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THE SPECIFICATION AND USE OF SUSTAINABLE FLOORING MATERIALS BY INTERIOR DESIGNERS IN RESIDENTIAL DESIGN PRACTICE

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ABSTRACT

THE SPECIFICATION AND USE OF SUSTAINABLE FLOORING MATERIALS BY INTERIOR DESIGNERS IN RESIDENTIAL DESIGN PRACTICE

By

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This study investigated factors influencing designers' intentions to use flooring materials as well as specifying sustainable flooring materials in residential design practice using the theory of planned behavior (TPB) as a framework. Following TPB, belief structures (behavioral, normative, and control beliefs), determinants (attitude, subjective norm, and perceived behavior control) of intention, and intention were examined. This study used quantitative methodologies through an Internet survey with a sample selected based on the American Society of Interior Designers (ASID) practicing interior designers in residential practice with available e-mail addresses. A total of 225 final surveys were utilized for further analysis. Findings from statistic analyses revealed that one factor of behavior beliefs—environment—positively influenced attitude whereas health—another expected outcome—was negatively influenced. Normative beliefs positively influenced subjective norms while control beliefs positively influenced perceived behavior control. Attitude, subjective norm and perceived behavior control positively influenced intention. Implications of these findings for researchers and interior designers were discussed in detail.

This thesis is dedicated to my family for their love and support.

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CHAPTER 1

INTRODUCTION

Americans have long been concerned with the natural environment, and many people have a positive attitude toward environmental programs (Berger & Corbin, 1992; Mendler, Odell & Lazarus, 2006). According to a survey of 3,600 consumers in nine United States (US) metropolitan areas, although 93 percent of Americans worry about their home's environmental impact, only 18 percent are willing to pay more to reduce such impact (Buchta, 1996).

Adler (2006) argues that the concept of sustainable design is emerging as a new set of opportunities for the building and design industry as a result of the growing population and the ongoing depletion of natural resources. Sustainable design refers to the connection or interdependence between the built and natural environment; the efficient use of energy, land, and other natural and finite resources, the enhancement of communities, and the fostering of physical and emotional well-being (McDonough & Braungart, 2002). As such, sustainability requires a balance of environmental, economic, and social issues considered over the long term; thus, sustainable building design focuses on these three principles of sustainability (Dean, 2003).

Interior designers are positioned to have a major influence on sustainability. "Interior designers who focus on environmentally responsible design plan, specify, and execute solutions for interior environments that reflect concern for both the world's ecology and the inhabitant's quality of life" (Guerin, 2003, p. 45). Interior designers have been progressive creators in regard to economic and social issues; however, now they are adding a responsibility—namely, solving environmental problems in their design

practices (Forster, Stelmack, & Hindman, 2007). To meet the growing concern related to environmental issues, interior designers should emphasize environmental, economic, and social sustainability. Consequently, interior designers must not only provide an improved quality of interior environment for residential customers, but also consider the homeowners' economic situation. Moreover, interior designers help residential customers enhance their quality of life and improve their productivity while protecting the health, safety, and welfare of the general public (National Council for Interior Design Qualification (NCIDQ), 2004).

To provide better interior quality, it is increasingly important for interior designers to consider incorporating sustainable design as a component of their practice. Designers, builders, and manufacturers are becoming increasingly interested in and are focusing on sustainable design as they reap the benefits of sustainable design, including environmental, economic, health and safety, and community benefits (US Green Building Council, 2003). Environmental advantages stem from the minimized impact of the building's construction on air, water, landfills, and non-renewable energy resources. Economic advantages result from reduced operation costs and developed occupant work. Meanwhile, the health and safety advantages arise from the improved comfort and health of the occupants as well as the use of finishing materials incorporating fewer toxins and less pollution. Finally, community advantages emerge from minimized strain on local organizations and the enhanced quality of human life.

To satisfy their customers, manufacturers and designers need to develop and select building products that offer an attractive balance of environmental and economic performance, health and safety, and community benefits. Designers' and builders'

conscientious selections of materials are often constrained by home environments because they consider not only residential health and safety, but also benefits to the natural environment. In their book *Cradle to Cradle*, McDonough and Braungart (2002) stated:

> Imagine what you would come upon today at a typical landfill: old furniture, upholstery, carpets, televisions...and plastic packaging. Resources are extracted, shaped into products, sold, and eventually disposed of in "graves" of some kind, usually a landfill or incinerator. Cradle to grave designs dominate modern manufacturing. According to some accounts more than 90% of materials extracted to make durable goods in the US become waste almost immediately (p. 27).

For example, Moussatche and Languel (2001) in evaluating interior materials of Florida's educational facilities determined that the service life of interior flooring materials expands an otherwise limited Service Life Cycle Cost (SLCC). However, materials for all facilities should contribute to the natural environment as well as human health and safety—factors that eventually come into play because people spend much of their lives in homes and educational facilities.

Interior material qualification is one way by which interior designers can contribute to this sustainable design attempt. Many people have been learning about the benefits of sustainable floor coverings and have become interested in the available options. Although customers and interior designers are becoming increasingly interested in sustainable materials, education in the field and believable, non-prejudiced referenced resources provide low guidelines for designers in this task (Malin & Wilson, 1997). One area that has seen a particularly strong demand for environmentally friendly as well as more exotic options is flooring, yet limited research exists in the area of flooring materials in the residential practice of interior designers. As interest in this area is only

expected to increase, this study will evaluate appropriate choices of flooring materials in residential practice. It will also provide interior designers with a framework for the evaluation of sustainable flooring material regarding the health of the environment as well as people.

Purpose of the Study

The current issues of sustainability, human health, and the environment make it important not only to investigate interior designers' current flooring choices, but also to examine core factors that influence these behaviors for future interventions. Thus, the purpose of this study is to identify environmental factors that predict designers' material choices for floors. The primary purpose of the current study is to examine sustainable interior floor coverings, incorporating as many of these factors as possible, as well as explore the effect of such choices on residential design by applying the theory of planned behavior (TPB) (Ajzen, 1991). TPB is considered one of the most effective frameworks for explaining what factors affect how interior designers evaluate a behavior.

Significance of the Study

This study will address significant effects when using sustainable flooring materials in residential design practice. Furthermore, it will provide designers with the knowledge and behaviors, as well as helpful tools, to use for assessing future practices in regard to flooring materials in residential design or other building types in future design projects. In particular, the present study will assess and test a conceptual model based on the theory of planned behavior (TPB) (Ajzen 1991; Ajzen & Fishbein, 1985), considered

one of the most useful frameworks for explaining which key factors influence how people evaluate a behavior and how compatibly they perform that behavior (Hansen, 2008; Hsu, Wang, & Wen, 2006; Lim & Dubinsky, 2005; Tan & Teo, 2000; Taylor & Todd, 1995, 1995a).

In addition, the outcomes of this study will be invaluable for developing approaches to assist interior designers to maximize effectiveness in flooring choice behaviors. The study is expected to contribute to interior designers' awareness of healthy alternatives for sustainable flooring materials for residential use. Ultimately, this study is significant because it will begin the systematic study of the effect of using sustainable flooring materials.

CHAPTER II

LITERATURE REVIEW

This chapter comprises two sections providing the background for the current study. The first section discusses the background of sustainability, followed by a discussion on sustainable floor coverings. The second section addresses the theoretical background for this study.

Sustainability

The Background of Sustainable Development

Sustainable development is an extremely broad concept that encompasses a variety of critical issues related to human and ecological welfare, including climate change mitigation, natural resource conservation, poverty reduction, and the protection of human rights. It transcends and subsumes earlier industry practices, such as pollution prevention and design for environment, by combining environmental stewardship with social responsibility and wealth creation.

During the 1970s and early 1980s, a number of independent people worldwide began working on responses to problems in which environmental issues interrelated with human development and progress. The concept of sustainable development was born as a means for realizing the developmental needs of all people without sacrificing the earth's capacity to sustain life. The common definition of sustainable development comes from the report *Our Common Future* by the World Commission in Environment and Development (WCED, 1987). The report defines sustainable development as an approach in which "development [...] meets the needs of the present without compromising the

ability of future generations to meet their own needs" (p. 43). Meanwhile, the Global Development Research Center (GDRC, 2008) defines sustainable development as "maintaining a delicate balance between the human need to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend" (para. 1).

Sustainability incorporates a balance that supports human needs without diminishing the health and productivity of natural systems. According to Satterthwaite (1999), *sustainability* can be used in a limited perception, as when an environmental group is focused exclusively on environmental sustainability. This has resulted in uncertainty or contradictions, even at the level of international sustainable development declarations. In its fullest sense, sustainability involves a balance of environmental, economic, and social concerns considered over the long term (Satterthwaite, 1999; Toman, 1994). Scholars have examined various aspects related to their particular fields. For example, environmentalists and ecologists address sustainable interactions with natural resources and systems. Economists emphasize the economic standard of living and sustainable economic development, while sociologists and anthropologists give greater emphasis to social and cultural factors and quality-of-life issues.

Meanwhile, in response to the WECD's *Our Common Future* and a subsequent charge from the United Nations, governments worldwide began to examine their programs and policies to find ways to promote sustainable development. Their examination provided the basis for the United Nations (UN) Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, also known as the Earth Summit, which bought global attention to the understanding that environmental problems were

intimately linked to economic conditions and problems of social justice (UN, 2003). The summit further demonstrated that three dimensions—environmental, economic, and social development—must be in balance with each other to ensure sustainable outcomes in the long term.

Sustainable Design

Sustainable design provides solutions to address the economic, social, and environmental challenges of the practices simultaneously; such solutions are powered by sustainable energies. The combined beauty and function of the design result in endurance and beauty, which are central to sustainable thinking (Williams, 2007). A variety of concerns, experiences, and needs have emerged related to sustainable design for the built environment: energy efficiency, which gained importance during the 1970s' oil crisis; the rapidly increasing population; recycling efforts, which became commonplace in the US in the 1970s and came to the attention of the building industry; and the "sick building syndrome" concept, which emerged in the 1980s amidst concerns for worker health and productivity (Bierman-Lytle, 1995; Environmental Protection Agency (EPA), 2005; US Green Building Council, 2003).

Sustainable design improves the quality of life while eliminating the need for non-renewable energy. Although largely powered by sustainable processes that provide essential needs, human settlements rely on fossil fuels for food, comfort, and transportation as well as air, water, and security. Designs powered by free sustainable energies require no fossil fuels and are capable of providing a healthier level of comfort and a higher quality of life. In achieving this connection with local free energies, sustainable design reduces or eliminates the daily consumption of non-renewable energy,

reduces project costs and maintenance costs and requirements, increases user approval and user productivity, and reduces the total embodied project energy. Sustainable design is green design powered by sustainable energies—in other words, functioning unplugged (Williams, 2007).

Green design is one element of sustainable design. Green buildings and communities that integrate the local climate and building resources create healthy interior spaces with natural light; complete recycling and reuse of materials are critical to the development of a sustainable future. However, subtle differences are evident between green design and sustainable development. According to the Green Design Education Initiative (GDEI) (2003), green design implies an interest in design that protects people's health and well-being while sustainable design also protects the global environment and the world's ecosystems for future generations.

According to the US Green Building Council (2007), the Leadership in Energy and Environmental Design (LEED) green building rating system provides building design guidelines that significantly reduce or eliminate the negative effect of buildings on the environment and occupants in them according to the categories of site, water, energy, material and resources, and indoor environmental quality. Meanwhile, the Minnesota Sustainable Design Guideline (MSDG) (University of Minnesota, 2006) provides instructions for each phase of the building lifecycle as well as strategies for each aspect. These systems include site, water, energy, indoor environmental quality, materials, and innovation. The methods promote the development of a performance building to protect healthy environments, recognizing that the integration of all the factors identified produces the best sustainable results with a high performance building for a healthy

environment—whether it is called green or sustainable design.

Mendler, Odell, and Lazarus (2006) focused on designing and delivering the buildings and communities of the future. They addressed the new sustainable design process, including ecological and human health impacts of design decisions, and enhanced the old decision model which was based on a balance of cost, schedule, and quality. The new decision model integrates human health, safety, and comfort as well as ecology as deliberate considerations for the decision-making process in the same way that time, cost, and quality are integral to the project decision-making process today. The concepts (see Figure 1) are planned to help people change the methods systematically.

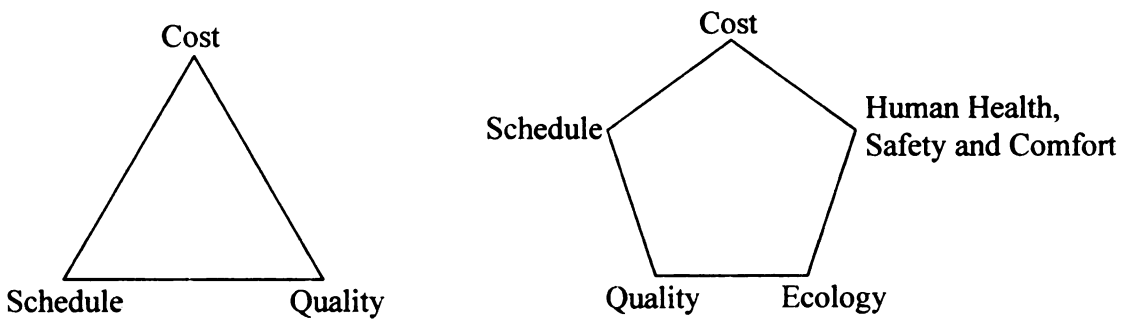

Figure 1. Designing sustainability (Mendler, Odell, & Lazarus, 2006)

Environmentally Sustainable Interior Design

Environmentally sustainable interior design issues, which people deem important, have not been considered as significant criteria in environmental issues. Sustainable interior design is based on the sustainable design principles and strategies common for the built environment. It uses design strategies from environmental approaches from MSDG, including conservation, site, water, energy, indoor environmental quality (IEQ), materials, waste, and innovation, as well as the LEED Rating System, including site,

water, energy, material and resources, and IEQ. In addition, sustainable interior design issues in MSDG include performance management, site and waste, energy and atmosphere, IEQ, and materials and waste. Ultimately, interior materials are the primary issues affecting human health, indoor air quality, and lifecycle design. As previously mentioned, interior materials for making environmentally sustainable interiors are significant; thus, their components will be explored as they relate to the variables studied.

Sustainable Floor Coverings

For individuals with Multiple Chemical Sensitivity (MCS), Nussbaumer (2006) identified the advantages and disadvantages of interior materials and products used to finish a home. Floor coverings have been considered for sustainable interiors as related to the lifecycle analysis (LCA), durability, energy use, and low- or zero- volatile organic compounds (VOCs) as well as to health and the environment. The analysis divides floor coverings according to soft floor coverings, hard surface floor coverings, and resilient floor coverings according to the characteristics of the materials used (Nussbaumer, 2006; Winchip, 2007).

Soft floor coverings: Carpet. Carpet is often chosen for residential buildings for its many health and environmental effects. Although most carpet is made with nonrenewable petroleum and cannot be recycled, recent advances in carpet recycling have resulted in increasing carpet recycling, yielding some of the strongest resource savings in terms of net avoided greenhouse gas (GHG) emissions of all the materials that can be currently recycled (Carpet America Recovery Effort (CARE), 2007). According to a 2007 CARE report, carpet diverted from landfills removed 296 million pounds—an increase of 35 million pounds or 17 percent over 2006; 275.1 million pounds of the 296

million total was recycled in 2007 (CARE, 2007). In addition, the US EPA reported waste composition data indicating that carpet comprises 1.2 percent of Americans' generation of municipal solid waste (6 billion pounds total) (EPA, 2005). The 296 million pounds diverted by CARE through 2007 represents only 4.9 percent of this total.

For healthy building, the carpet and rug institute (CRI) provides indoor air quality standards and enforces the CRI Green Label program. According to these standards, carpet often results in MCS or sick building syndrome (SBS) (Forster, Stelmack, & Hindman, 2007). Carpet creates a texture that can collect and maintain allergens, dust, and dust mites (Andes, 2000; Winchip, 2007). Therefore, for human environments, carpet fiber choice should be natural and synthetic fibers. Natural fibers include wool, cotton, hemp, linen, jute, sisal, reed, coir, seagrass, mountain grass, and rubber (Winchip, 2007), which are much more eco-friendly choices. For example, one of the best fibers for greening a home is wool. If possible, it is made domestically and avoids transportation and pesticides (Forster et al., 2007) because the domestic materials used are related to reduced fuel energy.

Hard surface floor coverings: Wood. As wood is an environmentally friendly resource, wood flooring is a great sustainable resource. Several forest certification programs in North America, such as the Forest Stewardship Council (FSC), the Sustainable Forestry Initiative (SFI), and the Sustainable Forest Management Program, focus on the recycling and renewability aspects of wood products (Sullivan & Horwitz-Bennett, 2008). The Athena Model developed by Canada's Athena Sustainable Materials Institute and used by Sullivan and Horwitz-Bennett (2008) suggests that wood is a more environmentally friendly material than steel or concrete. As Sullivan and Horwitz-

Bennett (2008) asserted, according to a recent national survey sponsored by the National Wood Flooring Association (NWFA), 90 percent of real estate property agents report houses with wood floors sell faster and for higher prices than houses without any exposed wood flooring.

Moreover, according to the EPA, 50 million Americans suffer from allergies, which are the sixth leading cause of chronic disease in the United States. Children, in particular, can be highly susceptible. Wood flooring can protect humans from bacteria, dust, and dirt as these cannot embed themselves in wood flooring (NWFA, 2005). Wood provides a surface that is easy to sweep and maintain, removing dirt or waste from the floor simply. This condition promotes human health and better indoor air quality (IAQ).

For example, bamboo is the most representative resource in hard floor covering for sustainable interiors. The amount of bamboo flooring used is increasing in the US (Winchip, 2007), making it a popular resource for a sustainable interior. Moreover, the growth time for bamboo is more rapid than other trees used for flooring (e.g., oak), and bamboo can regenerate without replanting, so it is a low-energy, naturally renewable material. Therefore, bamboo is aesthetically pleasing, durable, and made from a rapidly renewable, abundant resource.

Hard surface floor coverings: Tile. Tile is used for not only flooring in high-traffic and water-intensive applications such as bathrooms, kitchens, and entrances, but also walls, ceilings, and furniture. Tile is truly an environmental choice. To reduce waste and energy consumption, tiles can be made from post-consumption and post-industrial recyclable content. Tile flooring is made of ceramic, porcelain, terra-cotta, or earthenware; new or recycled glass; cement; stone; or terrazzo. Recycled-content tiles

include ceramic, glass, and terrazzo. Tiles can use 30 to 100 percent of recycled solid waste, including post-consumer recycled materials such as granite dust and clear and colored glass from window panes, bottles, windshields, and aviation. In addition, post-industrial recycled tile reuses plate glass and grinding paste from the computer industry. If the tiles are demolished, the materials can be recycled again (Winchip, 2007).

Tile is also a material that is healthful and safe for interiors (Nussbaumer, 2006; Winchip, 2007). Not only does tile not emit toxic gases into the interior, but its additional materials—such as substrates, adhesives, grout, mortar, and sealants—also tend to be zero- or low-VOC and do not include petroleum or plastic substances. Thus, tile and its related products provide healthful IAQ (Winchip, 2007).

Resilient floor coverings: Linoleum and cork. Resilient flooring provides comfort and cushion to users, thereby helping people who stand for a long time in one area or children who play on the floor (Winchip, 2007). Although resilient flooring includes vinyl, linoleum, and cork, linoleum and cork are the best choices for the environment and IAQ. According to Walsh (2004), resilient flooring made of polyvinyl chloride (PVC) emits VOCs, affecting IAQ, although the material was a popular floor covering in the 1960s (Winchip, 2007). Vinyl is also not biodegradable and cannot be recycled. Therefore, the material is not designated as a sustainable interior material and should be exchanged for the environmentally positive aspects associated with linoleum (Winchip, 2007).

Linoleum is made from natural materials—namely, linseed oil, wood flour, rosin, jute, and limestone (EPA, 2007; Winchip, 2007)—that come primarily from natural, renewable resources that are used without environmental risk. Thus, linoleum can be

recycled, is durable, and is comfortable. In 2004, a leading manufacturer reported that linoleum sales growth outpaced the overall flooring market by more than double in five years (Walsh, 2004).

Another sustainable resilient floor covering is cork. Cork is harvested from the bark of the cork oak tree every nine to eleven years, leaving the tree to remain living an average of 100 to 120 years (Winchip, 2007). As such, cork is one of best examples of a cradle-to-cradle resource (Forster et al., 2007) and a highly renewable resource, even though it is used in limited spaces because it is sensitive to heat and cannot be used with excessive moisture (Winchip, 2007).

Theoretical Framework: Theory of planned behavior (TPB)

This section reviews the conceptual definitions of variables and proposes the conceptual model of the current study as well as specific research questions.

General Phases of TPB

Ajzen (1991) and Ajzen and Fishbein (1985, 1988) developed the theory of planned behavior (TPB), extending the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). TRA is a theory of attitude-behavior relationships with attitudes, subjective norms, behavioral intentions, and behavior in a fixed causal sequence (Ajen & Fishbein, 1980; Fishbein & Ajzen, 1975; Shih & Fang, 2004; Taylor & Todd, 1995). In addition, TRA has obtained broad support for predicting behavioral intention and behavior in various disciplines, including social psychology, communication, and consumer behavior (Davis, Bagozzi & Warshaw, 1989; Madden, Ellen, & Ajzen, 1992; Sheppard, Hartwick, & Warshaw, 1988; Taylor & Todd, 1995).

However, TRA assumes that the behaviors being examined are under complete volitional control (Madden et al., 1992); therefore, it cannot be used to explain situations in which behaviors do not require skills or resources (Conner & Armitage, 1998).

TPB adds the prediction of consumers' behavioral intentions and actual behaviors with different levels of volitional control as well as an additional factor—perceived behavioral control—to TRA (Ajzen, 1991; Ajzen & Fishbein, 1985; Ajzen & Madden, 1986; Bansal & Taylor, 2002; Madden et al., 1992). Several studies have demonstrated that TPB is stronger than TRA (Conner & Armitage, 1998; Madden et al., 1992; Shih & Fang, 2004; Tan & Teo, 2000) as including perceived behavioral control in the theory helps increase TPB's boundary beyond the condition of pure volitional control (Madden et al., 1992). In the TPB model, behavior is a direct function of behavioral intention, which in turn is formed by attitude (which reflects feelings of favorableness or unfavorableness toward a behavior), subjective norm (which reflects perceptions that significant referents desire the individual to perform and not perform a behavior), and perceived behavioral control (which reflects beliefs regarding control over factors that may facilitate or impede performance of a behavior) (Ajzen,1991; Ajzen & Fishbein, 1985; Ajzen & Madden, 1986).

TPB is a useful theoretical framework for identifying factors that predict intention to perform a particular behavior, which in turn is linked with the actual behavior (Bansal & Taylor, 1999, 2002; Fortin, 2000; Taylor & Todd, 1995). TPB provides researchers with insight into the exploration of both internal factors (e.g., consumers' perception of events) and external factors (e.g., social influences, resource accessibility, or availability) that may influence consumers' intentions to engage in a specific behavior (Lim &

Dubinsky, 2005). Indeed, TPB has been applied to various fields of research, including users' acceptance of computer technology (Davis et al., 1989), college students' intention and behavior with respect to leisure time (Ajzen & Driver, 1992), and residential design implications of consumers' recycling behaviors (Macy & Thompson, 2003; Taylor & Todd, 1995a,1995b).

An essential assumption of TPB is that people usually act in a practical manner, considering both obtainable information and the internal or external suggestions of a behavior (Ajzen & Fishbein, 1985). Ajzen (1991) and Ajzen and Fishbein (1985) asserted that, when demonstrating a particular behavior, a primary determinant of TPB is an individual's intention. Intentions appear to satisfy the simulative nature that determines human behavior. In other words, as people increase their intention to achieve a behavior, they are more likely to act upon it. According to people's intention extent, they presumably refer to three considerations, conceptually divided as attitude toward the behavior, subjective norm, and perceived behavioral control. Each determinant has an individual belief structure: behavioral beliefs, normative beliefs, and control beliefs (Ajzen, 1991; Ajzen & Fishbein, 1985). Figure 2 illustrates the TPB model and its components as developed by Ajzen (1991) and Ajzen and Fishbein (1985).

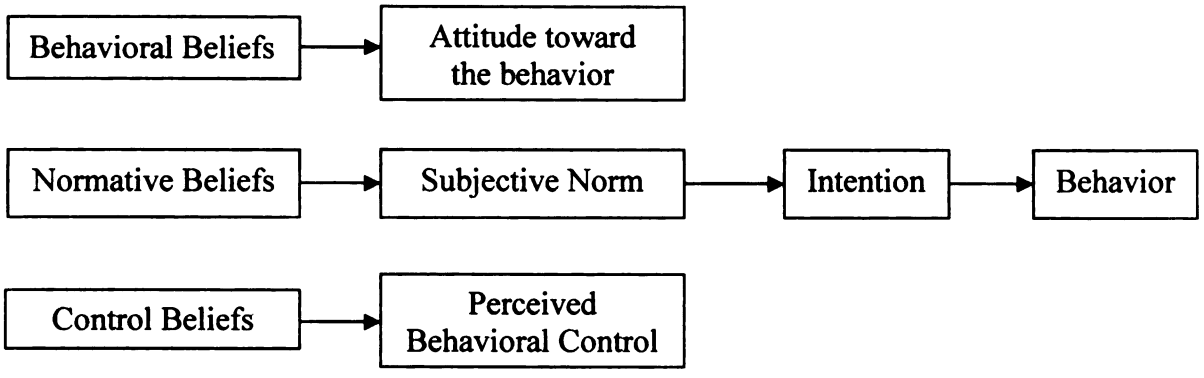

Figure 2. Theory of Planned Behavior (Ajzen, 1991, 2006)

Components of TPB

Actual behavior and intention. Actual behavior in TPB refers to observable evidence of a behavior, which is acted or not acted out with respect to a specific aim in a given situation and at a specific time (Fishbein & Ajzen, 1975). Fishbein and Ajzen (1975) proposed that the most significant antecedent of a volitional behavior is an individual's intention to perform the behavior. Intention points to "how hard people are willing to try or how much of an effort they are planning to exert" (Ajzen, 1991, p. 181), referring to actual behaviors that people intend to perform (Conner & Armitage, 1998). However, this does not mean that measuring intention always results in a perfect prediction of an actual behavior. Certain criteria must be considered in relation to intention and actual behavior. Fishbein and Ajzen (1975) suggested three primary factors that influence the relationship between intention and behavior: 1) the degree to which the measure of intentions and behaviors standard correspond with respect to their levels of specificity; 2) the stability of intentions between time of measurement and observation of the behavior; and 3) the degree to which performance of the intention is under the

volitional control of the actor.

Determinants of Intention. TPB postulates three determinants of intention. The first determinant is attitude toward the behavior, which Ajzen (1991) described as the degree to which an actor has a favorable or unfavorable evaluation of the given behavior. Attitude toward the behavior is determined by the sum of achievable behavioral beliefs, which refer to the subjective probability that the behavior will accomplish—positively or negatively—supposed outcomes (Ajzen, 1991; Fishbein & Ajzen, 1975).

The second determinant is subjective norm, which refers to the perceived social pressure to perform or not perform a particular behavior (Ajzen, 1991; Ajzen & Fishbein, 1985). According to Ajzen (1991) and Ajzen and Fishbein (1985), subjective norm is decided by the sum of assessable normative beliefs, which means perceived behavioral assumptions are important referents to individuals or groups. Several referent individuals or groups are based on demographics (e.g., family, parents, and friends) and situations (e.g., customer, advisor, and teacher).

The third determinant of intention is the level of perceived behavior control, which refers to the perceived ease or difficulty of performing the behavior; this is assumed to reflect the individual's perception of people's ability to perform a particular behavior (Ajzen, 1991). Ajzen (1991) also mentions that perceived behavioral control is determined by the addition of accessible control beliefs, which refer to the perceived presence of requisite resources and opportunities to perform a behavior in question. Control beliefs are produced by the past experience of the behavior, by second-hand information of behavior, by the experience of friends and referent people, or by other factors that facilitate or impede performance of a behavior (Ajzen, 1991; Ajzen &

Fishbein, 1985; Doll & Ajzen, 1992).

A major factor in TPB involves performing a given behavior of the individual's intention. In most cases, individuals perceive that they have more control over the behavior as they are convinced that they have more resources and opportunities, and fewer hindrances, in performing a behavior (Ajzen, 1991; Doll & Ajzen, 1992; Taylor & Todd, 1995, 1995a). Thus, TBP can be used to determine how residential interior designers make choices in the specification and use of floor coverings.

Predicting Interior Designers' Flooring Choice Using TPB

TPB can be considered a useful framework in understanding designers' choice of sustainable floorings for several reasons. First, the TPB model includes factors that stimulate a behavior by influencing attitudes toward the behavior (i.e., attitude toward the choice of flooring materials). Second, TPB explains the influence of a subjective norm on the intention to perform a behavior, which can benefit designers who often decide on floorings based on the opinions of important people involved in the project. Finally, TPB can make it possible to examine the influence of interior designers' voluntary or active exposure to sustainable floorings according to their intention and consumption of flooring materials.

Belief Structures and Predictor Variables

Behavioral beliefs toward attitude. The behavioral beliefs make it possible to examine the role of various characteristics and benefits of a behavior in influencing attitudes toward the behavior. Researchers have decomposed behavioral beliefs in various ways to discover the relationship between behavioral beliefs and attitudes. Taylor and

Todd (1995, 1995a) decomposed behavioral beliefs for consumers' adoption behaviors by identifying three salient behavioral beliefs of adopting innovation based on characteristics of innovation (Rogers, 1983): relative advantage, complexity, and compatibility. They found significant paths between relative advantage/compatibility and attitude toward adopting innovation and between complexities. Similarly, Shih and Fang (2004) examined the same behavioral beliefs to study Internet banking usage and found significant influences of relative advantage and complexity on attitude toward using Internet banking. Hsu et al. (2006) decomposed behavioral beliefs, in the context of predicting consumers' intention to use mobile text message coupons, into compatibility, personal innovativeness, perceived ease of use, and perceived usefulness. Among these beliefs, compatibility, perceived ease of use, and perceived usefulness were related to attitude toward mobile coupon usage.

The use of sustainable or green flooring materials is increasing in interior design. In order to decompose behavioral beliefs of using sustainable flooring materials in residential design practice, it is important to refer to previous literature concerning information related to sustainable material use. Several studies on sustainability have suggested that characteristics indicate supposed outcomes or benefits after analysis for material impacts (Cain, 2007; Kang & Guerin, 2009). Specifically, Andes (2000) examined the effects on people's health in regard to carpet fiber as well as differences between carpet and other flooring materials for growing dust mites. Fisk and Rosenfeld (1997) stress that buildings affect the health and welfare of their occupants through IAQ. Indoor environments have been shown to play an important role in respiratory disease, allergy and asthma symptoms, sick building indications, and worker performance.

Behavioral beliefs in the context of sustainable flooring materials refer to the subjective probability that using sustainable flooring materials will achieve certain expected outcomes. In order to examine behavioral beliefs in relation to sustainable flooring materials, it is necessary to identify what kinds of outcomes consumers or designers can expect from using sustainable flooring materials and how those expected outcomes influence attitude toward using sustainable flooring materials. Individuals may have different assessments of each of the expected outcomes, and each expected outcome may affect attitude toward using sustainable flooring materials separately. Thus, the behavioral beliefs can help researchers better understand the effects of the behavioral beliefs on attitude toward using sustainable flooring materials. As such, the following hypotheses emerge:

> **H1a**: Beliefs about improving environments will be positively associated with attitude toward the use of sustainable flooring materials.
>
> **H1b**: Beliefs about human health, safety, and comfort will be positively associated with attitude toward the use of sustainable flooring materials.

Normative beliefs and subjective norm. Subjective norm is defined as a person's perception that most people who are important to a person think the individual should or should not perform the behavior in question (Chang, 1998). According to TPB, the subjective norm is a function of a set of beliefs termed "normative beliefs," which are concerned with the likelihood that important referent individuals, such as spouse, parents, or colleagues, would approve or disapprove of the behavior (Ajzen & Madden, 1986). In the context of sustainable flooring materials, if an association designer believes that the most important referents (i.e., his/her parents, fiends, advisors/bosses, and or colleagues) think the designer should choose sustainable flooring materials, the perceived design

pressure to choose sustainable flooring materials will be increased along with the motivation to comply.

Consumers' normative beliefs will have a direct impact on subjective norm, the perceived social pressure to comply with the important referent's expectations of using sustainable flooring materials (Ajzen, 1991; Ajzen, & Fishbein, 1985; Madden et al., 1992). Although the decomposition of normative beliefs based on different referent groups may be appropriate, the current study considered referent groups as a dimension consisting of clients and other designers, as they were supposed to be highly related with normative beliefs (Taylor & Todd, 1995). In addition, there is discordance concerning the use of the multidimensional normative beliefs. Although Taylor Todd (1995a) used two groups for normative beliefs (e.g., family and people in his/her household for internal normative beliefs, friends and neighbors), Shih and Fang (2004) did not use normative beliefs because other researchers failed to identify individual dimensions without that construct (e.g., Oliver & Bearden, 1985; Shimp & Kavas, 1984). Given that TPB predicts a positive relationship between normative beliefs and subjective norm (George, 2004; Shih & Fang, 2004; Taylor & Todd, 1995, 1995a), the current study will examine the following related hypothesis:

H2: Normative beliefs will be positively associated with subjective norm.

Control beliefs and perceived behavioral control. Control beliefs are the individual's perception of the extent to which people possess internal and external factors that may increase or decrease the perceived difficulty of performing the behavior (Ajzen, 1991; Park, 2003). According to Ajzen and Fishbeina (1985), internal factors include such variables as individual differences, information, skills, abilities, and emotion, while

external factors involve time, financial opportunity, and dependence on others.

As suggested in the relevant literature on sustainable flooring materials' factors, the use of sustainable flooring materials is affected by various variables. One of the most prominent characteristics of sustainable flooring materials is that interior designers have control over their use or choice behavior. TPB makes it possible to examine the role of interior designers' control in predicting their intention to use sustainable flooring materials. In the current study, control beliefs refer to the perceived presence of requisite resources (e.g., time, computer, Internet access) and opportunities to facilitate or impede watching online video advertisement; meanwhile, perceived behavioral control refers to the perceived ability to watch online video advertisement. According to TPB, consumers' control beliefs affect perceived behavioral control, which in turn influences an intention and an actual behavior (Ajzen & Madden, 1986). Empirical evidence indicates that control beliefs have a significant relationship with perceived behavioral control (Hsu et al., 2006; Shih & Fang, 2004; Taylor & Todd, 1995, 1995a). As with normative beliefs, control beliefs were also considered a fundamental construct in the current study. In the context of selection of sustainable flooring materials, an individual with a stronger perception about the presence of resources (information, knowledge, money, or the accessibility) and possibilities to use sustainable flooring materials is more likely to have a stronger perception about designers' ability to use sustainable flooring materials, resulting in the following hypothesis:

> **H3**: Control beliefs will be positively associated with perceived behavioral control.

Components of Behavioral Intention

Attitude and intention to use sustainable flooring materials. Several TPB studies have found a significant influence of attitude toward a given behavior on intention to achieve the behavior (Ajzen & Driver, 1992; Gopi & Ramayah, 2007; Mathieson, 1991; Shih & Fang, 2004; Taylor & Todd, 1995, 1995a, 1995b). Specifically, Tarkiainen and Sundqvist (2005) found that attitude toward buying organic food was positively associated with intention to buy it. Taylor and Todd (1995a) demonstrated that attitude was highly related to the intention to recycle data. Bamberg, Ajzen and Schmidt (2003) also supported the conclusion that attitude had an effect on intention. As many studies have demonstrated that attitude toward behavior is an important predictor of intention, it is expected that a more favorable attitude toward using sustainable flooring materials will lead to a stronger intention to use sustainable flooring materials. Thus:

> **H4**: Attitude toward using sustainable flooring materials will be positively associated with intention to use sustainable flooring materials.

Subjective norm and intention to use sustainable flooring materials. Ajzen (1991) and Ajzen and Driver (1992) defined subjective norm as perceived social pressure to perform or not perform the behavior, which implies that people have assumptions regarding their significant others' perceptions of their decision to engage in the behavior. Here, significant others mean close people who might include family, friends, and—in case of co-workers—supervisors and clients. According to Hansen et al. (2008) and Lim and Dubinsky (2005), the stronger the subjective norm in the research, the stronger the behavioral intention. For example, Taylor and Todd (1995) found a positive impact of the subjective norm on a determinant of intention to adopt innovation. Vanucci and

Kerstetter (2001) revealed that the subjective norm was significantly related to the usage of the Internet. Furthermore, Lee (2008) discovered positive influences of subjective norm on intention to watch online video advertisements. As prior research has supported the significance of subjective norm, it is predicted that interior designers' perceived social pressure to use sustainable flooring materials will have a positive and significant effect on intention to use sustainable flooring materials. As such:

> **H5**: Subjective norm will be positively associated with intention to use sustainable flooring materials.

Perceived behavioral control and intention to use sustainable flooring materials. Perceived behavioral control is defined as the extent that people believe that they have control or that external factors can facilitate or constrain behavior (Ajzen, 1991). If individuals perceive that performing the behavior is easy, they will have a stronger intention to carry out a behavior (Ajzen, 1991; Hansen et al., 2008). This effect of perceived behavioral control on intention is based on the concept that perceived behavioral control motivates individuals' assessment of the likelihood of performing a behavior (Ajzen & Madden, 1986). Several studies have supported the positive relationship between perceived behavioral control and intention (Ajzen, 1991; George, 2004; Madden et al., 1992; Shih & Fang, 2004). Taylor and Todd (1995) found a positive relationship between perceived behavioral control and intention to adopt an innovation. In addition, they demonstrated that intention to recycle was positively influenced by perceived behavioral control (Taylor & Todd, 1995a). Cunningham and Kwon (2003) found that perceived behavioral control (time) was positively related to intention. Perceived behavioral control also strongly related to intention to participate in

environmental concern research (Bamberg et al., 2003). Therefore, with voluntary exposure to sustainable flooring materials, it is assumed that designers' perceived ability to use sustainable flooring materials will positively affect their intention, resulting in the following hypothesis:

> **H6**: Perceived behavioral control will be positively associated with intention to use sustainable flooring materials.

According to TPB, this is predicted in the following hypotheses shown in Figure 3.

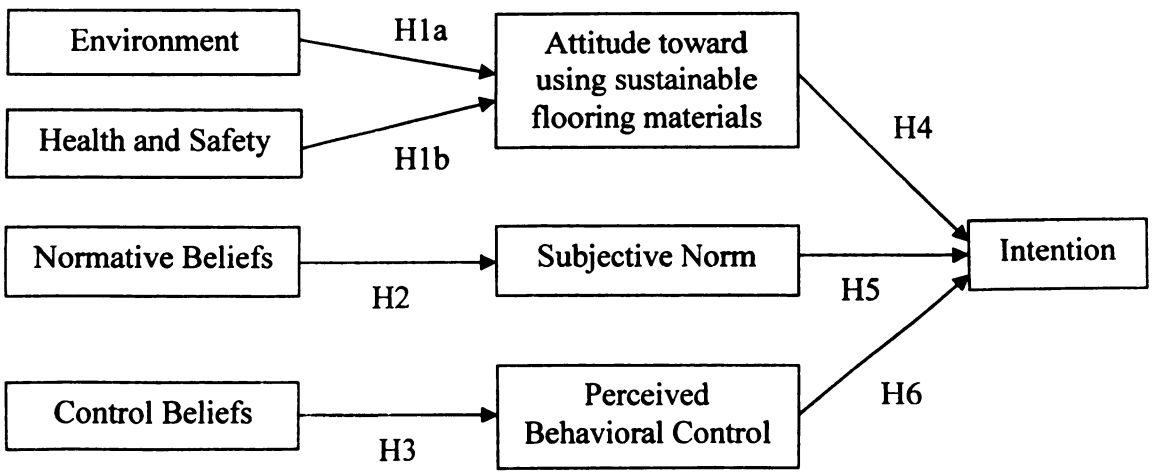

Figure 3. Hypothesized Model

CHAPTER III

RESEARCH METHODS

This chapter presents research methods. First, the sample for the proposed study is introduced in detail. Next, methods of data collection including survey instruments are described. Finally, methods of data analysis are presented.

Sample

In the current study, the target population consisted of interior designers who work in residential projects in the US. Participants were recruited from the membership list of the American Society of Interior Designers (ASID), which is the oldest and largest professional organization of interior designers, comprising 20,000 practicing interior designers, more than 2,500 member firms, and more than 12,000 students of interior design (ASID, n.d.). Thus, it is possible to recruit a large number of interior designers through this organization. ASID provides designers' information to everyone who needs help with their home or other interior design. The sample of this study was randomly selected based on ASID practicing interior designers in residential practice whose e-mail addresses were available.

This study utilized an e-mail web-based survey questionnaire for data collection. An Internet survey offers several advantages; it is able to cover a large geographic area in the US, can be sent faster and more easily to participants, and offers easier processing of data and low costs (Hewson, Yule, Laurent & Vogel, 2003; Porter &Whitcomb, 2003). However, relative return rates are lower than other competitive methods, such as mail surveys or paper surveys.

This Internet survey questionnaire was e-mailed to ASID members in residential practice. A total of 1,875 surveys were sent via *SurveyMonkey*. After the initial e-mail was sent to the sample, two email reminders were sent to those who had not yet responded. The final survey response rate was approximately 14 percent (N = 256), with 31 cases being dropped because they were found to be inappropriate for the analysis. Thus, a total of 225 final surveys were utilized for further analysis.

Instrument and Measurement

The questionnaire consisted of a seven-point bipolar adjective scale and likert scale. The survey was divided into two sections. The first section contained questions about demographic information and characteristics on sustainable flooring materials. The second section of the survey contained items designed to assess the major constructs using TPB. To examine TPB in the context of the choice of sustainable floor materials, questions were used based on the TPB questionnaire construction guidelines developed by Ajzen (2002, 2006). The developed model of TPB was based on the original scales created by Ajzen and Fishbein (1980, 1985) and Ajzen (1991). All statements were taken from Ajzen (2002, 2006) and developed for this study. A seven-point scale was used for strength of all variables. The measurement and scale for each variable are described in the following paragraphs.

Behavioral beliefs. To measure two decomposed behavioral beliefs related to using sustainable flooring materials (i.e., environment and health), the strength of each behavioral belief and its outcome evaluation were measured. Table 1 shows all items for the strength of behavioral belief and outcome evaluation.

Table 1. Items of Behavioral Beliefs for Using Sustainable Flooring Materials

Behavioral Beliefs Items ($\sum b_i e_i$)
Factor 1: Environment
b1. I would help protect the environment by using sustainable flooring materials
e1. Being able to protect the environment in choosing sustainable flooring materials is
b2. I would help reduce hazardous waste by using sustainable flooring materials
e2. Being able to help to reduce hazardous waste in choosing sustainable flooring materials is
b3. I would help improve indoor air quality by using sustainable flooring materials
e3. Being able to improve indoor air quality in choosing sustainable flooring materials is
Factor 2 : Health
b4. I would help improve the health of people by using sustainable flooring materials
e4. Being able to improve the health of people in choosing sustainable flooring materials is
b5. I would help protect from an allergy or atopic dermatitis for people by using sustainable flooring materials
e5. Being able to protect from an allergy or atopic dermatitis for people in choosing sustainable flooring materials is

The strength of each behavioral belief was assessed on a seven-point scale ranging from strongly disagree (1) to strongly agree (7). Meanwhile, the outcome evaluation of each expected outcome was measured on a seven-point scale ranging from extremely unimportant (1) to extremely important (7). To measure behavioral beliefs, the strength of each behavioral belief (b_i) was multiplied by its outcome evaluation (e_i); the resulting products were summed for each outcome factor (i.e., $\sum b_i e_i$ for each outcome factor) (Ajzen, 1991).

Normative beliefs. To measure normative beliefs, the strength of each normative belief (n_i) and motivation (m_i) to comply with each referent was measured ($\sum n_i m_i$). As Table 2 indicates, four items assessing the strength of normative beliefs and motivation to comply were borrowed and modified from Taylor and Todd (1995a). The strength of

normative beliefs (ni) was measured on a scale ranging from extremely unlikely (1) to extremely likely (7). Motivation to comply (mi) was measured on a scale ranging from not at all (1) to very much (7). To compute overall normative beliefs, the strength of each normative belief was multiplied by motivation to comply with each referent, and the resulting products were summed across all items of referent groups (Ajzen, 1991).

Table 2. Items for Normative Beliefs of Using Flooring Materials

Normative Belief Items (Normative Beliefs = $\sum n_i m_i$)
n1. Clients in my practice think I should choose sustainable flooring materials for residential projects m1. Generally speaking, I care what my clients think about my choice of sustainable flooring materials for residential use
n2. Co-workers in my company think that I should choose sustainable flooring materials for residential projects m2. Generally speaking, I care what my co-workers in my company think about my choice of sustainable flooring materials for residential use

Control beliefs. The strength of each control belief (c_i) was measured on a seven-point scale ranging from strongly disagree (1) to strongly agree (7). The perceived power of each control factor (p_i) was measured on a seven-point scale ranging from extremely unimportant (1) to extremely important (7). Table 3 lists all items for control beliefs.

To compute overall control beliefs, the strength of each control belief was multiplied by perceived power of each control factor; the resulting products were summed across all items ($\sum c_i p_i$) (Ajen, 1991; Taylor & Todd, 1995).

Attitude toward using sustainable flooring materials. Three items to measure attitude toward choice of sustainable flooring materials were taken from Ajzen (2002, 2006) and modified for this study. Each of the seven point scales appeared after the

following statement: "For me to choose sustainable flooring materials for clients' residential projects is _____." This item was measured on seven-point scales, anchored with bad - good, harmful – beneficial, or worthless – valuable.

Subjective norm. Two items were taken from Ajzen (2002, 2006) and modified for this study to measure subjective norm. The two items (e.g., "Most people who are important to me think that I should choose sustainable flooring materials for residential projects") were measured using seven point bipolar scales ranging from strongly disagree (1) to strongly agree (7).

Perceived behavioral control. Four items for measuring perceived behavioral control was taken from Ajzen (2002, 2006) and modified for this study. First statement, "For me, choosing sustainable flooring materials for residential projects is _____" was assessed on a seven-point scale anchored with definitely impossible (1) to definitely possible (7). The second statement, "If I wanted to, I would be able to choose sustainable flooring materials for residential projects" was assessed on a seven-point scale anchored with definitely false (1) to definitely true (7). Other items were measured using the statement "I choose sustainable flooring materials for residential use," which was measured on a seven-point scale ranging from strongly disagree (1) to strongly agree (7). The last item was assessed using the statement, "How much control do you believe you have over choice of sustainable flooring materials?", as measured on a seven-point scale anchored with no control – control.

Intention. This part was measured using three items taken from Ajzen (2002, 2006) and modified for this study. All statements were assessed on a seven-point scale.

Table 3. Items for Control Beliefs of Using Sustainable Flooring Materials

Control Belief Items (Control Belief = $\sum c_i p_i$)
c1. If I want to, I could easily get information about sustainable flooring materials p1. Being able to get information about sustainable flooring materials as part of my decision to choose sustainable flooring materials for residential use is
c2. I know enough about sustainable flooring materials for residential use on my own p2. Knowing enough to specify sustainable flooring materials is
c3. I would be able to choose sustainable flooring materials even if there is no one around to advise me on what kinds are available p3. Being able to choose sustainable flooring materials even if no one is around to advise me on what kinds are available is
c4. I would feel comfortable using sustainable flooring materials on my own p4. Being able to feel comfortable using sustainable flooring materials is
c5. I have access to the Internet whenever I want to choose sustainable flooring materials p5. Having access to the Internet whenever I want to choose sustainable flooring materials
c6. I find a trade magazine whenever I want to choose sustainable flooring materials p6. Finding trade magazines whenever I want to choose sustainable flooring materials
c7. Sustainable flooring materials are not used on my projects p7. Whether or not I use it personally, choosing sustainable flooring materials for residential use is
c8. For me choosing sustainable flooring materials requires more money than other basic flooring materials for my clients p8. Whether or not choosing sustainable flooring materials takes more money than general flooring materials for my clients, it is

The first statement, "I intend to choose sustainable flooring materials for residential projects," was measured on a scale ranging from extremely unlikely (1) to extremely likely (7). The next statement, "I plan to choose sustainable flooring materials for residential projects," was measured on a scale ranging from strongly disagree (1) to strongly agree (7). The final statement, "I will make an effort to choose sustainable flooring materials for residential projects," was assessed on a scale ranging from definitely false (1) to definitely true (7).

Data Collection

To understand perception and experiences about sustainable flooring materials as well as the survey questionnaire, a pilot study was conducted to reduce obscurity. When the pilot study was sent, the respondents were told that the questionnaire was a trial version of the survey. They were asked to fill out all questionnaires and to comment on wording and clarity. The participants are 15 interior designers in Michigan; their opinions helped this paper modify the survey questions, and some questions were revised in accordance with their opinions, as shown in Appendix.

Prior to data collection, survey instruments were reviewed and approved by the Institutional Review Board (IRB) of Michigan State University. Following IRB guidance, participants were informed by the investigator that participation was completely voluntary and that the results of the participation would remain confidential and would not be released in any individually identifiable form. Participants were also informed that anonymity would be protected, as consent was established when the questionnaire was completed and returned to the researcher.

Data Analysis

Multiple regression analysis—using the stepwise method—was utilized to test all hypotheses. A multiple regression model was developed based on TPB's global constructs. Multiple regression analysis determined what constructs/beliefs were most strongly related to intention. Statistics yielded from the regression analyses included standardized beta weights and multiple correlations for predictor variables (Ajzen, 1991). A total of four models were run (see Figure 4).

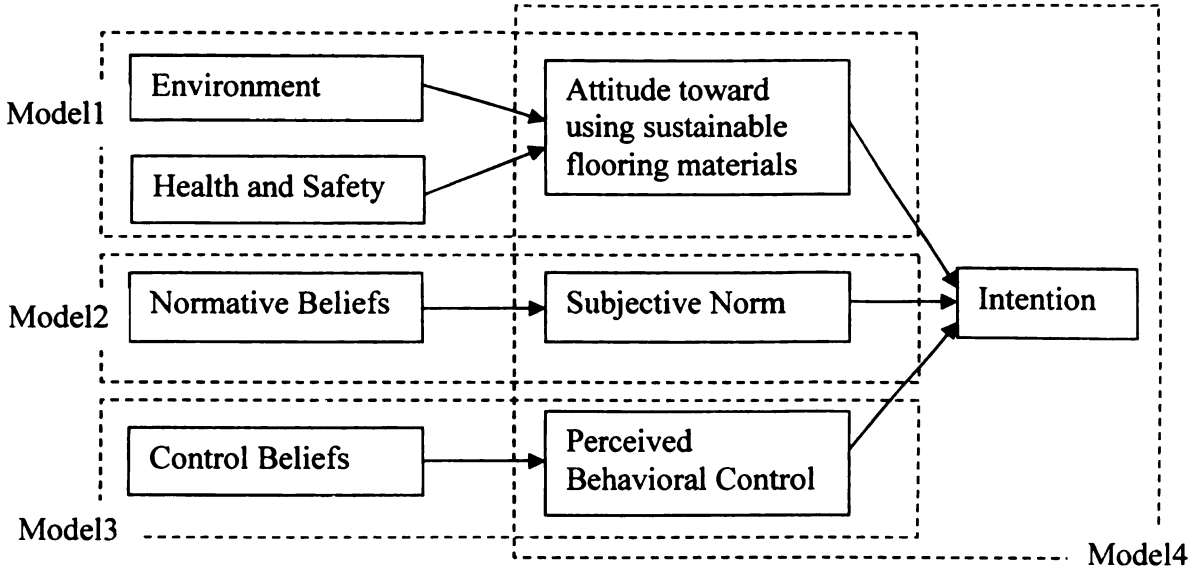

Figure 4 Models for Analysis

CHAPTER IV

RESULTS

This chapter begins by describing the characteristics of participants (i.e., demographic characteristics and designers' backgrounds) and their perceptions about sustainable floor coverings. Next, descriptive findings and reliability are presented. Finally, hypotheses tests are presented using regression analyses conducted to examine the effects of using sustainable floor coverings in residential practice on the constructs of TPB.

Characteristics of Participants

Demographic characteristics. Table 4 presents the frequency and percentage distributions for the demographic characteristics of the sample: respondent gender, age, education level, and ethnicity. As indicated, the sample consisted of 225 individuals; 198 (88 percent) participants were female. Most participants fell within the 45 to 54 years age range (n = 84, 37.3 percent), with 51 (22.7 percent) in the 55 to 65 years range and 44 (19.6 percent) in the 35 to 44 years range. Most respondents had college degrees: college degree (n = 169, 75.1 percent) and graduate degree or higher (n = 42, 18.7 percent). Almost all respondents self-identified as Caucasian (n = 209, 92.9 percent), followed by Native American (n = 8, 3.6 percent), Hispanic/Indian (n = 3, 1.3 percent), and Asian (n = 2, 0.9 percent).

Table 5 presents respondents' geographic regions of firms. Among the regions included, a high response rate was evident in California (n = 37, 16.4 percent), Florida (n = 30, 13.3 percent), and Texas (n = 12, 5.3 percent). Low response regions included Delaware, Iowa, Kansas, Louisiana, and five other regions (each n = 1, 0.4 percent).

Table4. Demographic Characteristics, Frequencies and Percentage of total

Demographic Characteristics	Frequency(N)	Percentage of Total (%)
Gender		
Male	27	12.0
Female	198	88.0
TOTAL	225	100
Age		
25-34 years	31	13.8
35-44 years	44	19.6
45-54 years	84	37.3
55-64 years	51	22.7
65-74 years	13	5.8
75 years and over	2	0.9
TOTAL	225	100
Education Level		
Some college, no degree	13	5.8
College degree	169	75.1
Graduate degree or higher	42	18.7
Missing	1	0.4
TOTAL	225	100
Ethnicity		
Native-American	8	3.6
African-American	2	0.9
Caucasian	209	92.9
Asian	2	0.9
Hispanic/Indian	3	1.3
Other	1	0.4
TOTAL	225	100

Respondents' backgrounds. Table 6 presents the respondents' status related to interior designer characteristics. According to the years of practice in interior design, about half (n = 104, 46.2 percent) of the participants have practiced more than 20 years, which may be reflected in the result that respondents (n = 73, 32.4 percent) had chosen sustainable flooring materials two to five times during their residential practice. In addition, 55 (24.0 percent) reported using it fewer than two times, while 41 (18.2 percent) reported using it more than 20 times in residential practices (see Table 6). More than half (n = 127, 56.4 percent) reported the size of their typical interior design project as 3,001 to 6,000 square feet, while 30.2 percent (n = 68) reported projects that were less than 3,000 square feet. Table 7 presents the frequency of sustainable flooring material use in residential practices

by project size. One respondent group that used sustainable flooring the most (i.e., more than 20 times) reported project sizes of 3,001 to 6,000 square feet (n = 28, 68.3 percent) while the respondent group that used it the least (i.e., fewer than two times) also reported project sizes of 3,001 to 6,000 square feet (n = 23, 41.8 percent).

Participants' general knowledge, perception, and attitude. Before testing the effective questions on the topic of using sustainable flooring materials beyond the TPB, participants were asked several questions related to the topic—namely, frequency of using flooring materials, education about sustainable flooring materials, and attitude and beliefs toward sustainable flooring materials in general.

Table5. Geographical Region of Firms

Location	Frequency (N)	Percent (%)	Location	Frequency (N)	Percent (%)
AL	6	2.7	MI	8	3.6
AR	4	1.8	MN	9	4.0
AZ	6	2.7	MO	3	1.3
CA	37	16.4	MS	1	0.4
CO	6	2.7	MT	1	0.4
CT	6	2.7	NC	3	1.3
DE	1	0.4	NE	2	0.9
FL	30	13.3	NJ	7	3.1
GA	13	5.8	NM	1	0.4
HI	2	0.9	NV	3	1.3
IA	1	0.4	NY	2	0.9
ID	4	1.8	OH	5	2.2
IL	11	4.9	OR	3	1.3
IN	2	0.9	PA	6	2.7
KS	1	0.4	RI	1	0.4
KY	2	0.9	TN	4	1.8
LA	1	0.4	TX	12	5.3
MA	7	3.1	UT	1	0.4
MD	5	2.2	VA	6	2.7
			missing	2	0.9
TOTAL					225(100%)

Table 6. Interior Designer Characteristics

	Frequency (N)	Percentage of Total (%)
Years of Practice Interior Design		
Less than 2 years	2	0.9
2-5 years	24	10.7
6-10 years	33	14.7
11-15 years	30	13.3
16-20 years	31	13.8
More than 20 years	104	46.2
Missing	1	0.4
TOTAL	225	100
Size of Interior Design Projects		
Less than 3,000 Sq.ft	68	30.2
3,001 to 6,000 Sq.ft	127	56.4
6,001 to 20,000 Sq.ft	27	12.0
20,001 to 50,000 Sq.ft	2	0.9
Missing	1	0.4
TOTAL	225	100
Using Time of Sustainable Flooring Materials in Residential Practice		
Less than 2times	55	24.0
2-5 times	73	32.4
6-10 times	34	15.1
11-15 times	13	5.8
16-20 times	6	2.7
More than 20 times	41	18.2
Missing	3	1.3
TOTAL	225	100

Table7. Frequency and Percentage of Using Time of Sustainable Flooring Materials in Residential Practices by Project Size

	Less than 3,000sq.ft. N (%)	3,0001 to 6,000sq.ft. N (%)	6,001 to 20,000sq.ft N (%)	2,001 to 50,000sq.ft N (%)	TOTAL N (%)
Less than 2 times	21(38.2)	23(41.8)	9(16.4)	2(3.6)	55(100)
2-5 times	24(32.9)	43(58.9)	6(8.2)	0	73(100)
6-10 times	9(26.5)	20(58.8)	5(14.7)	0	33(100)
11-15 times	4(30.8)	8(61.5)	1(7.7)	0	13(100)
16-20 times	1(16.7)	5(83.3)	0	0	6(100)
More than 20 times	8(19.5)	28(68.3)	5(12.2)	0	41(100)

When asked about frequency of choice of flooring materials for residential projects, 104 (46.2 percent) participants reported ceramic tile was used very frequently, 89 (39.6 percent) reported using stone very frequently, and 79 (35.1 percent) reported using carpet very frequently. Previous research found that the rate of using sustainable materials—namely, bamboo, cork, certified wood flooring, and reclaimed wood—had increased from 2006 to 2007 (EDC, 2007). However, participants very rarely used bamboo (n = 63, 28 percent), certified wood (n = 40, 17.8 percent), reclaimed wood (n = 78, 34.7 percent), cork (n = 80, 35.6 percent), linoleum (n = 108, 48.0 percent), terrazzo (n = 100, 44.4 percent), rubber (n = 122, 54.2 percent), and vinyl (n = 103, 45.8 percent) in residential projects. Despite being sustainable materials with the exception of vinyl, many sustainable flooring materials (except for vinyl) are used very rarely. Table 8 presents the frequency and percentage distributions.

According to previous research of Environmental Design + Construction magazine which compared learning sources between 2006 and 2007 (EDC, 2007), in 2006, trade magazines were the most important sources of information about green flooring materials; manufacturers' websites (66 percent) and word-of-mouth referrals (42 percent) were also used to learn about them. In 2007, manufacturers' websites (84 percent) were most often used to learn about green flooring materials, followed by trade magazines (72 percent) and calls to dealers or distributors (62 percent) (EDC, 2007). The current research confirmed these findings. In this study, trade magazines (n = 179, 79.6 percent) were very important sources used to learn about sustainable flooring materials, as Table 9 indicates. Participants also reported using manufacturers' websites (n = 158, 70.2

percent), calls to the dealer or distributor (n = 125, 55.6 percent), and industry associations (n = 100, 44.4 percent).

Table 8. Percentage Distribution of Choice of Flooring Materials for Residential Project

	Very rarely	rarely	Some rarely	Neutral	Some frequently	Frequently	Very frequently
Bamboo							
Frequency(N)	63	39	22	38	31	11	20
Percent (%)	28.0	17.3	9.8	16.9	13.8	4.9	8.9
Certified Wood							
Frequency(N)	40	23	24	29	32	34	43
Percent (%)	17.8	10.2	10.7	12.9	14.2	15.1	19.1
Reclaimed Wood							
Frequency(N)	78	40	23	26	25	21	12
Percent (%)	34.7	17.8	10.2	11.6	11.1	9.3	5.3
Carpet							
Frequency(N)	16	6	14	32	35	43	79
Percent (%)	7.1	2.7	6.2	14.2	15.6	19.1	35.1
Cork							
Frequency(N)	80	42	23	31	21	14	14
Percent (%)	35.6	18.7	10.2	13.8	9.3	6.2	6.2
Linoleum							
Frequency(N)	108	38	26	17	13	13	8
Percent (%)	48.0	16.9	11.6	7.6	5.8	5.8	3.6
Ceramic Tile							
Frequency(N)	8	2	11	21	28	51	104
Percent (%)	3.6	0.9	4.9	9.3	12.4	22.7	46.2
Terrazzo							
Frequency(N)	100	44	20	22	13	11	14
Percent (%)	44.4	19.6	8.9	9.8	5.8	4.9	6.2
Stone							
Frequency(N)	14	6	17	21	37	39	89
Percent (%)	6.2	2.7	7.6	9.3	16.4	17.3	39.6
Rubber							
Frequency(N)	122	50	13	23	10	4	2
Percent (%)	54.2	22.2	5.8	10.2	4.4	1.8	0.9
Vinyl							
Frequency(N)	103	39	24	29	12	7	8
Percent (%)	45.8	17.3	10.7	12.9	5.3	3.1	3.6

Table 9. Sources Used to Learn about Sustainable Flooring Materials (multiple responses)

	Responses Frequencies(N)	Percent of Cases (%)
Trade magazine	179	79.6
Manufacturers websites	158	70.2
Word of Mouth referral	80	35.6
Call dealer / distributor	125	55.6
Industry association	100	44.4
Search engines	79	35.1
Dealer web	59	26.2
Other (i.e. trade show, sales reps, merchandise mart Showrooms)	21	9.3
TOTAL	801	356.0

Using Sustainable Flooring Materials in Residential Practice and the Theory of Planned Behavior

Descriptive analyses. Table 10 presents the descriptive statistics for the measurement of belief items for behavioral beliefs (i.e., environment and health), normative beliefs, and control beliefs, indicating the mean value and standard deviation of each measurement item for each construct as well as the mean value and standard deviation of the overall beliefs.

Respondents reported their positive perceptions about behavioral beliefs of the overall beliefs (b_ie_i) with environment with a mean ranging from 38.24 to 40.38. For health, safety, and comfort, respondents reported overall beliefs with a mean ranging from 39.08 to 40.81. In two measurements for normative beliefs, respondents reported positive perceptions. Overall normative beliefs' (n_im_i) mean was 24.57 for clients; the second factor, co-workers, reported a mean of 20.96. Finally, respondents also reported

Table10. Descriptive Summary of Belief Items

Belief Items	Strength		Evaluation		Overall Beliefs	
	Mean	S.D	Mean	S.D.	Mean	S.D.
Behavioral Beliefs	b_i		e_i		$b_i e_i$	
Factor 1:Environment						
Protecting the environment	6.04	1.19	6.20	0.97	38.24	11.27
Reducing hazardous waste	6.35	1.01	6.28	0.90	40.38	10.18
Improving indoor air quality	6.36	1.03	6.26	0.97	40.29	10.29
Factor 2: Health						
Improving the health of people	6.44	0.87	6.28	0.93	40.81	9.57
Protecting from an allergy or atopic dermatitis	6.25	1.05	6.20	1.02	39.08	10.27
Normative Beliefs	n_i		m_i		$n_i m_i$	
Clients	3.93	1.59	6.08	1.20	24.57	12.11
Co-workers	4.40	1.80	4.36	2.05	20.96	14.66
Control Beliefs	c_i		p_i		$c_i p_i$	
Information	6.10	1.14	6.06	1.15	37.32	10.71
Knowledge	4.79	1.44	6.26	0.97	30.32	10.94
Efficiency	5.12	1.46	5.79	1.28	30.31	12.07
Facilitating Condition	5.48	1.40	6.24	0.94	34.66	11.48
Accessibility1	6.41	1.00	6.26	1.00	40.66	10.10
Accessibility2	5.03	1.78	5.22	1.67	28.37	15.23
Self- Efficiency	5.15	1.71	5.94	1.07	30.87	12.55
Money	4.48	1.72	5.19	1.36	23.61	11.84

Note: b=Behavioral Beliefs, e= Behavioral Beliefs Evaluation, n= Normative Beliefs, m= Motivation to Comply, c=Control Beliefs, p= Perceived Power

positive perceptions about control beliefs ($c_i p_i$), with an overall mean ranging from 23.61 to 40.66.

Table 11 also provides a descriptive analysis of each item for attitude, subjective norm, perceived behavioral control, and intention. Three items for attitude ranged in mean from 6.25 to 6.44. Subjective norm was measured with means of 4.15 and 4.08.

Perceived behavior control was ranged in mean from 5.28 to 6.14, and intention ranged in mean from 5.63 to 5.92.

Reliability tests. In preparation for further analysis, behavioral belief was measured using a summated scale by multiplying behavioral beliefs and evaluation. Normative belief was measured using a summated scale by multiplying normative beliefs and motive to comply.

Table 11.Descriptive Analysis of Attitude (ATT), Subjective Norm (SN), Perceived Behavioral Control (PBC), and Behavioral Intention (BI)

		Mean	SD
Attitude (ATT)			
ATT1	For me to choose sustainable flooring materials for clients' residential projects is *Extremely bad(1) / Extremely good(7)*	6.32	0.99
ATT2	For me to choose sustainable flooring materials for clients' residential projects is *Extremely harmful(1) / Extremely beneficial(7)*	6.44	0.85
ATT3	For me to choose sustainable flooring materials for clients' residential projects is *Extremely worthless(1) / Extremely valuable(7)*	6.25	1.05
Subjective Norm(SN)			
SN1	Most people who are important to me think that I should choose sustainable flooring materials for residential projects	4.15	1.73
SN2	Most people who influence my decisions think that I should choose sustainable flooring materials for residential projects	4.08	1.71
Perceived Behavioral Control (PBC)			
PBC1	For me to choose sustainable flooring materials for residential projects is	6.14	1.08
PBC2	If I wanted to, I would be able to choose sustainable flooring materials for residential projects	6.02	1.16
PBC3	I chose sustainable flooring materials for residential use	5.34	1.52
PBC4	How much control do you believe you have over the choic e of sustainable flooring materials for residential	5.28	1.32
Behavioral Intention(BI)			
BI1	I intend to choose sustainable flooring materials for residential projects	5.67	1.21
BI2	I plan to choose sustainable flooring materials for residential projects	5.63	1.26
BI3	I will make an effort to choose sustainable flooring materi als for residential projects	5.92	1.15

Control behavioral belief was measured using a summated scale by multiplying control beliefs and perceived powers. The reliability of the three belief structures is listed in Table 12; Cronbach's alpha ranged from 0.75 to 0.94. In addition, attitude, subjective norm, perceived behavioral control, and intention were measured using a summated scale by assembling items. The reliability of the eight variables ranged from 0.75 to 0.95 according to Cronbach's alpha (see Table 12). Each of these alpha levels is above the acceptable threshold for reliability (Nunnally, 1970).

Table 12. Reliability Analysis of Beliefs, Attitude (ATT), Subjective Norm (SN), Perceived Behavioral Control (PBC), and Behavioral Intention (BI)

Variables	N of items	Mean	SD	Cronbach's Alpha
Behavior Belief (Environment)	3	118.91	30.00	0.94
(Health)	2	79.90	18.44	0.84
Normative Beliefs	2	45.53	24.05	0.75
Control Beliefs	8	32.10	61.66	0.80
Attitude	3	6.336	0.882	0.90
Subjective Norm	2	4.116	1.676	0.95
Perceived Behavioral Control	4	5.694	1.012	0.80
Behavioral Intention	3	5.739	1.155	0.95

Hypothesis testing. The initial results from model 1 indicated the presence among the independent variables. H1a predicted that beliefs about environment would be positively associated with attitude toward the use of sustainable flooring materials (β = 0.645, $R^2 = 0.416$, $p < 0.001$; see Table 13). However, H1b predicted that beliefs about human health, safety, and comfort would be positively associated with attitude toward the use of sustainable flooring materials. The data did not support H1b. Beliefs about human health, safety, and comfort were not related to attitude toward the use of sustainable

flooring materials (β = -0.026, $p > 0.001$; see Table 13). Thus, environment was the only assumption of attitude toward the use of sustainable flooring materials.

Table 14 indicates that H2 predicted that normative beliefs (NB) would be positively associated with subjective norm (SN), which was found to be statistically highly significant (β = .661. $p < .001$). H3 hypothesized that control beliefs (CB) would be positively related to perceived behavioral control (PBC). It was found to be statistically significant (β = .554, R2 = .307, $p < .001$; see Table 15).

The initial results of Model 4, related to H4, H5, and H6, indicated correlated explanatory variables. H4 hypothesized that attitude toward the use of sustainable flooring materials (ATT) would be positively associated with behavioral intention (BI); the results demonstrated that ATT was positively related to BI (β = .378, R2 = .691, $p < .001$; see Table 16). H5 predicted that SN would be associated with BI to use sustainable flooring materials. This prediction was supported as the relationship between SN and BI was statistically significant (β = .90, $p < .001$; see Table 16). H6 predicted that PBC would be positively associated with BI to use sustainable flooring materials; this relationship was significant (β = .512, $p < .001$; see Table 16). In addition to the predicted relationships, several other relationships were found among the dependent TPB variables—ATT, SN, PBC, and BI—as Table 17 indicates. The correlation for ATT and SN was significant (.432, $p < .001$). The relationship between ATT and PBC was correlated positively (.528, $p < .001$). The correlation between ATT and BI was also significant (.678, $p < .001$; see Table 17). In addition, a significant relationship was evident between SN and PBC (.481, $p < .001$; see Table 17) and SN and BI (.499, p

< .001; see Table 17). All hypotheses tests are shown in Figure 5. Finally, the relationship between PBC and BI was significant (.755, $p < .001$; see Table 17).

Table 13. Results of Regression Analysis (Model 1)

	Variable	β	t	P-value	Supported
H1a	Environment →ATT	0.645	12.616	0.000	Yes
H1b	Health →ATT	-0.026	-0.302	0.763	No
	R^2	0.416			
	Adjusted R2	0.414			
	F statistics (df)	(1,223)=159.151			

Significant at the 0.001 level (2-tailed)

Table 14. Results of Regression Analysis (Model 2)

	Variable	β	t	P-value	Supported
H2	NB→SN	0.661	13.162	.000	Yes
	R^2	0.437			
	Adjusted R^2	0.435			
	F statistics (df)	1,233) = 73.225			

Significant at the 0.001 level (2-tailed)

Table 15. Results of Regression Analysis (Model 3)

	Variable	β	t	P-value	Supported
H3	CB→PBC	0.554	9.93	.000	Yes
	R^2	0.307			
	Adjusted R^2	0.303			
	F statistics (df)	(1,223) = 98.6			

Significant at the 0.001 level (2-tailed)

Table 16. Results of Regression Analysis (Model 4)

	Variable	β	t	P-value	Supported
H4	ATT→BI	0.378	8.326	0.000**	Yes
H5	SN → BI	0.090	2.044	0.042*	Yes
H6	PBC → BI	0.512	10.971	0.000**	Yes
	R^2	0.691			
	Adjusted R^2	0.687			
	F statistics (df)	(1, 221) = 4.178			

**Significant at the 0.001 level (2-tailed)

*Significant at the 0.05 level (2-tailed)

Table 17. Correlations among Attitude, Subjective Norm, Perceived Behavioral Control, and Behavioral Intention

	ATT	SN	PBC	BI
Attitude (ATT)	1.00	.432**	.528**	.687**
Subjective Norm (SN)		1.00	.481**	.499**
Perceived Behavioral Control (PBC)			1.00	.755**
Behavioral Intention (BI)				1.00

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

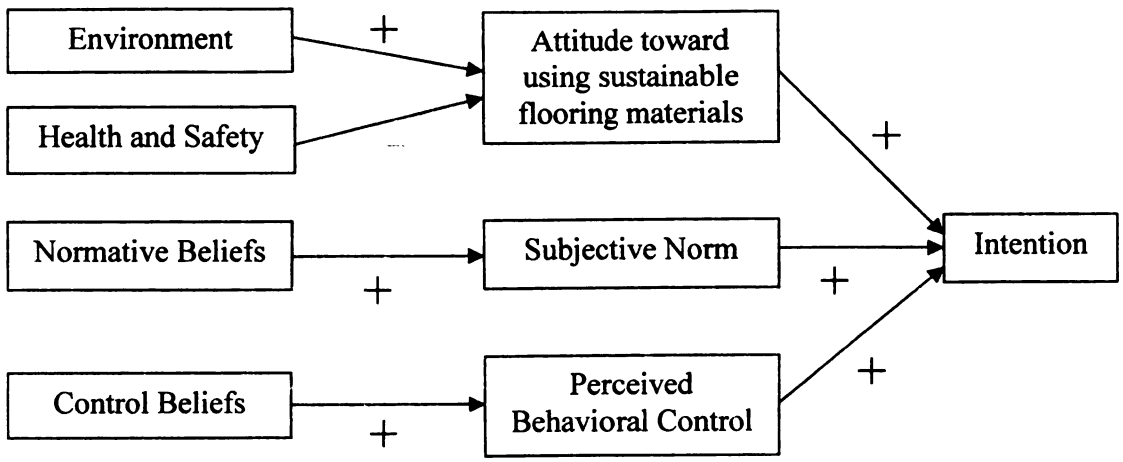

Figure 5 Results of Analysis

CHAPTER V

DISCUSSION AND CONCLUSION

This chapter begins with a discussion of the findings, following by conclusions and theoretical implications from the findings. Finally, limitations of the present study and recommendations for future study are presented.

Discussion

This section discusses the findings regarding factors influencing the use of sustainable flooring materials and TPB. A conceptual framework for this study was developed from TPB (Ajzen, 1991; Ajzen & Fishbein, 1985, 1988). Specifically, the findings of this study showed that three belief structures—behavioral beliefs, normative beliefs, and control beliefs—influence TPB's fitting determinant of intention, attitude, subjective norm, and perceived behavioral control. Several findings from this study justify further research.

According to the results related to online video advertising with TPB (Lee, 2008), behavioral beliefs provide the basic structure for attitude, normative beliefs for subjective norms, and control beliefs for perceived behavioral control. Previous research found correlations between measures of these predictor structures and their individual beliefs—namely, that attitude stemmed from a behavior's consequences, subjective norm stemmed from normative beliefs, and perceptions of control stemmed from control beliefs. However, the current study provided different results related to belief structure, although a positive relationship still existed between normative beliefs and subjective norm (H2) and between control beliefs and perceived behavior control (H3). This study proposed

two hypotheses between behavioral beliefs and attitude, although one of the two factors was not related to attitude.

Specifically, improving the environment (H1a) showed a significant relationship with attitude toward the use of sustainable flooring materials. In contrast, human health, safety, and comfort (H1b) were not supported in regard to attitude toward the use of sustainable flooring materials. Although Mendler, Odell, and Lazarus (2006) included human health, safety, and comfort in their design decision model, the current study could not support this model. However, the LEED Rating System and MSDG design strategies do not mention human health, safety, or comfort. Thus, when interior designers choose flooring materials in residential practice, human health, safety, and comfort did not significantly influence attitude. However, this result would differ if the hypothesis were based on low-cost effects as many people regard their health, safety, and comfort when they are economically stable.

Normative beliefs were also important determinants of subjective norm, describing about 44 percent of the variance (see Table 14); thus, H2 was supported. Several previous studies (Ajzen, 1991; Taylor & Todd, 1995) examined the relationship between normative beliefs and subjective norm and found a positive relationship. As with these results, the positive relationship between normative beliefs and subjective norm shows that interior designers tend to feel more social pressure to use sustainable flooring materials when they believe that important referents want them to. As such, interior designers will benefit from recognizing clients' important concerns and encouraging them to use appropriate flooring materials.

The final belief structure, control beliefs, positively affected perceived behavioral control, thereby supporting H3. Control beliefs reflect the extent of the interior designer's ability to operate the flooring materials. Ajzen (1991) defined control beliefs that measure the presence or absence of needed resources and opportunities. Based on this operational definition, control belief items for using sustainable flooring materials were identified to assess overall control beliefs. The results of the present study indicate that more available accessibility allows interior designers to perceive themselves as having the information to use sustainable flooring materials or maintain control over them, thereby confirming and reinforcing the notion that control structure is multi-dimensional and includes not only personal beliefs, but also resource constraints.

Along with findings about determinants of intention, attitude, subjective norm, and perceived behavioral control positively influenced intention; thus, H4, H5, and H6 were supported. Most researchers (Hansen, 2008; Lim & Dubinsky, 2005) have found that the three determinants of intention (attitude, subjective norm, and perceived behavioral control) significantly influence intention; the findings of the current study supported this conclusion as well. Overall, based on the results, these variables accounted for 69 percent of the variance in intention, meaning that they are very strong factors in this study.

These findings suggest that, the more positive of an attitude interior designers have toward the use of sustainable flooring materials, the more confident they will be in their ability to access resources to use sustainable flooring materials. Furthermore, most interior designers are concerned about social power from important referents. As such, they have a greater intention to use sustainable flooring materials.

Implications of the Study

The current study offers both theoretical and practical implications. TPB is usually tested using either indirect measures of salient beliefs relevant to each determinant or direct measures of the postulated determinants of behavior in question. The purpose of the current study was to apply TPB to a model for using sustainable flooring materials in order to develop a series of testable hypotheses. The proposed model also incorporated certain individual difference factors that are likely to influence intentions to use sustainable flooring materials.

The original TPB model is a valuable framework; meanwhile, the decomposed TPB model offers more significant data to interior designers. Although interior designers cannot control every component that affects their use of sustainable flooring materials in residential practices, they can develop their residential practices to satisfy specific expected outcomes. This study identified the five expected outcomes that consumers consider before actually using sustainable flooring materials; interior designers can use this information to their advantage. Another important finding of this study is that subjective norm has no impact on attitude toward the use of sustainable flooring materials. Thus, future researchers should build a stronger and more comprehensive theoretical model of factors influencing interior designers' use of sustainable flooring materials.

Choosing sustainable flooring materials in residential practice significantly impacts not only designers, builders, and material industries, but also homeowners in the US and other countries as the floor is a major element of interior design. Efforts should be made to try to understand this phenomenon.

Limitations and Future Research

Although the present study attempted to validate the use of sustainable flooring materials, several limitations remain. This section discusses limitations of this study and provides several suggestions for future research.

First, although this study provided TPB determinants, it did not find any relationship between intention and actual behaviors. As a strong and significant causal link between behavioral intention and actual behavior has been consistently demonstrated in TPB studies (Ajzen, 2002; Armitage & Conner, 1999; Vankatesh & Morris, 2000), the use of behavioral intention as a dependent variable to examine the use of sustainable flooring materials in residential practice is theoretically reasonable. In addition, in a research design, intentions are more appropriate than actual behavior because they can be measured contemporaneously with beliefs (Agarwal & Prasad, 1999). Thus, the choice of intention over actual behavior as a dependent variable does not seem to reveal a serious problem for interpreting findings of this study. However, a high correlation between behavioral intention and actual behavior is not always obtained. Behavioral intentions may change after they have been measured, but before the overt behavior has been observed (Young & Kent, 1985). Therefore, it is always preferable to measure actual behavior. Future research on the use of sustainable flooring materials in residential practice should measure actual participation behavior to resolve this concern.

Second, although the TPB model presumes direct relationships between belief structures and determinant variables, evidence suggests the existence of crossover effects whereby attitudinal beliefs may influence subjective norm (Oliver & Bearden, 1985; Ryan, 1982; Taylor & Todd, 1995) or normative beliefs may influence attitude (Oliver &

Bearden, 1985, Shimp & Kavas, 1984). Several TPB studies found a significant direct effect of subjective norms on attitude (Chang, 1998; Davis et al., 1989; Park, 2003). These results would provide important theoretical and practical implications about the effect of social influences on attitude and the belief that most people are similar and, therefore, probably share common beliefs (Taylor & Todd, 1995). Thus, future research investigating the crossover effect of TPB and the use of sustainable flooring materials—particularly between the normative belief structure and attitude—will provide insights into whether or not social influence affects association members' attitudes toward the use of sustainable flooring materials. Examining the crossover effect between subjective norms and attitude in the context of using sustainable flooring materials would also be a meaningful approach as it will help understand whether information secured from referents is also used to form an interior designer's attitude toward the use of sustainable flooring materials. Overall, comparing the original TPB with the use of sustainable flooring materials and crossover effects of TPB with the use of sustainable flooring materials can provide many implications for both researchers and practitioners.

Third, the majority of participants in this study were interior designers who are ASID members. Thus, generalization of findings of this study to other professional groups should be done cautiously. Future studies using different professional groups would test the validation of the findings in this study and expand understanding of using sustainable materials' behaviors. Furthermore, multi-group analysis may reveal those different groups have significantly different path parameters across all links between constructs in sustainable materials' choosing group. To conduct the survey with US-based interior designers, members of the International Interior Design Association (IIDA)

could be included. IIDA is a professional networking and educational association of over 13,000 members around the world, committed to facilitating a global community for members.

Asking respondents about the homeowners' perceptions of the importance of using sustainable flooring materials would further expand this study. Homeowners might feel motivated or discouraged to use environmental and healthful sustainable flooring materials, although interior designers are aware of the importance of using sustainable flooring materials in residential locations. In addition, similar studies may be conducted with interior designers in other countries to determine if there are access countries, common interests about environmentally sustainable flooring materials. It could be compared to the state of practice to find out the differences or similarities.

Moreover, this study examined only flooring materials for residential projects, although elements of interior design are composed of floor, walls, and ceiling. These constructs could be used with other sustainable materials for sustainable interior design. Future study examining all interior elements could determine where to use sustainable materials for residential settings. Similarly, this study may extend to other practices (e.g., commercial, hospital, hotel), as Cain (2007) researched flooring materials in a LEED registered hotel, to determine advantages and disadvantages about sustainable flooring materials, comparing the findings with studies of differences or similarities.

Finally, this study focused on environment and health and excepted cost effect which was one of the significant categories of many sustainable guidelines as discussed in the literature review. If clients do not have enough money to use sustainable flooring

materials, improving the environment or health would not result. Therefore, incorporating cost effects will create a stronger study.

Conclusion

This study examined several factors that are significant determinants of the intent to use sustainable flooring materials by applying factors of the theory of planned behavior. The model developed in this study offers both researchers and interior designers a more complete picture of designers' use of sustainable flooring materials that includes beliefs, perceptions, attitudes, and intention. Practically, it is helpful not only for interior designers and material industries, but also for homeowners or customers in developing environments and protecting health problems in general. Discovering the critical relationship among factors that provoke intention as interior designers are increasingly using sustainable flooring materials in their residential practice will be of benefit for both the environment and humans.

APPENDIX

Questionnaire for the Study

Dear Interior Designer:

I am a Master's student in Interior Design at Michigan State University. You are invited to participate in a research study regarding the use of sustainable materials. The purpose of this study is to investigate the perception and choices of interior designers regarding sustainable flooring materials in residential use. The questionnaire can be completed in approximately fifteen to twenty minutes.

Your answers will remain anonymous. Your privacy will be protected to the maximum extent permitted by law. Your participation is completely voluntary and you may choose not to participate at all, or you may refuse to answer certain questions or discontinue your participation at any time without consequence.

If you have concerns or questions about this study, please contact Bo Kyung Kim (kimbo8@msu.edu) or my major advisor, Dr. April Allen (allenapr@msu.edu). If you have any questions or concerns about your role and rights as a research participant, or would like to register a complaint about this survey, you may contact, anonymously if you wish, MSU's Human Research Protection Program at (517) 355-2180, Fax (517) 432 – 4503, or e-mail irb@msu.edu.

If you would like to receive information regarding the results of this study, please indicate on the survey and results will be e-mailed to you at the completion of the study.

Thank you so much for your time and participation in this study. By completing and submitting the questionnaire, you are indicating your voluntary participation.

Sincerely,

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MICHIGAN STATE
UNIVERSITY

Section I

These data will be kept in the strictest confidence and used for statistical purposes only.

1. Your gender is: □ Male □ Female

2. Your age is:

□ 18 - 24 years □ 25 - 34 years □ 35-44 years
□ 45 - 54 years □ 55 - 64 years □ 65-74 years
□ 75 - 84 years □ 85 years and over

3. Your highest education level completed :

□ Some high school, no degree □ High school graduate (include equivalency)
□ College degree □ Graduate degree or higher
□ Some college, no degree

4. What is your ethnicity?

□ Native - American □ African-American □ Caucasian
□ Asian □ Hispanic / Indian □ Other _____

5. Please indicate the geographical region where you work, where your firm is located.
_____ (State)

6. How long have you practiced interior design?

□ Less than 2years □ 2 - 5 years □ 6 - 10 years
□ 11-15 years □ 16-20 years □ More than 20 years

7. What is the size of your typical/ average interior design project?
□ Less than 3,000 Sq.ft (or less than 279 square meters)
□ 3,001 to 6,000 Sq.ft (or 280 to 557 square meters)
□ 6,001 to 20,000 Sq.ft (or 558 to 1,858 square meters)
□ 20,001 to 50,000 Sq.ft (or 1,859 to 4,645 square meters)
□ More than 50,000 Sq.ft (or more than 4,646 square meters)

8. How often have you chosen sustainable flooring materials in your residential practic e?

□ Less than 2 times □ 2 - 5 times □ 6 - 10 times
□ 11-15 times □ 16-20 times □ More than 20 times

9. How often do you usually choose the following flooring materials for residential project? (*Please circle only one number for each statement)*

	Very rarely						Very frequently
Bamboo	1	2	3	4	5	6	7
Certified wood flooring	1	2	3	4	5	6	7
Reclaimed wood	1	2	3	4	5	6	7
Carpet	1	2	3	4	5	6	7
Cork	1	2	3	4	5	6	7
Linoleum	1	2	3	4	5	6	7
Ceramic tile	1	2	3	4	5	6	7
Terrazzo	1	2	3	4	5	6	7
Stone	1	2	3	4	5	6	7
Rubber	1	2	3	4	5	6	7
Vinyl	1	2	3	4	5	6	7
Other	1	2	3	4	5	6	7

(Please, specify_____)

10. What do you usually use to learn about a sustainable flooring material? (*Please check all that apply*)

□ Trade magazine □ Manufacturer's websites □ Word of mouth referral
□ Call dealer/ distributor □ Industry association □ Search engines
□ Dealer websites □ Other (Please, specify_____)

11. The following items assess your **attitude toward sustainable flooring materials in general**. Please choose the number that best describes your opinion for each item. Many items might seem similar; however no two items are exactly alike so be sure to check one number for each statement.

My attitude toward sustainable flooring materials in general.....

Bad	1	2	3	4	5	6	7	Good
Negative	1	2	3	4	5	6	7	Positive
Unfavorable	1	2	3	4	5	6	7	Favorable

12. The following items assess your **beliefs toward sustainable flooring materials in general**. Please choose the number that best describes your opinion for each item. Many items might seem similar; however no two items are exactly alike so be sure to circle one number for each statement.

Bad	1	2	3	4	5	6	7	Good
Weak	1	2	3	4	5	6	7	Strong
Worthless	1	2	3	4	5	6	7	Valuable
Unnecessary	1	2	3	4	5	6	7	Necessary
Unimportant	1	2	3	4	5	6	7	Important

Section II

Please answer each of the following questions by deciding the number that best describes your opinion. Some of the questions may appear to be similar, but they do address somewhat different issues.

Please remember the following points in making your ratings:
*Be sure to answer all items – do not omit anything.
*Do not circle more than one number on a single scale for each statement.

(13 - 26) The following items assess your **Environmental and Human Health Concern.**
Please choose the number that best describes your opinion for each item.

	Extremely unimportant						Extremely important
13. Being able to help to protect the environment in choosing sustainable flooring materials is	1	2	3	4	5	6	7
14. Being able to help to reduce hazardous waste in choosing sustainable flooring materials is	1	2	3	4	5	6	7
15. Being able to improve indoor air quality in choosing sustainable flooring materials is	1	2	3	4	5	6	7
16. Being able to improve the health of people in choosing sustainable flooring materials is	1	2	3	4	5	6	7
17. Being able to protect from an allergy or atopic dermatitis for people in choosing sustainable flooring materials is	1	2	3	4	5	6	7
18. Whether or not using sustainable flooring materials is difficult, it is	1	2	3	4	5	6	7
19. Whether or not using sustainable flooring materials is easy, it is	1	2	3	4	5	6	7
	Strongly disagree						Strongly agree
20. I would help protect the environment by using sustainable flooring materials	1	2	3	4	5	6	7
21. I would help reduce hazardous waste by using sustainable flooring materials	1	2	3	4	5	6	7
22. I would help improve indoor air quality by using sustainable flooring materials	1	2	3	4	5	6	7
23. I would help improve the health of people by using sustainable flooring materials	1	2	3	4	5	6	7
24. I would help protect from an allergy or atopic dermatitis for p eople by using sustainable flooring materials	1	2	3	4	5	6	7
25. Using sustainable flooring materials is difficult	1	2	3	4	5	6	7
26. Using sustainable flooring materials is easy	1	2	3	4	5	6	7

(27 - 30) The following items assess your **Concern of Others' Opinion**. *Please choose the number that best describes your opinion for each item.*

	Not at all						Very much
27. Generally speaking, I care what my clients think about my choice of sustainable flooring materials for residential use	1	2	3	4	5	6	7
28. Generally speaking, I care what my co-workers in my company think about my choice of sustainable flooring materials for residential use	1	2	3	4	5	6	7
	Extremely unlikely						**Extremely likely**
29. Clients in my practice think that I should choose sustainable flooring materials for residential projects	1	2	3	4	5	6	7
30. Co-workers in my company think that I should choose sustainable flooring materials for residential projects	1	2	3	4	5	6	7

(31 – 46) The following items assess your **Accessibility of Information**. *Please choose the number that best describes your opinion for each item.*

	Strongly disagree						Strongly agree
31. If I want to, I could easily get information about sustainable flooring materials	1	2	3	4	5	6	7
32. I know enough about sustainable flooring materials for residential use on my own	1	2	3	4	5	6	7
33. I would be able to choose sustainable flooring materials even if there is no one around to advise me on what kinds are available	1	2	3	4	5	6	7
34. I would feel comfortable using sustainable flooring materials on my own	1	2	3	4	5	6	7
35. I have access to the Internet whenever I want to choose sustainable flooring materials	1	2	3	4	5	6	7
36. I find a trade magazine or trade magazines whenever I want to choose sustainable flooring materials	1	2	3	4	5	6	7
37. Sustainable flooring materials are not used on my projects	1	2	3	4	5	6	7
38. For me choosing sustainable flooring materials requires more money than other basic flooring materials for my clients	1	2	3	4	5	6	7
	Extremely unimportant						**Extremely important**
39. Being able to get information about sustainable flooring mate rials as part of my decision to choose sustainable flooring materials for residential use is	1	2	3	4	5	6	7
40. Knowing enough to specify sustainable flooring materials is	1	2	3	4	5	6	7
41. Being able to choose sustainable flooring materials even if no one is around to advise me on what kinds are available is	1	2	3	4	5	6	7

42. Being able to feel comfortable using sustainable flooring materials is	1	2	3	4	5	6	7
43. Having access to the Internet whenever I want to choose sust ainable flooring materials is	1	2	3	4	5	6	7
44. Finding trade magazines whenever I want to choose sustainable flooring materials is	1	2	3	4	5	6	7
45. Whether or not I use it personally, choosing sustainable flooring materials for residential use is	1	2	3	4	5	6	7
46. Whether or not choosing sustainable flooring materials takes more money than general flooring materials for my clients, it is	1	2	3	4	5	6	7

47. The following items assess your **Attitude**. *Please choose the number that best describes your opinion for each item.*

For me to choose sustainable flooring materials for clients' residential projects is

Bad	1	2	3	4	5	6	7	Good
Harmful	1	2	3	4	5	6	7	Beneficial
Worthless	1	2	3	4	5	6	7	Valuable

(48 – 49) The following items assess **Attitude of Others**. *Please choose the number that best describes your opinion for each item.*

	Strongly disagree						Strongly agree
48. Most people who are important to me think that I should cho ose sustainable flooring materials for residential projects	1	2	3	4	5	6	7
49. Most people who influence my decisions think that I should choose sustainable flooring materials for residential projects	1	2	3	4	5	6	7

(50 - 53) The following items assess your **Personal Behavior**. *Please choose the number that best describes your opinion for each item.*

	Definitely impossible						Definitely possible
50. For me to choose sustainable flooring materials for residential projects is	1	2	3	4	5	6	7
	Definitely false						Definitely true
51. If I wanted to, I would be able to choose sustainable flooring materials for residential projects	1	2	3	4	5	6	7
	Strongly disagree						Strongly agree
52. I chose sustainable flooring materials for residential use	1	2	3	4	5	6	7
	No control						Control
53. How much control do you believe you have over the choice of sustainable flooring materials for residential	1	2	3	4	5	6	7

(54 – 56) The following items assess your **Intention**. *Please choose the number that best describes your opinion for each item.*

	Extremely unlikely						Extremely likely
54. I intend to choose sustainable flooring materials for residential projects	1	2	3	4	5	6	7
	Strongly disagree						Strongly agree
55. I plan to choose sustainable flooring materials for residential projects	1	2	3	4	5	6	7
	Definitely false						Definitely true
56. I will make an effort to choose sustainable flooring materials for residential projects	1	2	3	4	5	6	7

Results

I would like to receive information on the results of this study. □ Yes □ No

If "Yes", please provide your e-mail address._____

Thank you for your participation!

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