthy sustainable life for the Kingdom's citizens and residents. According to the son of the King of Saudi Arabia, Prince Mohammed bin Salman, also known as "MBS," by 2030 the vision of sustainability will be mandatory (Malek, 2018). This is a bold step toward achieving a better environment. As a developing yet prosperous country, it could be beneficial for Saudi Arabia to go green on its road to long-lasting development, especially since the country has capital to invest in sustainable materials and champion their use.

To support a healthier environment, the government should work from the inside to the outside, by using sustainable interior materials. The importance of interior design relates to people's use of interior spaces. This is important in Saudi Arabia due to the very hot, and in some regions dry weather. That is a main rational to use sustainable interior materials. For the purposes of this research, the interest of using sustainable interior materials will be confined to commercial projects. The small offices may not prioritize using or providing information to their client about sustainable interior materials. For instance, the designer asks the client about their needs and their budget and may not inform them of alternative healthy interior materials. Therefore, research is needed to investigate the level of awareness of Saudi Arabian's designers about sustainable interior materials. It is crucial to understand whether the lack of awareness

comes from the clients' own understanding of the issue or the designer does not care to provide the client information regarding the importance of sustainable interior design. The benefits of using green materials can affect community health and can have a lasting impact. Sustainable building features can promote better health, comfort, well-being, and productivity of building occupants, which can reduce levels of absenteeism and increase productivity (Miller, Pogue, Gough, Davis, 2009).

This study will examine designer's knowledge of sustainable interior materials in Saudi Arabia, right from project conception through to the project completion. The study will, however, be based and limited to major developments in Riyadh which is the capital of Saudi Arabia. Designers in these key areas will be sought and questioned with a view to assessing their knowledge on sustainable interior materials. The need to integrate sustainable interior building technologies during construction, occupation and decommissioning phases of a building will be assessing designer's knowledge of sustainable interior materials. This research requires the use of qualitative approaches, especially with designers who are passionate about sustainable development. The study seeks insight into Saudi Arabia designer's knowledge of sustainable materials and as such will employ qualitative approaches to gathering data. Qualitative research has the advantage of giving the researcher the freedom to let the research unfold more naturally, allowing the researcher to acquire detailed and rich information in the form of comprehensive written descriptions. The research uses a sampling research design in which data will be collected through interviews. An audio recording device will be used to record the interviews. After collecting data, the researcher will code and group the responses according to emergent themes: Results will be presented as descriptive

statistics. Graphs, charts and frequency tables will also help in presenting the results in a visual manner. The research will document designer knowledge of some of the sustainable interior building materials currently in use. The results of this study may help policymakers and the Saudi Arabia government to better prepare the country for an increased uptake of green practices in the interior design industry. A framework has been developed by Saudi Arabia in an urgent response to enable a comprehensive monitoring and measuring of environmental degradation activities. Some of the measures put in action include prevention of depletion of natural resources, its efficient use, and sustainable development implantation, in which a list of comprehensive Standards and Guidelines have been adopted by the country (Chakibi, 2013). Some of Saudi Arabia's intentions and determining activities include the food and water security improvement that supports neither, dramatically raising the people's standards of living, improving the infrastructure concerning energy and placing extensive investments in renewable forms of energy, improving the state of health services and elevating the ranking of educational institutions (UN, HLPF,2018). A stricter system of enforcement should be developed by companies, and preparation of an internal policy that follows the issued guidance in their compliance programs that should be the basis for a timely readiness before the mandatory requirements become necessity (Chakibi, 2013). The implementation of Vision 2030 will continue concurrently with the SDGs-related activities in which significant momentum has gathered. The SDGs process is inclusive of certain key priority areas; continuous alignment process of the state strategies and programs with global development goals, targets and indicators, improving the analysis of data and the coverage and quality of SDG indicators, developing collaboration strengthening strategies among the various

involved parties, improving the tracking progress through enhancing the evaluation and monitoring infrastructure in view of the achievement of SDGs at both the national and sub-national level, reinforcing the role of SDGs at the sub-national level, and international partnerships promotion involving the SDGs through assistance in development activities at the regional level specifically (UN,HLPF, 2018).

### 2.1. Definition of Sustainable Interior Materials:

Sustainable interior materials are materials that help protect the environment, and are environmentally friendly, healthy, and can be maintained at a level that does not deplete natural resource. Moreover, sustainable materials are natural materials that are not dangerous to the environment and its society such as wood, glass, stone and paper and these materials can help ensuring environmental sustainability (Anandaraj, Rooby, Awoyera, Gobinath,2018). Some countries are searching for new sustainable materials. These countries, such as the United States, China, and the Scandinavian countries, are trying to create new green products that are eco-friendly.

Here is a list of green interior materials:

#### Coco tiles

Coco tiles are made of the shells of coconut. “Each tile is finished with low-VOC resin and set on a backer made of sustainably harvested wood “(Sukhai, 2019)



*FIGURE 2: COCO TILES. PHOTO BY COURTESY OF ECODOMO*

Leather tiles are made of leftover leather and stone-grinds. The leather tiles are similar to vinyl sheet (Sukhai, 2019).





*FIGURE 3: LEATHER TILES. PHOTO BY COURTESY OF ECODOMO*

Strandwoven Bamboo Flooring are made of recycled bamboo material (Sukhai, 2019).



*FIGURE 4: STRANDWOVEN BAMBOO FLOORING. PHOTO BY COURTESY OF GREEN CHOICE FLOORING INTERNATIONAL*

Bio-Glass are a renewable glass source that is recreated to be solid-surfacing slabs (Sukhai, 2019).



*FIGURE 5: BIO GLASS. PHOTO BY COURTESY OF ECOVERINGS*

Migrations Biobased Tile are made from recycled limestone with Biostride, and plant ingredients (Sukhai, 2019).



*FIGURE 6: MIGRATIONS BIOBASED. PHOTO BY COURTESY OF ARMSTRONG*

Natura Paint is a type of organic compound other than a volatile organic compound and comes in three varieties- flat, eggshell, and semigloss (Sukhai, 2019).



*FIGURE 7: NATURAL PAINT. PHOTO BY COURTESY OF BENJAMIN MOORE*

Traditional Veneer Cork Flooring is a material of wine stoppers waste and cork (Sukhai, 2019).



*FIGURE 8: TRADITIONAL VENEER CORK FLOORING. PHOTO BY COURTESY OF EXPANKO*

Bronze Art Tiles are recyclable tiles made of recycled copper and other material (Sukhai, 2019).



*FIGURE 9: BRONZE ART TILES. PHOTO BY COURTESY OF SAINT-GAUDENS*

“EcoRock made of 80% post-industrial recycled materials and requires 80% less energy to produce than its counterpart” (John, 2012).



*FIGURE 10: ECO ROCK. PHOTO BY COURTESY OF SERIOUS MATERIALS*

Showercork is made of 100% post-industrial recycled wine cork slices (Sukhai, 2019).



*FIGURE 11: SHOWERCORK. PHOTO BY COURTESY OF SUSTAINABLE FLOORING*

Varia Ecoresin is a wall material made of 40% recycled resin that has sustainable materials like bamboo (Sukhai, 2019).



*FIGURE 12: VARIA ECORESIN. PHOTO BY COURTESY OF 3FORM*

Mulberry Panels are made of silk and pharmaceutical industries are used to create these wood panels (Sukhai, 2019).



*FIGURE 13: MULLBERRY PANELS. PHOTO BY COURTESY OF ENGINEERED TIMBER RESOURCES*

Using green material can improve renewable energy, water conservation, site development and indoor environmental quality (Ning, Li, Yang, & Ju, 2016). The possession of sustainable indoor materials can be of help in enhancing energy efficiency and effectiveness of resources. There is no sacrifice in comfort, well-being or aesthetics by having a high-performance and healthy interior. These qualities can be enhanced by a sustainable design using a wide range of product knowledge, extensive research, and credible guidance, and also by involving interior designers in the achievement of sustainable goals. An interior designer analyzes a building's interior and identifies ways of saving energy and water, reducing carbon dioxide, CO<sub>2</sub> emissions, improving indoor air quality, IAQ, enhancing responsiveness to impacts caused by the environment and effectively use resources. Possession of sustainable indoor materials can positively impact the circulation of healthy indoor air. Products require vetting for purposes of sustainable interiors done through filtering in order to protect the indoor air quality in accordance with health and safety standards.

## 2.2. Awareness about Sustainable Interior Materials in Saudi Arabia

There is not enough information and evidence about a designer's level of awareness in Riyadh, Saudi Arabia, which this research is going to investigate. The research will assess the designer's awareness and knowledge about sustainable interior materials by interviewing the interior designers, to find out if they inform the clients about the benefits of using sustainable interior materials in their homes.

### 2.3. Use of Sustainable Materials in Saudi Arabia

Saudi Arabia nowadays is trying to achieve sustainability in their government projects and by 2030 the goal is that sustainable building designs in Saudi Arabia will play a vital role in boosting the kingdom's Vision 2030 goals (Pereira, 2018). Moreover, Dr. Mohammed S. Al Surf, US Green Building Council faculty regional manager, said: Applying [sustainable] building methods to residential projects is a win-win case, where all stakeholders benefit from the economic, environmental, and social pillars of sustainability (Pereira, 2018). Saudi Arabia's sustainable building designs will play a pivotal role in boosting the Vision 2030 goals of the kingdom (Pereira, 2018). Moreover, Dr. Mohammed S. Al Surf, US Green Building Council faculty regional manager, said: It is a win-win case in the application of sustainable building methods to residential projects, in which there is benefit to all stakeholders from the economic, social, and environmental pillars in play (Pereira, 2018). Sustainable building designs are being encouraged in Saudi Arabia. However, the small projects like houses or restaurants are still not there yet.

### 2.4. Benefits of Sustainable Materials

It is important to be aware of the benefits of using indoor green materials and understanding the life cycle of the design. By choosing healthy materials it can

significantly change a good design into a good sustainable one (Mate, 2007). Interior materials and finishes can impact the health and comfort of the people living in the homes (Stelmack, september,2012). For example, using sustainable interior materials in houses can improve the air quality and energy performance. Similarly, using a high thermal inertia wall can reduce the impact of outdoor heat temperature changes on the indoor environment (Taleb, Sharples, 2011). There is significant environmental impact brought about by green materials and its products over the life cycle of a building. An assessment of green materials is dependent upon project-specific goals and may involve an evaluation of the following criteria: indoor air quality, resource efficiency, energy efficiency, affordability, and water conservation.

The interior environment comprises of interior building materials, furniture, and equipment that contain potential contaminants and particulates, and may be available throughout their full life cycle. A toxin-free interior environment is the ideal target for the world, and that is resource effective (Stelmack, 2012). In the 1990s, most countries in the world paid particular attention to the issues of environmental protection and sustainable development. Environmental voices called for reducing the environmental effects of various human activities, to reduce waste and contaminants, while preserving the natural resource base for generations to come (Oldfield, Dearing, 2003). As a result, urban sectors are no longer isolated from the pressing environmental issues that have been threatening the world for the last few years. These sectors are one of the main consumers of natural resources such as land, materials, water and energy. On the other hand, the construction industry produces large amounts of noise, pollution and solid waste. The problem of wasting energy and water remains one of the most important environmental-

economic problems of the building industry. According to the United Nations (2014), Inequitable access to water is aggravated by environmental degradation, competition for water and scaling energy prices, and is experienced both in urban and rural settings. These trends will always have a greater effect to those without access to affordable alternatives or having cost-effective means of coping, which adds to the driving factor towards poverty. An increase in ill health for children and the elderly will result as a failure in addressing these key issues, leading to growing inequity and increased marginalization of the poor and vulnerable, particularly women (UNESCO, 2014). The energy needs of a growing population can be met by increased deployment, which can drive development and improve well-being, while reducing greenhouse gas emissions and improving natural resource productivity.

Inequitable access to water is aggravated by environmental degradation, competition for water and soaring energy prices, and is experienced both in urban and rural settings. These trends will always have a greater effect on those without access to affordable alternatives or having cost-effective means of coping, which adds to the driving factor towards poverty. An increase in ill health for children and the elderly may result as a failure in addressing these key issues, leading to growing inequity and increased marginalization of the poor and vulnerable, particularly women. This is due to the continuity and sustainability of a building throughout its period of operation. For these and other reasons, and as a result of growing public awareness of the environmental impacts associated with construction activities, it is noticeable that the main challenge facing urban sectors at this time is their ability to meet their commitments and fulfill their developmental role towards achieving comprehensive sustainable development concepts.

On urban projects will be one of the most important competitive standards in these sectors in the 21st century. In advanced industrial countries, new concepts and methods that were previously unknown in the design and implementation of projects, such as sustainable design, green architecture, and sustainable buildings, have emerged. These concepts reflect the growing interest of urban sectors in economic development issues, such as environmental protection, reducing energy consumption, optimizing the use of natural resources and relying more on renewable sources. According to the international renewable energy agency IRENA, energy needs of a growing population can be met by increased deployment, which can drive development and improve well-being, while reducing greenhouse gas emissions and improving natural resource productivity (Amin, 2016). Sustainable design, green architecture, sustainable construction, and green construction are all new ways of design and construction. They evoke environmental and economic challenges, which have cast a shadow on various sectors in this era. New buildings are designed, implemented and operated with advanced methods and technologies. These methods can contribute to reducing environmental impact and costs particularly running costs, while contributing to a safe and comfortable urban environment. Thus, the motivation for adopting the concept of sustainability in the urban sector is no different from the motives that led to the emergence and adoption of the concept of sustainable development with its interconnected environmental, economic and social dimensions in other sectors. Sustainability debates nowadays not only consider environmental concern solely as sustainability, but also incorporate dimensions involving economic and social aspects. The social dimension however, even though it has been



widely accepted, its exact meaning has not been well defined or agreed upon (Dempsey, Bramley, Power, & Brown, 2011).

There is less of a dividing between the environment and the economy since the emergence and spread of the concept of sustainable development. The sustainability of economic growth cannot be achieved under the threat of environment pollutants which destroy vital systems and deplete natural resources. Sustainable green architecture promotes and adopts this close link between the environment and the economy, because the effects of urban activities and buildings on the environment have clear economic dimensions and vice versa. As a result, many users in work environments have complained about physical stress, fatigue, headaches and insomnia. Heavy industrial lighting is also the leading cause of depressive symptoms in work environments. Regulation of artificial lighting in recent years has been done through European standards and norms, before the standardization, a significant research body investigated how fluorescent lighting, specifically the luminous flicker produced, leads to discomfort and deteriorations in visual performance, stress and headaches (Silvester, Konstantinou, OCT 23, 2013). The waste of building materials during project implementation causes additional costs and at the same time pollutes the environment with residues that contain a significant proportion of harmful toxic and chemical substances. Thus, environmental solutions offered by sustainable green design can at the same time achieve economic benefits at the individual and community level. According to some estimates, the construction industry in the world consumes about 40% of raw materials. About 6% of global Gross Domestic Product, GDP is accounted for in the industry and is growing. It accounts for more than 8% of GDP in parts of the developing world, such as India. The largest consumer of raw materials is E&C, consuming

about 50% of global steel production and more than 3 billion tons of raw materials (WEF, 2016). This consumption is estimated at three billion tons per year. In the United States, buildings alone consume 65% of total energy consumption and cause 30% of greenhouse emissions. The importance of integrating sustainable green design practices and applications is clear. In his book *Green Architecture*, architect James Wines, (2008) notes that buildings consume one-sixth of the world's fresh water supply, a quarter of wood production, and 50% fuel and processed materials. At the same time, half of the world's greenhouse gases are produced as the area of the built environment is added. In 40 years, the world will double over a very short period ranging from 20 built environment to come. These facts make the construction and operation of urban buildings one of the largest consumers of energy and resources in the world. Pollution resulting from inefficient buildings and their resulting waste can be the result of bad building design. Pollutants and by-product waste that cause significant damage to the environment are merely incidental products.

The energy consumption that causes an electricity bill to rise is closely related to the phenomenon of Sick Buildings. These buildings rely more on artificial air conditioners and neglect natural ventilation. They depend on artificial lighting to illuminate the building from the inside, leading to an increase in electricity and a reduction of environmental and health benefits. According to the UK World Green Building Council (2016), It has been shown that exposure to artificial lighting for long periods of time causes serious damage to human health at the psychological and physical levels (Cho, Y. Ryu, S. Lee, B. Kim, K. Lee, E. Choi, J. 2015). The process of exposure to light oscillations from fluorescent lamps and the lack of natural lighting are two of the most negative effects of

the office environment. Buildings, construction, operation and maintenance, and when they become vital systems as a result of these pollutants, results in an unsafe environment for users. The high cost of energy, environmental concerns and public concern about the phenomenon of "sick buildings" are associated in the closed box buildings of the 1970s, all of which helped to drive the sustainable green design movement. Smart technologies or design techniques can reduce energy consumption and reduce environmental impact, but also reduce construction costs and building maintenance(Akadiri, Chinyio, & Olomolaiye, 2012). They can create a pleasant and comfortable working environment, improve the health of users, raise productivity rates, and also reduce the legal liability that may arise from building sickness (Feit, 2018). This, in turn, can increase the value of the property and rental income. The overall vacancy rate showed by the San Diego real estate market for green buildings was 4 percent lower than for non-green properties which was 11.7 percent, in comparison to 15.7 percent (USGBC, 2015). Thus, the green trend in the construction sector saves energy costs in the long run. According to the United States Green Building Council, green buildings in the United States (U.S.) consume 30% less energy than conventional buildings. Any additional costs in the design and construction phases can be quickly restored (Kats, 2003). In comparison, the traditional view of trying to reduce initial construction costs can lead to wasted materials and higher energy bills.

But the benefits of green buildings are not only limited to direct environmental and economic aspects. The use of natural daylight in office buildings, for example, can reduce energy costs and also make workers more productive. The California Energy Commission (2003) gives an estimation of the economic value of energy savings for daylighting offices in California at \$3.7 million dollars per year for the first year of new

construction. Due to accumulated construction, this would increase to 37 million dollars per year after 10 years. This is based on the average electric costs of \$0.1287 kWh in California in 2003(Heschong, 2003).

Today's enthusiasm for green design and sustainable buildings has its origins associated with the energy crisis in the 1970s. Architects began to think about the existence of box buildings surrounded by glass and steel that require enormous heating and cooling systems. From there, enthusiastic architects such as, William McDonough, Bruce Full, Robert Fox of the United States, Thomas Herzog of Germany, Norman Foster and Richard Rogers from Britain proposed more energy efficient architecture. These architects are progressive thinkers who began to explore and crystallize architectural designs that focused on long-term environmental impact. They looked beyond the initial costs for construction. This view has since been rooted in evaluation systems. Standard buildings which was applied in Britain in 1990, the Building Research Establishment Environmental Assessment Method (BREEAM)and the Leadership in Energy and Environmental Design (LEED)in the United States. This latter standard was developed by the American Council for Environmental and Design and was first introduced in 2000. Now, the USGBC certification is given for green construction for Outstanding Projects in Sustainable Green Architecture Applications in the United States. The standards are economically better. They are provided to architects, engineers, designers, developers and investors and consist of a simple list of criteria used to judge the extent to which the building is bound by green controls. According to these standards, points are awarded to the building in various aspects. Energy efficiency in the building is granted within the limits of 17 points. The efficiency of water use is granted within the limits of 5 points.

The environmental integrity of the building is granted to the limit 15 points. Additional points can be gained when adding specific building benefits such as renewable energy generators or gas/carbon dioxide monitoring systems. After the points are assessed by a committee, the total is calculated and the classification of the building is given. A building that achieves total LEED points of 39 or higher is rated Gold. This classification means that the building reduces the effects on the environment by at least 50% compared to a similar traditional building. A building design that achieve a total score of 52 points is rated Platinum. This classification means that the building reduces its environmental impact by at least 70% compared to a similar traditional building (USGBC, 2015, Feb 10). Evaluating buildings in such a way can highlight the number of traditional buildings that are inefficient. LEED-rated buildings are becoming popular in the U.S. While Saudi Arabia is still about 10 years behind. (see figure 14)

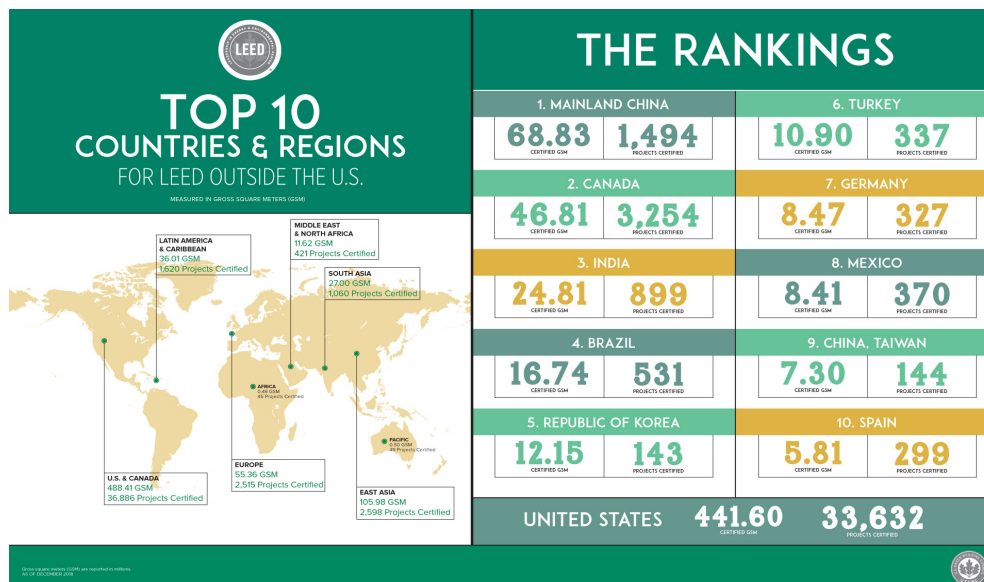


FIGURE 14: TOP 10 COUNTRIES&REGIONS FOR LEED OUTSIDE THE U.S. PHOTO BY USGBC

Green or sustainable design is also one of the modern trends in interior design. New building constructions should meet the needs of the present users without losing sight of the right of future generations to natural resources. Despite increasing talk of environmental sustainable interior design in the past few years, many architects and designers interested in the concept of sustainable design unfortunately may not apply these principles to their work, for several reasons, including poor environmental awareness of their customers, or weakness in their personal conviction.

Green architecture and green buildings are modern trends that deal with the relationship between buildings and the environment. There are many concepts and definitions that have been developed in this field. The architect Ken Yeang, (2000) believes that green or sustainable architecture must meet the needs of the present without neglecting the right of future generations to meet their needs as well as Reed B (2009) green buildings are buildings designed, implemented and managed in a manner that places the environment first. One of the concerns of green buildings is to reduce the impact of the building on the environment. Architect Stanley Abercrombie (1990) believes that there is an influential relationship between the building and the land. Many cities in ancient civilization also took into account the southern facades of the buildings. One of the most important energy rationing concepts is the building use of shade in all its parts, components and urban fabric. A building's shadow is one of the most important factors contributing to energy saving by more than 30%, in addition to leaving an aesthetic touch in cities. Sunlit and shaded areas make a difference in the beauty of the city as a result of surface refraction. The abundance of shade also has a good social impact contrary to what the modern city suffers today, where people use different means of transportation rather than walking.

There is a growing interest of both developed and developing countries in raising public awareness of the issues of environmental protection and sustainable development. There has been an emergence of green terminology in the late 20th century such as depletion of natural resources, ecological design, energy efficiency, sustainable design economics, alternative energy.

Environmentally friendly materials, and symptoms of a patient building. Using sustainable interior materials can play a significant role in achieving a healthy environment. The interior design process has imposed on designers the need for a comprehensive and informed approach to fulfill the increasing recognition of environmentally sustainable designs (Celadyn, 2018). Environmental responsibility in interior design is a notion that comprises of issues such as: the ecological effectiveness of an object, with regard to the negative effect minimization on the natural environment; the economic considerations and energy performance implications of the building space; and considerations of the social system in relation to the inner space quality parameters, the psychological state of the occupants and physical comfort. The frequent interrelationship of these three systems affects the stability of the human ecosystem model and is usually the area of consideration of environmentally responsible interior designers when optimizing the inner space functionality and quality. The term ‘green design’ is interchangeably used with ecological, environmentally-responsible, or sustainable design, it only applies in micro-scale of the interior. In the definition of the interior is the built environment is in direct mediation with the space of the occupants and makes up the closest area for their activities, and directly affects their health and well-being, and stimulates their patterns of behavior. Interior designers who uphold the environmental

implications, put considerations in the multiple life cycle consequences of completed project, and therefore, address global environmental problems (Celadyn, 2018).

Interior design is closely ingrained in its the society, where the design can affect the community member's livelihood through its associated standards of meaning, value, and culture. It is hypothesized that high awareness of green design can improve design concepts in Saudi Arabia. This design method can play a substantial role in the interior decision-making process in Saudi Arabia.

#### Interior Design in Saudi Arabia

In Saudi Arabia, there is one professional organization for engineers and other professional organization for other professions, but there is no single organization for interior design. The engineer profession is monitored under government rules and regulations, which specialize in engineering. It is called the Saudi Council of Engineers SCE in 2003. Interior design organizations are important to ensure designers are up to date on issues in interior design and have the relevant skills and knowledge to practice their profession. As an example, the U.S. has many professional interior design organizations such as American Society of Interior Design ASID, Interior Design Association IIDA, Council for Interior Design Qualification CIDQ, Interior Design Society ids, and Council for Interior Design Accreditation CIDA. According to a recent report, Saudi Arabia is determined to dramatically raise the living standards of its people, improving food and water security in an environment where the endowment of both is scarce, enhancing health services and targeting the elevation of educational institutions ranking, developing an extensive energy infrastructure and planning heavy investments in renewable energy. (2018) Saudi Arabia was part of the 2018 voluntary national review of



the high-level political forum on sustainability. This shows that Saudi Arabia is aware of the importance of sustainable living for large projects. What about small project or a residential home?

This chapter has presented the relevant literature pertinent to sustainable and green design, interior design and the current state of sustainable construction in Saudi Arabia. The next chapter presents the study's methods for acquiring new knowledge in the area.

## CHAPTER 3

### METHODOLOGY

This chapter describes the methodology selected for this study including research design, sampling, interview procedures and research questions. The study used qualitative approaches to provide insight into Saudi Arabia's interior design professional's knowledge of sustainable interior materials. As topical in qualitative research, a purposive sampling procedure was used. The sample of building developers and interior designers was selected by calling the interior design companies or contacting the designers via their Instagram or twitter accounts to schedule a phone call interview. The phone call interviews were designed to ask ten questions about the sustainable interior materials used in Saudi Arabia. The study has been done to test the awareness of Saudi Arabia designers about sustainable interior materials. These professionals are the ones who directly influence the purchasing decisions of their clients. Qualitative research has the advantage of giving the researcher the freedom to let the research unfold more naturally, allowing the acquisition of detailed and rich information in the form of comprehensive written descriptions(Holliday,2007,58).

The research has used sampling research design in which data was collected by telephone interview. Interviews entailed in-depth and semi-structured questions which enabled the researcher to collect data in a cost-effective way. This allowed the researcher to obtain detailed information regarding opinions, perceptions and personal feelings. This method also can enable a high response rate and enables one to clarify ambiguities when they arise. After collecting data, the researcher coded and grouped the responses into emergent themes. Coding is the procedure used for recording and categorizing text into mutually

exclusive subsets. Units are defined in coding to “increase the productivity, efficiency, and reliability of content analysis research” (Krippendorff, 2013, p. 98). Units are individual elements of text. They can be single words or longer text segments. For example, all of Julie H’s answers are sampling units, but when I put them into categories, they become coding units. Results are presented in graphs and frequency tables which will help in presenting the results in a more elaborate manner. Semi-structured interviews have the advantage of recognize pattern. While structured interviews does not allow detailed answers, it required short responses (O’Leary, 2017).

The researcher completed telephone interviews with fourteen interior designers. The first three of ten questions were about their age, education, work position, and experiences to have a general idea about their demographics. The remaining six questions were about their use and knowledge of sustainable interior materials. Each designer engaged in a one-half hour telephone interview. The researcher selected the designers carefully based on their descriptions because the study’s main focus is to interview those designers who actively meet with clients and are in the city of Riyadh, Saudi Arabia.

The research design included interview questions given to a sample of fourteenth interior designers. An audio recording device was used to record the interviews. The interview questions were developed by the researcher based on the literature review and questions about knowledge of sustainable materials and the opinions about specifying such materials. The interview questions are listed in table 1. Interviews were conducted in either Arabic or English. If in Arabic, the researcher translated all responses to English.

## **Sample**

- Fourteenth interior designers in Saudi Arabia were identified to participate in this study.
- The researcher recruited the designers by calling their company or contacting them via Instagram or twitter account.
- All participants were 18 years of age or older.
- After study recruitment, the researcher called the designers to schedule a telephone interview.
- Participation in this study was voluntary and confidential.

## **Institutional Review Board (IRB) Procedure**

There were no foreseeable risks to study participants. Study procedure permission to commence the study was granted by Arizona State University's Institution Review Board (IRB). The audio recording will be deleted after transcription. The researcher also complied with any applicable international rules or regulations related to this research.

- Data from each telephone interview was recorded in a smart phone and stored on the researcher's password-protected computer. Only the researcher has access to the data.
- The names of study participants are not associated with the interview data. All reports of research results are in aggregate form. No individual names or companies are used in any reports of this study. The investigator was responsible for gaining the verbal consent of study participants. In October 2017, the researcher completed the collaborative IRB Training Initiative (CITI) for human participants.

### 3.1. Research Questions

Based on the literature review presented in Chapter 2, the following two research questions were created to guide the research study:

Research Question 1: What is a Saudi Arabia interior designer's level of awareness of interior sustainable materials?

- Rational: There is not enough information about Saudi Arabia designers' level of awareness

Research Question 2: To what extent are Saudi Arabia designers specifying sustainable interior materials in their interior designs?

- Rational: To gain understanding of the usage of sustainable interior materials in Riyadh, Saudi Arabia

Table 1: Interview Questions

1-How old are you?
2_ What is your highest degree earned?
3_ How many years of experience do you have? work position?
4_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?
5_ Would you ask your client to spend more money for having a healthy sustainable home?
6_ Do you know the benefits of using sustainable materials? Can you give me an example?
7_ Would you use sustainable materials if they contributed to better health conditions within your home?
8- On a Scale of One to Five- How would you rate your interest in applying sustainable interior materials in your work?
9_ Did you learn about sustainable interior material in your education?

10\_ Do you have any final comments about using sustainable materials in an interior environment?

The benefits of interviews are that the interviewer can ask the same question in different ways to get fuller answers. In an interview, the interviewer can ask the interviewee for clarification or explanations. Phone interviews were chosen due to the advantages of action and reaction with the interviewee. Hearing the tone of their voices helped the researcher to reach accurate.

## CHAPTER 4

### STUDY AND DISCUSSION OF RESULTS

The Saudi Arabia interior designers who participated in this study are working in interior design companies in Riyadh, which is the capital of Saudi Arabia. Ten questions were asked to fourteenth interior designers by telephone interviews. The interviews lasted 30 to 60 minutes with each designer. While the designers were answering the questions, the interviewer was coding and taking notes. The designers who volunteered in this study worked in different interior design companies in Riyadh and held different positions. The questions focused on the awareness of sustainable interior materials in Riyadh, Saudi Arabia.

About half of the designer's answers represented a lack of awareness of what is occurring now in the Kingdom of Saudi Arabia with little concern of sustainability in interior design. Two designers refused to do the interview by saying, "*I have zero interest in sustainable interior design*" or "*what does sustainable interior materials mean*".

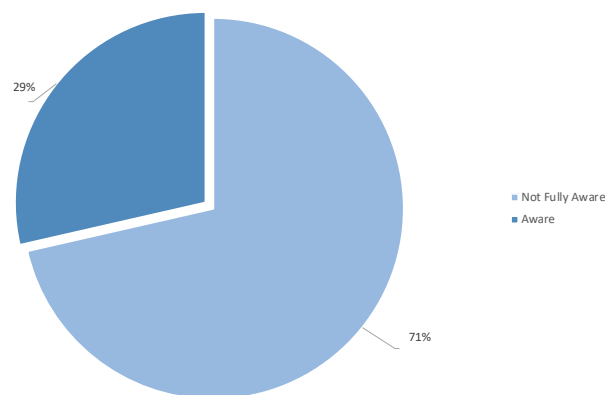


FIGURE 15: Designers Awareness of Sustainable Interior Materials

The first three questions were general questions about their age, education, work position, and experience. Most of the designers were between 25 to 39 years old with no more than 14 years' experiences. The designer's educational degrees were between bachelor and master's degree. (see table 2)

Male\female	Male	Male	Female	Female	Female
Age	28	38	27	30	29
Position	Sustainability engineer	Interior designer	Interior designer	Interior designer	Interior designer
Education	Eng. Architectural Engineering. MSc. Low Carbon Building design & Modelling	Bachelor and masters in interior design	Bachelor of interior design	Bachelor of interior design	Bachelor of interior design
Years of experience	2 years	14 years	8 years	6 years	5 years

Male	Female	Male	Male	Female	Female
39	31	34	28	35	25
Architecture engineer	Senior interior designer	Interior designer	Interior designer	Interior designer	Interior designer
Master of architecture and building science	Bachelor of interior and furniture design	Bachelor of interior design	Bachelor of interior design & master of interior design	Bachelor of interior design	Bachelor of interior design
15	10 years	9 years	6 years	8 years	2 years

Table 2: General Information.



Code	Question
S4 (Interest)	4_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?
S5 (Health)	5_ Would you ask your client to spend more money for having a healthy sustainable home?
S6 (Benefits)	6_ Do you know the benefits of using sustainable materials? Can you give me an example?
S7 (Usage)	7_ Would you use sustainable materials if they contributed to better health conditions within your home?
S8(implement)	8_ On a Scale of One to Five- How would you rate your interest in implementing sustainable interior materials in your work?
S9(Education)	9_ did you learn about sustainable interior material in your education?
S10(Thoughts)	10_ Do you have any final comments about using sustainable materials in an interior environment?

Table 3: Questions Codes.

S4 was about their interest to use sustainable interior materials in their projects. Only four out of fourteenth (28% of the respondents) were interested in applying sustainable interior materials, while the rest (71% of the respondents) acknowledged that they do not care if they use sustainable materials or not. One answer was shocking because the interviewee asked the interviewer about the meaning of sustainable materials, when the definition was explained to the designer the designer responded “*the Client always wants the cheaper materials and the variety of colors which mean they prefer artificial materials*”. About half of the designers seemed convinced that what the buyer need is what is important.

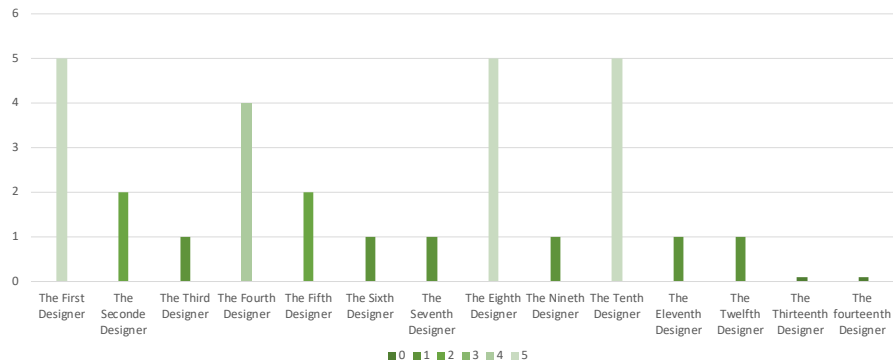
S5 was if the designers ask their client to spend more money for having a healthy sustainable home. Five participants (35% of the respondents) stated that they provide their client information about using green materials. One participant said that he/she considers environmentally-friendly materials in commercial projects only. The remaining

participants (57% of the respondents) answered that they let the client choose the materials they like without providing information about the benefit of using green interior materials.

S6 was asked to assess the designer's knowledge about the benefits of using sustainable interior materials. Four designers (28% of the respondents) have a good insight about the advantages of green materials while the remaining (71% of the respondents) designers were not fully aware of the influences of environmentally-friendly interior materials because their responses were (environmentally-friendly) and that's all they know.

The study participants were then asked if they would select sustainable materials if they contributed to better health conditions within the client's home, and all designers (100% of the respondents) strongly agreed to select green materials for healthy environment.

On a Scale of One to Five- How would you rate your interest in implementing sustainable interior materials in your work was question number eight. Three (21% of the respondents) participants have a complete interest in applying green materials to their project, while six (42% of the respondents) designers have no enthusiasm to add sustainable interior materials. As mentioned in the beginning of this chapter, two designers (14% of the respondents) have zero interest in using natural materials. One designer (7% of the respondents) rated his interest to number four while two designers (14% of the respondents) were in the middle. (see figure 16)



*FIGURE 16: Designers interest in implementing sustainable interior materials in their work*

S9 was about if they learned about sustainable interior material in their education. Eleven designers (90% of the respondents) acknowledged that they learned about green materials in their college but it was not stressed heavily while one designer has not taken any class about sustainable materials. The interviewer asked for further clarification. One participant commented, “it was just one course in my whole four years’ program”. Another participant stated that college professors did not encourage them to apply these sustainable principles in their school projects.

Finally, all study participants (100% of the respondents) acknowledged the importance of raising the awareness of sustainable interior materials in Saudi Arabia according to S10 comments. However, the interest of informing the clients about green interior materials is nominal based on the designers’ answers to question number five.

It is obvious that there is a lack of awareness about sustainable interior materials in Saudi Arabia based on the participants' answers. This study showed that the usage of green interior materials in Saudi Arabia is rare.

The designers who participated in this study are between 25 and 39 years, which means represent the new generation knowledge, they are more likely to be fully aware of sustainable interior materials in interior design than older designers. After the phone call interviews, the study results show that there is a lack of awareness in sustainable interior materials in Riyadh Saudi Arabia. To emphasize, only four out of fourteen (28% of the respondents) designers were fairly knowledgeable about green materials, which demonstrates the level of awareness happening now in Riyadh. It is obvious from participant responses that the lack of awareness about sustainable interior materials in interior design is exists in Saudi Arabia. One of the noticeable results is that one designer has no knowledge about sustainable interior materials when she/he asked the interviewer to define sustainable interior materials.

For the first three questions, the participants provided general information such as, age, highest degree, work position, and years of experience to give a clear image about the designer's demographic background.

The results of the fourth question S4 represent the designer's care of using environmentally-responsible products. Most answers (71% of the respondents) demonstrated a lack of care if the interior of the house they design for a client is made of sustainable materials or not. *"I let my client choose what blesses them"* was a response from one study participant, while another participant stated that she\he might apply sustainable interior materials in commercial projects only. It can be what benefits them

also, if the designer is informed to provide a list of natural materials and its benefit for them. Moreover, a designer mentioned that sustainable interior materials are high priced, which makes him/her not interested to go sustainable. Another replied that the suppliers he/she work with are not using green products. Three designers felt that their designs should be about the decoration and the beauty of their design regardless what kind of materials they use. On the other hand, responses to S5 question highlighted that designers are not asking their client to spend more money for a green interior house believing that the client will refuse because it is more expensive. However, designers have the ability to convince the client to go sustainable by informing them about the benefits of using sustainable interior materials such as long lasting, ecological toxicity, improve indoor environment like air quality and occupant health, and lower environment impact.

Responses to question number six showed the knowledge of the Saudi Arabia designer about the benefits of using sustainable materials. Most designers were aware of the advantages of specifying green materials.

Similar to question number six, responses to question S7 were alike. All designers (100% of the respondents) agreed to use sustainable materials if they contributed to better health conditions within their home, which means these designers have an awareness that green materials are beneficial to us. The results of question number seven provide evident that there is a contradiction between answers. It is obvious that the Riyadh designers are informed that sustainable interior materials are good, but they are not interested in using these materials.

S8 responses proved that there is a lack of interest in implementing sustainable interior materials in some of Riyadh interior designs homes. To clarify, based on

designers' interest rating, just four designers have an interest in green materials. On the other hand, ten designers (71% of the respondents) was not absorbed.

S9 was if the designers were educated about sustainable interior materials in their education. All designers admit that they did not learn enough information about green materials, they explained that their school projects did not require or recommend using natural materials. It can be said that the lack of awareness of going sustainable may be due in part to their education.

Finally, (100% of the respondents) believing that raising the awareness about sustainable interior materials is demanded these days in Saudi Arabia. One of the designers stated that *“It important to motivate the society regarding the advantages of using sustainable materials within their homes, so they will have a good understanding, on how to operate their homes after the installation of sustainable materials”* some designers were aware about the importance of using sustainable materials. on the other hand, most designers agreed to the concept of using sustainable interior materials, but hesitating to inform and convince their client fearing of losing their client. The Price was one of the answers that all designers agreed about, they believe that buyers will not choose green materials due to the high price comparing to artificial ones.

Apparently, the specification of sustainable interior materials is not that important in the Saudi Arabian interior design companies. Saudi Arabia government may impose on designers to put green materials into their projects or at least to inform their client of this option. For example, China has considered green building as a national strategy (Song, 2018). Developing a code for interior design in Saudi Arabia will help with the 2030

vision within higher education, if the interior designers learned how sustainable materials are important, they may be interested to apply these materials in their work. For example, in U.S., design schools are integrating sustainability in many student's projects.

Government guidelines for Saudi Arabian interior design could include:

- Inform the client about sustainable interior materials.
- Encourage the design schools in Saudi Arabia to have students apply sustainable interior materials in their projects.
- Raise the awareness about sustainable interior materials to society.
- Teach the general public the benefits of using sustainable interior materials.

According to a research by Susilawati and Al-surf (2011) over 50 percent (52.2) of Saudi Arabia people have not hear about sustainable housing before. (Susilawati, Al-surf, 2011).

Another study by Al Surf, Susilawati and Trigunarsayah (2013), reported that most Saudi Arabian architects and designers who participated in this study have not worked with any sustainable projects. This represents a lack of awareness of sustainability in the Kingdom of Saudi Arabia.

A prosperous country such as Saudi Arabia, that is seeking development, may benefit from giving attention to green interior design, in order to improve the environment (Al-Shihri, 2013). As mentioned in the literature review, the crown prince MBS is enhancing the country and his 2030 vision is attracting sustainability in many fields but not interior design. Prince Mohammed bin Salman have to concentrate on

interior design world. To have better inside developing to outside living.

#### 4.1. Study Limitations:

This study could have potential limitations. First, there is a lack of existing information and studies about sustainable interior materials, therefore study in this specific area could help provide better insight. Second, the fact that this study is done out of the United States reveals some issues because the research or could not have direct access to study participants in order to, determine the public awareness about sustainable interior materials, detect the usage of green materials, or compare relegated studies. The study sample of twelve designers was also low and should be considered when any generalization of study conclusions are made of the larger population of interior designers in Saudi Arabia.

The next chapter will draw conclusions from the study data. It will also provide study implications and suggested areas for further research.



## CHAPTER 5

### CONCLUSION

Using sustainable interior materials may impact a healthy environment. Natural materials are a trend in the developing countries to go more sustainable, and some countries are inventing new eco-friendly products. While Saudi Arabia is seeking sustainable and healthy environments, ascertaining the Saudi Arabian designers' level of awareness about sustainable interior materials in Riyadh, Saudi Arabia is a first step to help achieving country-wide sustainability by 2030.

Adopting green interior materials is a strong and effective way to go green, and to help society a great deal healthier. The awareness of the importance of using sustainable materials in the Kingdom of Saudi Arabia should be raised by the 2030 vision deadline. The Saudi Arabian designers' interest of applying green products and informing their customer about the benefits of it can be implemented. It is recommended that the government support the designers to go green in all of their projects. Saudi Arabia is a rich country that encourage their designers, architects, and engineers to try to invent new sustainable materials. It is also suggested for the education ministry to enhance their interior design program to meet sustainable practice guidelines and standards.

The ultimate goal of this research was to gain a more acute perspective into the Saudi Arabia interior designers' level of awareness, so that interior design may begin to promote and affect environmentally friendly behavior in its users. The two main fields that were the focus of this paper were the interior designers' knowledge of sustainable interior design in Saudi Arabia and the usage of green interior materials there. Both of

these aspects are essential to understanding the unique relationship people have with their built environment.

One goal of the sustainability movement, is the creation of an environmentally friendly society. The widespread use of sustainable interior materials practices has been a great step forward, yet if this movement is to be successful, it should focus equally on the relationship between people and their physical environments. Ultimately, the sustainability movement depends less on the architectural environments that are created, and more on the cooperation of the people who occupy those environments.

#### 5.1. Implications and Future Research:

This study could not have happened without the designers having a full knowledge of sustainable interior building materials and the best practices for constructing buildings using sustainable interior design. The research was necessary to identify whether Saudi Arabia's designers are knowledgeable and ready to embrace the new wave of sustainable development. The research documented designer knowledge of some of the sustainable interior building materials in use the study intention is to assist policymakers and the government in better preparing the country for an increased uptake of green practices in the construction industry. A more quantitative research study can be done in the future to demonstrating the interior designers' level of awareness in Saudi Arabia. Creating another study that shows the usage of green interior materials in Saudi Arabia may help clarifying the designers interest in using these materials. This study covers only interior designers in Riyadh, Saudi Arabia. However, testing different regions in Saudi Arabia such as Jeddah,

Dammam, Khobar, and Madinah, can be considered to see the big picture.

The following recommendations are provided, based on this study findings:

- More studies about sustainable interior materials could help future researchers.

Due to the lack of recourse that this research had faced, a more studies are needed to help future research have enough information.

- Sustainable interior material campaigns may raise the public awareness about the benefits of sustainable interior materials.

Starting an organization for interior design can help raise the public awareness by teach the public through schools, universities, and social events.

- The education of green interior materials can be developed in order to have a more knowledgeable generation of designers.

Design schools in Saudi Arabia may adjust their program to meet sustainable practice.

- Encouraging interior designers, architects, engineers, and other professionals to apply green materials in their work might help in having a healthy environment.

Each interior design, architecture, engineers, and other professionals companies may require applying sustainable materials in all of their projects could help achieving green environment.

In conclusion, this study has provided a glimpse into knowledge base and perceptions of a small group of interior designers. More research is needed and can build off the foundation of this study to assist the kingdom of Saudi Arabia achieve its sustainability goals in its 2030 vision.

References:

3form (2019). Lightbox framed varia. Retrieved from <https://www.3-form.com/products/lightbox-framed-varia>

Abercrombie, S. (1990). *A philosophy of interior design*. New York: Harper & Row Publishers.

Akadiri, P. O., Chinyio, E. A., & Olomolaiye, P. O. (2012). Design of A Sustainable Building: A Conceptual Framework for Implementing Sustainability in the Building Sector. *Buildings*, 2(2), 126–152. <https://doi.org/10.3390/buildings2020126>

Al-Shihri, F. S. (2013). PRINCIPLES OF SUSTAINABLE DEVELOPMENT AND THEIR APPLICATION IN URBAN PLANNING IN SAUDI ARABIA. *Journal of Engineering Sciences*, 41(3), 25.

Al-surf, M. Susilawati, C. Trigunarsayah, B. (2013). Integration of Saudi Arabia's conservative Islamic culture in Sustainable housing design. 19th CIB World Building Congress, At Brisbane, Australia.

Amin, A. Z. (2016). *Renewable Energy Benefits: Measuring the Economics*. 92.

Anandaraj, S. Rooby, J. Awoyera, p.o. Gobinath, R. (2018). Structural distress in glass fiber-reinforced concrete under loading and exposure to aggressive environments. *Construction and Building Materials*. ,197, 862–870. doi:10.1016/j.conbuildmat.2018.06.090.

Appunn, K. Wettengel, J. (2019, October 11) Germany's greenhouse gas emissions and climate targets. Retrieved from <https://www.cleanenergywire.org/factsheets/germanys-greenhouse-gas-emissions-and-climate-targets>

Armstrong Flooring (2019). Migrations biobased tile. Retrieved from <https://www.armstrongflooring.com/residential/en-us/search-results.html?q=Migrations+Biobased+Tile>

Benefits of green building. (2018). United States Green Building Council. Retrieved from <https://new.usgbc.org/press/benefits-of-green-building>.

Benjamin Moore (2019). Natura interior paint. Retrieved from <https://www.benjaminmoore.com/en-us/interior-exterior-paints-stains/product-catalog/nwip/natura-paint>

Celadyn, M. (2018). Environmental activation of inner space components in sustainable interior design. *Sustainability*, 10(6), 1945. <https://doi.org/10.3390/su10061945>

Chakibi, S. (2013, January 26). Saudi Arabia releases 9 new environmental laws. *EHS Journal*. Retrieved from <http://ehsjournal.org/http://ehsjournal.org/sanaa-chakibi/saudi-arabia-9-new-environmental-laws/2013/>

Cho, Y. Ryu, S. Lee, B. Kim, K. Lee, E. Choi, J. (2015). Effects of artificial light at night on human health: A literature review of observational and experimental studies applied to exposure assessment.

Commission, B. (1987). *Our Common Future: The world commission on environment and development*. Oxford University Press.

Creswell, J. W. & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches*. Los Angeles, CA: Sage.

Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable Development*, 19(5), 289–300. <https://doi.org/10.1002/sd.417>

Ecodomo (2019). Retrieved from <http://ecodomo.com/>

Ecoverings (2019). Bio-glass. Retrieved from <https://www.coveringsetc.com/BioGlass?pfid=a1050000002aAnW>.

Engineered Timber Resources (2009). Mulberry. Retrieved from <https://www.etimberr.com/products/mulberry/>

Expanko (2019). Resilient Flooring: About XCR4. Retrieved from <https://www.expanko.com/products/xcr4-corkrubber-flooring/about-xcr4/>

Feit, J. (2018, April 02). Don't Let Sick Building Syndrome Reduce Productivity. Retrieved from <https://www.buildings.com/news/industry-news/articleid/21497/title/dont-let-sick-building-syndrome-reduce-productivity>.

Future Saudi Cities. (2014). Retrieved from <https://www.futuresaudicities.org/>.

Garrison, D.R., Cleveland-Innes, M., Koole, M. & Kappelman, J. (2006). Revisiting methodological issues in transcript analysis: Negotiated coding and reliability. *Internet and Higher Education*, 9(1), 1-8.

Health and Wellbeing in Homes (2016) UK Green Building Council. World Economic Forum.

Heschong, L. (2003) *Windows and Offices: A study of office worker performance and the indoor environment*. California Energy Commission.

Holliday, A. (2007). *Doing and writing qualitative research* (2nd ed.). London; Thousand Oaks: Sage.

- John, J. S. (2012, April 5). Serious energy in serious trouble. Retrieved from <https://www.greentechmedia.com/articles/read/serious-energy-in-serious-trouble#gs.77ldft>
- Kats, G. H. (2003). *Green Building Costs and Financial Benefits*. 10.
- Krippendorff, K. (2013). *Content Analysis: An introduction to its methodology* (3<sup>rd</sup> ed.). Los Angeles: Sage.
- Malek, C. (2018, November 16). How Saudi Arabia is moving towards a green economy. Retrieved from <http://www.arabnews.pk/node/1401126/saudi-arabia>
- Marzouk, M., Metawie, M., Hisham, M., Al-Sulahi, I., Kamal, M. & Al-Gahtani, K. (2014).
- Modeling sustainable building materials in Saudi Arabia. (2014). *International Conference on Computing in Civil and Building Engineering*, 1546–1553. <https://doi.org/10.1061/9780784413616.192>
- Máté, K. (2007). Using materials for sustainability in interior architecture and design. *Journal of Green Building*, 2(4), 23–38. <https://doi.org/10.3992/jgb.2.4.23>
- Ning, Li, Yang, & Ju, (2016, Dec 27) Exploring Socio-Technical Features of Green Interior Design of Residential Buildings: Indicators, Interdependence and Embeddedness.15.
- Norm G. Miller, Dave Pogue, Quiana D. Gough, and Susan M. Davis (2009) *Green Buildings and Productivity*.
- Oldfield, F., & Dearing, J. A. (2003). The Role of Human Activities in Past Environmental Change. In K. D. Alverson, T. F. Pedersen, & R. S. Bradley (Eds.), *Paleoclimate, Global Change and the Future* (pp. 143–162). [https://doi.org/10.1007/978-3-642-55828-3\\_7](https://doi.org/10.1007/978-3-642-55828-3_7)
- O'Leary, Z. (2017). *The essential guide to doing your research project*. Los Angeles, CA: Sage.
- Pereira, N. (2018, February 25). Developers in Saudi urged to implement green building designs. Retrieved from <https://www.constructionweekonline.com/article-48342-developers-in-saudi-urged-to-implement-green-building-designs>.
- Peter. (2018, June 29) What is the greenest country in the world. Retrieved from <https://www.atlasandboots.com/greenest-country-in-the-world/>.

Reed, B. & Boecker, J. (2009). *The integrative design guide to green building: Redefining the practice of sustainability*. Hoboken, N.J: John Wiley & Sons.  
Saudi Arabia (2018). Sustainable Development Knowledge Platform. *United Nations*, United Nations. Retrieved from <https://sustainabledevelopment.un.org/memberstates/saudiarabia>

Shaping the Future of Construction: A Breakthrough in Mindset and Technology (2016).

Silvester, J. & Konstantinou, E. (2013). Lighting, well-being and performance at work. Retrieved from <https://www.cass.city.ac.uk/faculties-and-research/research/cass-knowledge/2013/october/lighting-well-being-and-performance-at-work>.

Song, S. (2018, Apr 26). Global Centre for Public Goods, & World Economic Forum: Here's how China is going green. Retrieved from <https://www.weforum.org/agenda/2018/04/china-is-going-green-here-s-how/>.

Stanley, S. (2019). Infographic: The 2018 Top 10 Countries and Regions for LEED. Retrieved from <https://www.usgbc.org/articles/infographic-2018-top-10-countries-and-regions-leed>.

Stelmack, A. (2012, Sep 17) Sustainable Interiors: Vetting interior products for healthy, sustainable homes. Retrieved from [https://www.architectmagazine.com/technology/products/product-review-sustainable-interiors\\_o](https://www.architectmagazine.com/technology/products/product-review-sustainable-interiors_o).

Sukhai, T. (2019, July 15). Best New Green Materials for Your Interior. Retrieved from <https://www.thisoldhouse.com/ideas/best-new-green-materials-your-interior>

Susilawati, C., & Al-Surf, M. (2011). *Challenges Facing Sustainable Housing in Saudi Arabia: A current study showing the level of public awareness*. 12.

Sustainable Flooring, Inc. (2019). Ceramicork™ tile. Retrieved from <https://www.sustainableflooring.com/product/ceramicork-tile/>

Synder, D. (2018, November 12). Green buildings attract happy tenants and bring green earnings to the commercial real estate industry. Retrieved from <https://cpowerenergymanagement.com/green-buildings-attract-happy-tenants-bring-green-earnings-commercial-real-estate-industry/>

Taleb, H. M. & Sharples, S. (2011). Developing sustainable residential buildings in Saudi Arabia: A case study. *Applied Energy*, 88(1), 383–391.  
<https://doi.org/10.1016/j.apenergy.2010.07.029>

The Business Case for Green Building (2012). United States Green Building Council. Retrieved from <https://www.usgbc.org/articles/business-case-green-building>

UN High-Level Political Forum, Sustainable Development Goals. (2018, July 9). “Transformation towards sustainable and resilient societies”. 1<sup>ST</sup> Voluntary National Review Kingdom of Saudi Arabia. Retrieved from

UNESCO (2014). World water development report 2014, water and energy. United Nations Educational, Scientific and Cultural Organization. Retrieved from <http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2014-water-and-energy/>

USGBC (2015, Feb 10) The Business Case for Green Building. Retrieved from <https://www.usgbc.org/articles/business-case-green-building>.

VSG Metal Arts (2016). Saint-Gaudens bronze tile. Retrieved from <http://vsgmetalarts.com/>

Watson, P. (2018, July 29). What is the greenest country in the world? Atlas & Boots Ltd. Retrieved from <https://www.atlasandboots.com/greenest-country-in-the-world/>

Wines, J. & Jodidio, P. (2008). *Green architecture*. Hong Kong: Taschen.

World Economic Forum (2016). Shaping the future of construction: A breakthrough in mindset and technology. Retrieved from [http://www3.weforum.org/docs/WEF\\_Shaping\\_the\\_Future\\_of\\_Construction\\_full\\_report\\_.pdf](http://www3.weforum.org/docs/WEF_Shaping_the_Future_of_Construction_full_report_.pdf)

Yeang, K. (2000). *The green skyscraper: The basis for designing sustainable intensive buildings*. Munich: Prestel.



APPENDIX A  
FIRST INTERVIEW RESPONSE

A. The interview with the first designer (Ammar)

1-How old are you?

28 years' old

2\_ What is your highest degree earned and work Position?

1. BEng. Architectural Engineering.
  2. MSc. Low Carbon Building design & Modelling
- My work position is Sustainability engineer

3\_ How many years of experience do you have?

2 years

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

Yes, it important I always think to adopt sustainable strategies (including Sustainable Materials) within the design of any facility.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

Yes, by explaining the economic, environmental and social advantages of investing on sustainable strategies.

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

- Environmental benefits.
- Economic benefits.
- Social benefits.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

YES.

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

5

9\_ Did you learn about sustainable interior material in your education?

Yes, during both Bachelor and Master degrees.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

1. It important to motivate the society regarding the advantages of using sustainable materials within their homes, so they will have a good understanding, on how to operate their homes after the installation of sustainable materials.
2. From my Experience within the Sustainability sector, buildings owners will concede investing on sustainable strategies in general, whenever they will have a full knowledge of sustainable designs economic advantages.

APPENDIX B  
SECOND INTERVIEW RESPONSE

B. The interview with the second designer (Esra)

1-How old are you?

31

2\_ What is your highest degree earned and work Position?

Bachelor of interior and furniture design\ Senior interior designer

3\_ How many years of experience do you have?

10 years

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

Not all time maybe for commercial projects it's easy to work within a certain concept but in residential it's not easy to convince the client they will not accept putting natural materials because its expensive.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

Maybe

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

To be kind to our environment

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Sure

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

2

9\_ did you learn about sustainable interior material in your education?

Not much

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Thank you. I wish this will change in Saudi Arabia.

APPENDIX C

THIRD INTERVIEW RESPONSE

C. The interview with the third designer (M.M)

1-How old are you?

34

2\_ What is your highest degree earned and work Position?

Bachelor of interior design\ Interior designer

3\_ How many years of experience do you have?

9

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

No, I let my client choose what blesses them.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

No

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

It's good for the environment.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Yes, of course.

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

1

9\_ Did you learn about sustainable interior material in your education?

Yes, but it wasn't important.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Through my experience working with clients for 9 years I can tell you that most client have no knowledge about green materials and they don't care to know.

APPENDIX D

FOURTH INTERVIEW RESPONSE

D. The interview with the fourth designer (Riyadh)

1-How old are you?

28

2\_ What is your highest degree earned and work Position?

Bachelor of interior design & master of interior design\ Interior designer

3\_ How many years of experience do you have?

6 years

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

Yes, I care because I guess it's better in the long time in many ways and this will reflect on the reputation I'm building

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

Yes

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

I guess using sustainable materials can make the building more energy efficient and environmentally-friendly

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Sure

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

4

9\_ Did you learn about sustainable interior material in your education?

Yes.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

I find the relationship between cost and sustainability is very weird I mean why is it the more sustainable the product is the higher price it gets I mean when I talk to clients and try to convince them to use sustainable materials and try explaining why and the benefits of it especially in the long term I get their attention until they know how much it cost and then they go with the conventional materials.



APPENDIX E  
FIFTH INTERVIEW RESPONSE

E. The interview with the fifth designer (A.H)

1-How old are you?

27

2\_ What is your highest degree earned and work Position?

Bachelor of interior design/ interior designer.

3\_ how many years of experience do you have?

8

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

Yes, because natural materials have good advantages.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

I'm not sure because most of my client know what kind of materials they want and it is not sustainable ones.

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

Yes, sure sustainable materials have many benefits like environmentally friendly.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Yes.

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

2

9\_ Did you learn about sustainable interior material in your education?

Yes, but not that much it was a class about all materials.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Good luck in your study. It is a good topic and we need it here in Saudi Arabia due to the lack of awareness that I realized in most of my clients.

APPENDIX F  
SIXTH INTERVIEW RESPONSE

F. The interview with the sixth designer (M.R)

1-How old are you?

25

2\_ What is your highest degree earned and work Position?

Bachelor of interior design\ Interior designer

3\_ How many years of experience do you have?

2

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

No, because its expensive

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

No

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

Environmentally- friendly.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Yes

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

1

9\_ Did you learn about sustainable interior material in your education?

Yes.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Sustainable interior materials is not important here in Saudi Arabia and I hope this change in the future.

APPENDIX G

SEVENTH INTERVIEW RESPONSE

G. The interview with the seventh designer (Nora)

1-How old are you?

35

2\_ What is your highest degree earned and work Position?

Bachelor of interior design\ Interior designer

3\_ How many years of experience do you have?

8

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

No, because my supplier I work with use conventional materials.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

No

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

Long lasting

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Yes

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

1

9\_ Did you learn about sustainable interior material in your education?

It was One class about all materials

10\_ Do you have any final comments about using sustainable materials in an interior environment?

I wish sustainable materials go cheaper.

APPENDIX H  
EIGHTH INTERVIEW RESPONSE

H. The interview with the eighth designer (Abdul)

1-How old are you?

38

2\_ What is your highest degree earned and work Position?

Bachelor of interior design & master of interior design\ Interior designer

3\_ How many years of experience do you have?

14 yrs.

4\_Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

Yes

Because sustainable materials are healthier and does not degrade the indoor air quality. It is safe for us and our family particularly children. It is free of harmful substances such as the volatile organic compounds that are likely contained in paints and adhesives.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

Yes.

Although clients always seek cost reduction, explaining the danger of non-sustainable materials on health is a good idea to raise the awareness of the clients who care. The challenge is the investor client who does not care of the health of his tenants or buyers. Since he does not build a home for himself or his family, he does not care. All he takes care of is the lowest cost and highest revenue.

6\_Do you know the benefits of using sustainable materials? Can you give me an example?

Yes

As I said in the answer of question 4, sustainable materials are free of harmful substances that negatively impact our health. This is a direct benefit. There are also indirect benefits such as reducing waste. Most of sustainable materials are made of recycled contents that were diverted from disposal in the landfill to be recycled in a manufacturing process of another material. Sustainable materials also are able to be reused, re-recycled, or dissolved.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Yes

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

5



9\_ Did you learn about sustainable interior material in your education?

Yes

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Yes. I want to add that the problem of using sustainable materials in the interior environment is the price. Although sustainable materials became more cheaper than before and most of suppliers compete to make their products standard environmentally friendly, the price is still high. Such high price is an obstacle that discourage clients to use sustainable materials in their projects. How to solve this? To raise the awareness and knowledge of the clients in an attempt to let them recognize the added value they get for the extra money they pay.

APPENDIX I  
NINTH INTERVIEW RESPONSE

I. The interview with the ninth designer (Reham)

1-How old are you?

29

2\_ What is your highest degree earned and work Position?

Bachelor of interior design \ Interior designer

3\_ How many years of experience do you have?

5

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

No, because interior design is about the beauty of the interior like furniture, color, and decoration which mean that the beauty of the place is more important.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

No.

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

Yes, it is environmentally friendly.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Yes, but these materials are expensive and that's why we go to manufactured materials.

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

1

9\_ Did you learn about sustainable interior material in your education?

Yes, but it was just one class. The courses did not required us to apply these sustainable principles.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Good luck in your research. This topic is needed in Riyadh. I wish you the best of luck.

APPENDIX J  
TENTH INTERVIEW RESPONSE

J. The interview with the tenth designer (Moh)

1-how old are you?

39

2\_ what is your highest degree earned and work Position?

Master of architecture and building science\ architecture engineer.

3\_ how many years of experience do you have?

15

4\_Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

Yes, I do care because I'm interested in sustainable and environmentally friendly materials. Actually I designed a LEED platinum building.

5\_Would you ask your client to spend more money for having a healthy sustainable home?

Yes, I always try to convince the client to invest on environmentally friendly system like natural light, solar panel, smart building control systems to save energy, and natural ventilation.

6\_Do you know the benefits of using sustainable materials? Can you give me an example?

The benefits are recycled and low maintained.

7\_Would you use sustainable materials if they contributed to better health conditions within your home?

Yes, I would use natural recycled and maintained wood flooring and natural plants to spread good and positivity interior environment. For furniture I go with natural wood and non-harm paint.

8\_On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

5

9\_did you learn about sustainable interior material in your education?

It was a one class about the climate and architecture but I'm interested from my sustainable practice in my work and I always try to implement the USGBC. I won the first place on an environmentally friendly building in a competition with University of Derby.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Thank you for choosing this interesting study. I suggest you to search the local natural materials that fit Riyadh climate and study the benefit of using them in interior design because most of our products are imported and it does not go with our climate. For example, reuse palm fronds as curtain and use stone cutting for flooring.

APPENDIX K

EKEVENTH INTERVIEW RESPONSE

K. The interview with the eleventh designer (Nada)

1-How old are you?

30

2\_ What is your highest degree earned and work Position?

Bachelor of interior design \ Interior designer

3\_ How many years of experience do you have?

6

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

NO, because as an interior designer I think the design and decoration is much important than sustainable materials.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

Yes, I would if the client is interested.

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

Yes, healthy.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Yes.

8-On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

1

9\_ did you learn about sustainable interior material in your education?

No not that much and I wish I had an adequate education about sustainability.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Good luck. I hope your study raise the awareness.



APPENDIX L

TWELFTH INTERVIEW RESPONSE

L. The interview with the twelfth designer (Nouf)

1-How old are you?

26

2\_ What is your highest degree earned and work Position?

Bachelor of interior design/ interior designer.

3\_ How many years of experience do you have?

3

4\_ Do you care if the interior of the house you design for a client is made of sustainable materials? Why or why not?

No, I care about the beauty of my designs.

5\_ Would you ask your client to spend more money for having a healthy sustainable home?

No.

6\_ Do you know the benefits of using sustainable materials? Can you give me an example?

Yes, environmentally friendly.

7\_ Would you use sustainable materials if they contributed to better health conditions within your home?

Maybe.

8\_ On a Scale of One to Five-How much are you interested in applying sustainable interior materials in your work?

1

9\_ did you learn about sustainable interior material in your education?

No.

10\_ Do you have any final comments about using sustainable materials in an interior environment?

Thank you. Raising the awareness in Saudi is important.

APPENDIX M

IRB APPROVAL FOR HUMAN SUBJECT TESTING



EXEMPTION GRANTED

Diane Bender  
The Design School  
(480) 965-04367  
Diane.Bender@asu.edu

Dear Diane Bender:

On 2/6/2019 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Determining an interior designer's awareness of sustainable building materials in Saudi Arabia
Investigator:	Diane Bender
IRB ID:	STUDY00009357
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"><li>• Arig Alotibi Final consent form Feb5.pdf, Category: Consent Form;</li><li>• Arig ALOTIBI-Form-Social-Behavioral-Protocol Feb5.docx, Category: IRB Protocol;</li><li>• Interview Questions.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li></ul>

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 2/6/2019.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,