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UTAUT, green Values and affective factors that lead to the intention to adopt the Urban Retreat™ carpet in employees.

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A research project submitted to the Faculty of Humanities, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements of the Degree of Masters of Arts (Organisational Psychology), February 2015



I declare that this research report is my own, unaided work. It has not been submitted before for any other degree or examination at this or any other university.

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Ms M Lekitlane

Date: _____

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Abstract

Environmental degradation and technological advancements are two trends that are increasingly characterising the human experience. Innovation in systems to be more sustainable in relation to the environment is seen as one way to mitigate the effects of prolonged human action on the planet. Carpets in buildings have been found to be one of the biggest contributors of carbon emissions. The Interface® Urban Retreat™ carpet range has sustainable properties such as post-consumer recycled content, no volatile organic compounds and biophilic properties. The adoption of sustainable technologies, such as the Urban Retreat™ carpet, have not been instant because of the expense they are believed to incur to the organisation. In some cases, sustainable technologies have been met with outright resistance. Research into the factors leading to the adoption or acceptance of these technologies is scarce and thus of paramount importance to reduce the degradation to the planet. It is also important for employers as some sustainable technologies have been shown to be linked to positive organisational behaviours. The aim of the study was to investigate which factors led to employees having positive feelings towards the intention to adopt the Urban Retreat™ Carpet. The factors that were considered were functionality, concern for the natural environment and affectivity. These factors were investigated by means of an online survey. The functionality aspects were operationalised through the use of the Unified Theory of Acceptance of Use of Technology (UTAUT) (Venkatesh, Morris, Davis & Davis, 2003). The current research proposed that age and gender would moderate the relationship between the UTAUT factors and the feelings towards the intention to adopt. Concern for the natural environment was measured through a self-developed subscale. Finally, affect or biophilic tendencies was measured through the Nature Relatedness scale (Nisbet, Zilenski & Murphy, 2009). The intention of the study was to determine whether the affective/biophilic properties of the carpet as well as the individual were an important determinant of the likelihood to adopt the carpet in relation to other aspects such as functionality and therefore whether the affective properties might be leveraged to encourage the acceptance of products that are more sustainable. The sample was 114 employees in a law firm in Johannesburg, considering moving from a non-biophilic range to the Urban Retreat™ range. The main analysis that was performed on the data was a multiple moderated linear regression, which assessed which independent variables

explained the most amount of variance in the outcome variable. The findings show that the significant predictor of the positive feelings towards adoption were performance perception and perceived facilitating conditions. The impact of age and gender as moderator variables on these relationships was non-significant. Every effort was made to ensure that all ethical standards were met.

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Chapter 1

Introduction

Over the past 150 years, the activities of humankind have been at the root of significant environmental degradation (UNEP, 2012). Eras such as the industrial revolution saw the onset of the exhaustive extraction of the planet's natural resources, leaving it with no time at all to properly recover. This has continued to present day with the high levels of Carbon Dioxide (CO_2) emitted into the atmosphere. "*This has resulted in severe disruptions to the planet's natural nutrient recycling patterns, to climatic systems and to reductions in biodiversity"* (Thatcher, 2012; p.1, UNEP, 2012). Despite knowledge of the impacts that human activity has on the environment, measures to deal with these issues have fallen short and individuals have simply continued sourcing energy from destructive resources such as coal and oil. Regardless of the knowledge of alternative sources of energy and that certain technological activities, seen mostly in manufacturing, are a hazardous, more sustainable practices have not been adopted.

The following quotation shows that environmental issues are a growing concern for nations*:* "United Nations officials stress that the Sustainable Development Goals (SDGs) which are being formulated by member states, must address the environmental degradation that is threatening present and future generations" (United Nations News Centre, 2013, para 3). There is recognition that environmental matters are pressing issues in policy formation and human security. There is a need for scholars to research into sustainable ways of ensuring the development of the environment as well as that of its inhabitants.

From the macro level of analysis, we move to the organisational level. People spend most of their time at work in buildings therefore, they have a significant impact on the environment through the buildings they occupy. Cole and Kernan (1996) found that the operating energy of buildings, in other words the energy required to keep a building functioning, represented the largest component of its life-cycle use. This is in contrast to the energy needed to construct a building (Cole & Kernan, 1996). This is due to the fact that carpets amongst other elements of a building, are constantly refurbished and replaced on a regular basis. Life Cycle Assessments (LCA) which study the life of products including carpets, analyse their

environmental impact from extraction, production to manufacturing and transport (Arratia, 2011).The environmental impacts of typical commercial carpets come from the raw materials used to produce them at the extraction stage of manufacturing. Of the 68% of the raw materials, yarn accounts for 45% of it (Arratia, 2011). Yarn is the fibres of cotton or wool that are spun into a thread. Companies such as Interface® claim that there are smart ways of dealing with yarn such as reducing the amount used, using recycled versions of it or to use a low impact alternatives (Anderson & White, 2009). This will see carpets, which are the contributors of some carbon emissions in buildings, become more sustainable. It is in the best interest of companies to install carpets that are made from eco-friendly products but have a long life span. The more sustainable they are the less replacement and refurbishment is required.

The Urban Retreat™ carpet produced by Interface is an example of such a technology (Intefaceflor, 2013). Interface produces carpets for commercial purposes for office spaces. Products in the workplace, such as the Urban Retreat™ range, are designed with the intention of being sustainable. These characteristics of the product could very well be a part of the solution to the constant environmental degradation (Hopwood, Mellor & O'Brien, 2005). Please see appendix 1 for the full product description of the Interface® Urban Retreat™ carpet range.

This is not to say though, that carpets are the sole emitters of CO_2 within buildings. Air conditioners, electronics, lighting, water heating and cooking contribute to buildings energy usage. According to the U.S Department of Energy (DOE, 2008), residential and commercial buildings account for almost 39% percent of total U.S. energy consumption and 38 percent of U.S. carbon dioxide (CO_2) emissions. 18% of the 39% belongs to commercial buildings such as offices. Consequently, addressing energy use in any given building requires a holistic approach to ensure the best results. In other words, it would require more than a carpet refurbishment to lower the carbon footprint of a building.

Ergonomics as a field of study can play a particular role in the reduction of environmental destruction by focusing more on these sustainable technologies (Thatcher, 2012). The International Ergonomics Association (IEA), (2013) defines ergonomics as the field of study concerned with designing equipment and devices that fit the human body and

their cognitive abilities. Thus, systems that are meant to fit the physical, physiological and psychological aspects of human beings, while allowing for the products composite materials to replenish, are sustainable (Hanson, 2013). This view, conceptualises sustainability as not only meeting the needs of the environment but those of people. The Urban Retreat™ meets not only the functional human needs of being an aesthetically appealing surface for office, but those also of the environment, as mentioned above. Hanson (2013) believes that green ergonomics, a branch of ergonomics should also be concerned with the determinants of sustainable behaviour change such as the usage and adoption of sustainable technologies. This latter issue of what motivates people to engage in sustainable behaviours is the focus of the current study.

Perhaps the most important role of green ergonomics is the understanding of the determinants of sustainable behaviour (Hanson, 2013). Conservation or pro-environmental studies within the field of ergonomics are limited. More specifically, sustained conservation behaviours within the organisation are rare, hence Hanson's (2013) emphasis on the need to focus on this area of research. The current study does exactly this, as it looks at the predictors of positive or negative feelings toward the adoption of a sustainable technology, the Urban Retreat™ carpet. In doing this researchers could draw inspiration from eco-psychology which looks at how engineered environments, such as work spaces, can foster a closer relationship with nature and where people can learn about the appreciation of nature (Hanson, 2013). Therefore, there is a need to understand the kind of behaviour change that transcends mere knowledge about the environment. The investigation into the antecedents of people's appreciation of the natural environment could facilitate more eco-friendly behaviour. This pro-environmental behaviour includes choosing sustainable products over non-sustainable ones. The organisation can be a facilitating stakeholder in the adoption process. The role of the organisation may be to create or sustain a culture that promotes 'green' behaviour such as using electronic documents over hard copies printed on paper. By understanding individual or micro-level determinants of sustainable behaviour in organisations, green ergonomics could be facilitating larger, systemic behaviour change (Thatcher, 2012), which could make substantial benefits to the manner in which the planet is being treated by the human race. The field of ergonomics needs to focus on the motivators of the adoption of sustainable technologies for the sake of the planet.

The study focuses on qualities at the pre-purchase stage of the adoption of sustainable technologies, (Thatcher, 2012).

The aim of study was to determine whether the affective/biophilic properties of the carpet as well as in the individual were an important determinant of the likelihood to adopt the carpet in relation to other aspects such as functionality and therefore whether the affective properties might be leveraged to encourage the acceptance of products that are more sustainable.

It partly looks at whether employee's feelings towards nature, biophilic tendencies, have an impact as to whether they have positive feelings towards the final adoption of a sustainable technology, the Urban Retreat™ carpet. As mentioned the Urban Retreat™ carpet is not only made with the intention of protecting nature, but mimics nature (Interfaceflor, 2013). Affective design (Khalid, 2006) attempts to understand how a user's feelings and emotions towards a product or system influence their likelihood of adoption. It has been argued by biologists such as Wilson (1984) that humans have an innate affinity with nature and that inspiration can be derived directly from nature. This affinity varies in individuals as do many characteristics (Nisbet et al., 2009). In recent times there has been a growing interest in the emotional responses to technological products mainly whether these affective factors have an impact on a system's continuous usage (Thatcher, 2014). Companies promoting sustainable technologies such as Interflor, could benefit from the understanding of what motivates people to purchase and continue adopting these types of products, from an emotional perspective. It could also benefit from knowing what aspects of a technology bring about emotional responses linked to the use of sustainable technology. Although beyond the scope of this research, possible results of biophilic tendencies in employees could hint at more interventions by organisations to include in the package of interventions.

Business on the other hand may question the economic benefits for the concern for affect or biomimicry in the design and adoption of sustainable technologies (Anderson & White, 2009; Terrapin Bright Green, 2012). It was shown by Elzeyadi (2011) in Terrapin Bright Green (2012) that constructing office space in a way that brings nature and people closer by creating views of trees and landscapes, resulted in employees taking an average of 57 hours of sick leave per year, compared with 68 hours per year of sick leave taken by employees

with no view. Thus, a simple change in the design of a building to incorporate nature has been shown to have a Return on Investment (Terrapin Bright Green, 2012). The Urban Retreat™ carpet is not only a sustainable technology but a form of 'technological nature' (Kahn et al., 2009). Technological nature is defined as "technologies that in various ways mediate, augment, or simulate the natural world" (Kahn et al., 2009; p. 37). Kahn et al. (2009) found that workers who were in a building that had plasma screens, technological nature, nature displays recovered quickly from mental fatigue. This in contrast to those that were in a building that did not have the displays. If the results of biophilic tendencies show a high nature orientation- that the organisation's employees feel connected to nature, this could mean that once the carpet is installed, the organisation may reap similar results to those found by Terrapin Bright Green (2012) and Kahn et al. (2009), of direct Return on Investment (ROI). Kahn et al. (2009) found better focus, mental stamina, and productivity. Once installed the carpet could benefit the workers by fulfilling the need to be closer to nature. Although these possible benefits are beyond the scope of the current study, evidence of employees being high on biophilic tendencies could be a precursor for the organisation to install the carpet. Studies looking at these factors could follow.

Chapter 2

Literature Review

2.1 Sustainability and sustainable technologies

Sustainable development and sustainability are terms or ideas that are often used to point out the exhaustion of resources with meanings that are as varied as the responses they produce (Hopwood et al., 2005). Generally, these ideas convey concerns about the environment's degradation or socio-economic problems. The development of this idea over time explicates the evolution of thought, in the way in which humans relate to nature and the environment. It is the idea about the interdependence that exists between the two and how this impacts on future generations. The Brundtland Report's definition of sustainable development is 'meeting the needs of the present without compromising the ability of future generations to meet their needs' (WCED, 1987, p. 43 in Hopwood et al., 2005). Ultimately the practice of sustainability is conservation of nature and natural resources in times of scarcity (Thatcher, 2014).

Earlier notions of the word sustainability referred to the practice of conservation or the need for it- it was concerned with preventing the overuse of natural resources (such as wood) so as to enable the continuous supply of this resource while meeting human needs (for building, heating, mining, and manufacturing). More recently, the term 'sustainable development' has become common. It highlights the need for conservation but takes it a step further by focusing on equitable development to meet human needs while still recognising that the preservation of natural resources is necessary to fulfil these needs. Equitable development refers to 'just and equitable' opportunities to all people now, in the future and across all areas. Therefore in this definition, the environment is not explicitly addressed but is incorporated as one of the important dimensions. Some ecologists who hold strict views on sustainability ascribe to the notions that environmental degradation and depletion should be prioritised over any other aspects needs, including human needs. There are literally numerous definitions of sustainable development emphasising different aspects of the system of existence. In Thatcher's (2012) review of early papers on human factors and sustainable development, he argues that the variability of sustainable development

definitions and the largest proportion (44%) of the papers provided no definition of sustainable development. Redclift (2007) in Thatcher (2014) has suggested that sustainable development is an oxymoron as human development inevitably means environmental degradation. Nevertheless, sustainable development is a dynamic concept rather than a static state, it requires decision makers to be flexible and willing to modify their approaches according to changes in the environment, human needs and desires, or technological advances.

The current research believes that the Reformist approach may reconcile the issues around the definition of sustainable development by proposing a solution based view. This approach posits that the problems facing the environment can be addressed if people are educated and given enough information about systems that do not destroy yet seek to preserve the environment (Hopwood et al., 2005; Moons, De Bont, De Pelsmacker, & Standaert, 2009). Among the proponents of this paradigm, there is widespread support for a dramatic increase in energy efficiency and change in energy use from fossil fuels to renewable sources. Technology plays a very important role in sustainable development because it is one of the most significant ways in which we interact with our environment. Technologies are used to extract natural resources, to modify them for human purposes, and to adapt our human-made living space. It is through use of technology that we have seen drastic improvements in the way business is conducted and how people live. Defining what a sustainable technology is as problematic as it is to define sustainable development because of the varying degree of the latter concept. Unfortunately, many of these short term improvements in the immediate quality of life have also exacted a great toll on the environment. In order to proceed toward sustainability, while some technologies have reaped benefits for its users they have caused extensive damage to the environment. There needs to be a deliberate focus on developing technologies with sustainability in mind. There is need “sustainable technologies.”

As it is difficult to universally define a sustainable technology the research report will propose a working definition. In this research report the term "technology" is taken to mean "the application of knowledge to the achievement of particular goals or to the solution of particular problems" (Moore 1972, p. 5). Thus, technologies include not only the physical tools that are used to interact with the environment, but also symbols, processes, and other

non-tangible effectors such as language and economic transactions which serve as interfaces between humans and enable actions to occur toward the solution of problems." This broad description which encompasses more than physical artefacts is applicable to the Urban Retreat carpet ™. In general terms, a sustainable technology is one that promotes a societal move toward sustainability, a technology that fits well with the goals of sustainable development. Sustainable technologies are practical solutions to achieve economic development and human satisfaction in harmony with the environment (Vanegas, DuBose, & Pearce, 1996).

Steimle and Zink's (2006) proposed that ergonomists should focus on research that builds the development and usage of sustainable technologies as opposed to the fixation with defining the construct that is sustainable development. He believes that they should contribute to the debate by accounting for: "designing sustainable work systems, complementing the design process of sustainability-oriented products, ensuring the safe operation of complex systems to mitigate ecological and economic disasters, and community ergonomics to help resolve social problems" (p. 120). Resonating this statement, Hopwood et al. (2005) believes that the barriers to entry and adoption of innovative sustainable technologies should be reduced if their benefits are to occur at multiple levels.

The Urban Retreat™ is a product that is made up of recycled yarn which means that the energy that would have otherwise been used to produce the new material has been reduced. In addition, another benefit for the natural environment is that this waste that is recycled to manufacture the carpet, would have otherwise landed up in the ocean posing a risk to wild sea animals being trapped. The use or adoption of this product promotes the up keeping of the environment which most sustainability frameworks emphasise (Anderson & White, 2009). Please see the product description of the Urban Retreat™ carpet in Appendix 1. The hypothesised benefits of installing a product such as the Urban Retreat™ carpet may include improved wellbeing (Kahn et al. 2009) and a workforce that performs better ultimately increasing the return on revenue (Terrapin Bright Green, 2012). These have been discussed at length in the introduction. The Reformist approach has been criticised for supporting the political and economic interests, by failing to account for the intrinsic role of the economic and social structures that perpetuate this environmental degradation as they seek to prioritise humanity's needs. Although there are discrepancies against reform, it at

least places the environment's wellbeing at the forefront of sustainability discussions (Hopwood et al., 2005) Having said the above, the Urban Retreat™ carpet not only meets the needs of humans but also improves the carbon footprint of the carpet on the environment.

The Environmental Product Declaration (EPD®) makes available the life cycle environmental performance or the sustainability of products and services per industry (What is an EPD, 2012). Issues such as climate change (carbon footprint), depletion of the ozone layer, eutrophication and depletion of mineral resources are some of the impacts that are covered by the framework. This means that the environmental impacts of a product from the manufacturing to transportation stage (and installation stage in this case) can be measured directly for consumers to make informed decisions (Arratia, 2011; What is an EPD, 2012).

The Urban Retreat™ carpet range performance on the EPD system provides evidence for its sustainable characteristics. Like many of the Interface carpets, the Urban Retreat™ carpet is made from more than 80% recycled contents such as yarn as compared to the typical carpet (Interfaceflor, 2013). This yarn is sourced from old commercial fishing nets at the bottom of the sea protecting the marine animals and the beach (Interfaceflor, 2013). In the carpet tile industry, yarn is the single largest contributor of environmental impacts amongst other raw materials. Other factors such as a the use of a recycled backing, glue-less installations and third-party verifications support the current research's assertion that the product is a sustainable technology. Given the fact that the Urban Retreat™ carpet meets EPD standards and other third party sustainability verifications the use of the framework is appropriate. The current research hypothesises that people that have an inclination to adopt the technology are most likely to value the environment.

Considerable strides have been taken to innovate sustainable and well-designed technologies, yet innovators are confronted with the prospects that their ingenious ideas may not be successful in the marketplace. There are many reasons for these failures that span across disciplines. As mentioned above the Reformist approach considers training and knowledge important factors that predict adoption, the most common reason attributed to the failure or success of particular technologies is the cost. Research has shown that economic accounts are not always valid. The adoption of technologies and its use is more

about being socially bound, the perceived application within the wider social group, and by individual ability (Green, 2001; Moons et al., 2009). Scholars such as Douthwaite, Keating and Park (2001) purport that an often overlooked aspect of technology adoption is due to the lack of focus on the user's experience during this adoption. This research report focuses on how people accept and view the adoption of sustainable technologies in their workspace. In essence, the manner in which people view green technologies in organisations is the primary focus.

2.2 Models of technology adoption

It has become crucial that the adoptions of technologies that are characteristically sustainable are prioritised (Venkatesh, Davis & Morris, 2007). The recognition of barriers to the adoption of technologies has been studied for over two decades (Venkatesh, Morris, Davis & Davis 2003; Venkatesh et al., 2007). It is argued that the recognition of these barriers makes it easier for their removal to take place (Thatcher & Ndabeni, 2011). Previously known as the Technology Adoption Model (TAM) (Venkatesh, Morris & Ackerman, 2000), the Unified Theory of Acceptance and Use of Technology (UTAUT) is a compilation of various models of technology adoption (Venkatesh et al., 2003).

In an account of the history and development of technology adoption research, Venkatesh et al. (2007), state that there have been numerous theories in the area of technology adoption. Thompson, Higgins, and Howell (1991) in Venkatesh et al. (2007) proposed a model of PC utilization. Moore and Benbasat (1991), drawing on innovation diffusion theory (IDT; Rogers 1995 in Venkatesh et al., 2007) introduced various characteristics that would influence technology adoption. The predictive validity of IDT was examined by Agarwal and Prasad (1998 in Venkatesh et al., 2007). The Theory of Planned behaviour (TPB) and Theory of Reasoned Action (TRA) are other prominent models in this research area (Venkatesh et al, 2003). The latter TRA has been used widely to explain human behaviour from a psychological stance whereas a similar and most cited model in the area, the Technological Adoption Model (TAM), has been used to understand a particular behaviour, specifically the adoption of information systems (Thatcher & Ndabeni, 2011).

Seen as one of the most influential models, the Technology Adoption Model (TAM) was presented as an adaptation of the theory of reasoned action which is a social psychology theory (Davis, 1985). This model argued that if a technology is rated high in terms of its

perceived usefulness and ease of use the intention for it to be adopted will be higher, influencing the actual use of the technology. Davis (1989) argued that high positive ratings of these two attitudes would lead first to intentions to use a particular technology and then, if the intention levels were high, this would lead directly to the actual use (behaviour) of that technology. TAM thus has roots in psychology, sociology and information systems. TAM was found to have greater empirical research support as opposed to the TRA (Davis et al. 1989; Venkatesh, 2003). To test the model in different settings and with different technologies, TAM was found to be robust, predicting relationships accurately. According to Venkatesh et al. (2007), TAM was tested among various types of information systems, including email (Karahanna & Straub 1999; Straub 1994), groupware (Lou, Luo, & Strong 2000), expert systems (Keil, Beranek, & Konsynski 1995), Computer-aided software engineering (CASE) tools (Dishaw & Strong 1999), voice mail (Karahanna & Limayem 2000), calculator (Mathieson 1991), digital libraries (Hong et al. 2001), spread sheets (Mathieson 1991; Venkatesh and Davis 1996), and e-health systems (Wilson & Lankton 2004). TAM has also been tested in different countries such as the U.S. (Venkatesh & Davis, 2000), Japan (Straub, Keil, & Brenner 1997), and Saudi Arabia (Abdulgader & Kozar 1995).

The common predictor in much of the research that was performed in the above citations is the perceived usefulness of the technology. It was found that perceived rewards for the use of the technology were directly linked to its acceptance. Extrinsic motivation was defined by Davis et al. (1992 pp. 1113) as the "the perception that users will want to perform an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself." These factors included job performance pay or promotion. Although other predictors were found to be significant, the reward that believed to be yielded was valued more. This theme has resonated in many research studies across the years.

The applicability of the TAM in various contexts makes its use appropriate in a setting such as South Africa. In the developing world, it is believed that access or availability of the technology is often the precursor to its use (Musa, 2006). However, Thatcher and Ndabeni (2011) have found that providing people with technology is insufficient in motivating them to actually use it. This they argue is evident in research on communities with similar

economic standing and geographical locations (Thatcher & Ndabeni, 2011; Musa, 2006). Thus there is an interplay between psychological, social and physical factors. Oshlyansky, Cairns and Thimberly (2007), validated the subsequent version of the TAM, the UTAUT, as a cross-cultural tool that is applicable in eight countries including South Africa. This is important as standardised tests, which have been normed in Euro centric countries, elicit different results in different contexts because of cultural differences.

TAM's emphasis on perceived ease of use as a prominent predictor of the intention to adopt or use technology has been criticised resulting in improved versions of the model. Venkatesh (2000) argued that the two attitudinal variables (perceived ease of use and perceived usefulness) only accounted for about 40% of the variance. The emphasis on these premises is believed to limit the information to practitioners to implement user acceptance projects (Thatcher & Ndabeni, 2011). It was then argued that external forces also contribute to the acceptance of technology (Venkatesh et al., 2000). Issues pertaining to external variables such as social norms, voluntariness, image, age, and gender were subsequently added to create the TAM2 (Karahanna et al, 1999; Venkatesh et al., 2000). In addition to these was perceived behavioural control and cognitive instrumental factors such as job relevance and output quality which were added to create the UTAUT (Venkatesh et al., 2003). Although these additional variables are not explicitly captured in the UTAUT model they have been captured in constructs such as Voluntariness, Effort Expectancy, and Performance Expectancy. The UTAUT is an all-encompassing model of technology adoption. The details of the theoretical framework will be elaborated on in the following section.

2.3 The Unified Theory of Acceptance and Use of Technology (UTAUT)

It is evident that the adoption of technology is subject to various factors which, in isolation, fail to give the full account of individuals accepting or using technology (Thatcher & Ndabeni, 2011; Venkatesh et al, 2003). The UTAUT endeavours to do this by amalgamating most of the above mentioned models into an integrated model (Venkatesh et al, 2003). The UTAUT comprises four core predictors of the intention to use and actual usage namely: Performance Expectancy, Effort expectancy, Social Influence, and Facilitating conditions. These factors are believed to predict intention to use which in turn strongly determines the adoption of a particular technology (Venkatesh et al., 2003). It also consists of moderators of age, gender, voluntariness, and experience (Venkatesh et al., 2003). For the purposes of

this study age and gender will be looked at as moderating the relationship between the four component determinants and intention to use. Therefore the UTAUT will help the investigation of which factors lead to positive feelings towards the adoption of the Urban Retreat™ carpet.

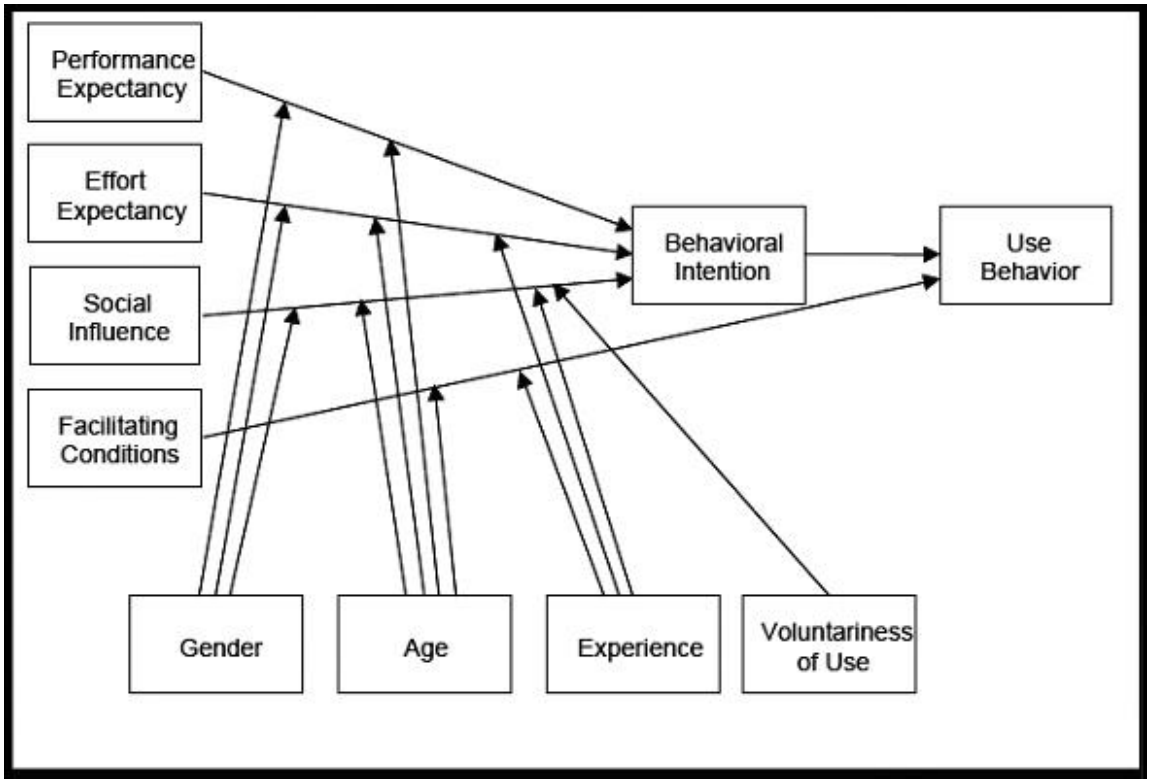


Figure 1: UTAUT Theoretical Framework Model (Venkatesh et al., 2003). This image explains the operationalisation of the functional aspect of the research.

The study utilised seven variables, whereby five were included in the UTAUT model. The remaining two variables are Concern for the natural environment and biophilic tendencies. Age is selected as one of the variables because the intended sample will mostly be sourced from a banking institution and is expected to vary substantially. The second moderator variable, gender will be included. It is included because Venkatesh et al. (2000) found that technology adoption in women was strongly influenced by social factors and perceived behavioural control as opposed to men who were influenced by their attitudes. Experience will not be included as the technology, the Urban Retreat™ carpet has not been installed in the place of work. Similarly, voluntariness will not be included as participants would not be able to authorize the installation of the carpet; there is no variance in voluntariness.

- Performance expectation is defined as “the degree to which an individual believes that using the system will help him or her to attain gain in job performance” (Venkatesh et al, 2003; p.447). In the current study, performance expectancy refers to whether employees perceive that having the Urban Retreat™ carpet installed in their working space will assist them in completing their job related tasks. Tasks would include the completion of projects and more time for them to spend on work. In other carpets, that have a shorter life span, in comparison to the Urban Retreat™ carpet, regular removal and reinstallation could affect the time required to meet an employee’s deadline. This could happen as loud machines such as glue guns used to install traditional carpet forms could disturb workers and thus take away time from the accomplishment of their tasks. The Urban Retreat™ carpet does not need to be replaced as it is hardwearing and durable.

- Venkatesh et al (2003; p.450) defines effort expectancy “as the degree of ease associated with the use of the system.” In relation to the Urban Retreat™ carpet, this variable would relate to employee’s effort in interacting with the technology and effort maintaining the product. The system needs minimal effort in order for it to be perceived as having low effort expectancy. The Urban Retreat™ carpet requires less effort than other carpets to install because it uses TacTiles that are environmentally friendly and takes less time to install. Furthermore, like other Interface products, the Urban Retreat™ carpet is made from Microtuft, which needs minimal cleaning.

- Social influence refers to “the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al, 2003; p.451). Social support and peer influence in relation to using the Urban Retreat™ carpet becomes the focus of this construct. Depending on the social influence of significant others in the workplace, people can move on to encouraging others to use or discontinue use (Karahanna et al, 1999). Significant others in the workplace include management, colleagues, subordinates, and top management.

- Facilitating conditions are defined “as the degree to which an individual believes that an organizational and technical infrastructure exists to support [the] use of the system” (Venkatesh et al, 2003; p453). This definition captures the role of the

employer in ensuring that all barriers to the use of the system are removed or mitigated. These aspects could relate to the organisation communicating with the employees about the benefits of installing the Urban Retreat™ carpet and whether the company will or will not provide maintenance services for the carpet. This construct has been found to be related to the effort expectancy construct because they cover similar issues. Facilitating conditions are not directly related to the intention of use but to the actual usage, therefore it is expected that facilitating conditions will not predict positive feelings towards the intention to use the system.

- Intention to Adopt/Behavioural intentions defined as the feelings of the employee towards the adoption of the carpet. In the UTAUT model, intention to adopt is considered a predictor of usage (Venkatesh et al, 2003) (See figure 2). However, the goal in the current study is to understand intention as the dependent variable. The role of intention has been found to be significant in predicting behaviour (Shepard, Hartwick & Warshaw, 1988). Because the actual installation of the carpet is done by the management of the organisation on behalf of the organisation, they are in control of the adoption or usage. Therefore, there is no variance in the sample as to them adopting or not adopting the technology. Whether the employees agree or disagree with this installation is of interest. Agreeing with the installation of the carpet will be an indicator of positive feelings whereas disagreeing to the intention by the organisation to adopt the technology will be negative feelings. Intention to adopt in the current study refers to 'feelings towards the intention to adopt the Urban Retreat™ carpet' but will herein be referred to as the feelings towards the intention to adopt.

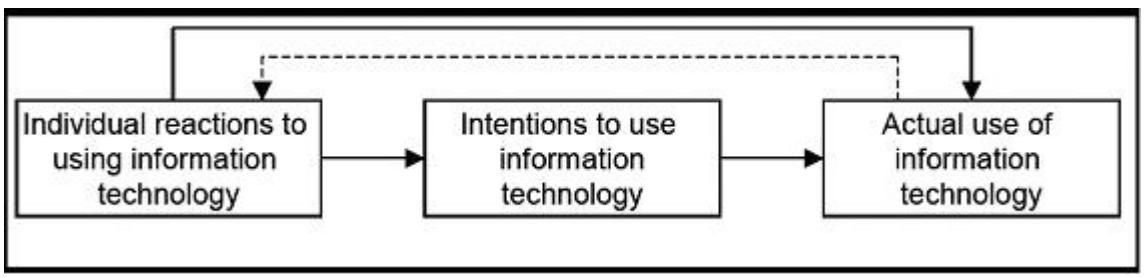


Figure 2: basic conceptual framework underlying user acceptance model (Venkatesh et al. 2003).

As mentioned previously, the conventional use of the UTAUT has been to predict the intentions to use information technology. The study utilises a carpet, which is distinct from traditional information systems (Marchekwa et al, 2007; Venkatesh et al, 2003; Wang & Wang, 2010). By rewording the items and putting in place the name of the appropriate technology, the UTAUT can be applied to different technologies. Maluleke (2011) successfully used the UTAUT to predict the intention to adopt a Solar Recharge Booth. Using the TAM2 (with situational factors added (performing the function of the UTAUT); the likelihood of adoption of a self-service fast food kiosk was studied (Dabholkar & Bagozzi, 2002). Another non-IT domain where the UTAUT has been applied is advertising (Rogers and Chen 2002 in Venkatesh et al., 2007). Other technologies in dairy farming and green electricity have also been looked at (Venkatesh et al., 2007).

Furthermore the UTAUT has been cross culturally validated by Oshlyansky et al (2007), who translated it from English to other languages. The languages it was successfully translated into include Arabic, Czech, Dutch, French, Greek, and Malay (Oshlyansky et al, 2007). In Maluleke (2011) the predictors of the adoption of the Solar Recharge Booth, the sample was South African students. The expected sample is banking employees who are white-collar workers. By virtue of being a white-collar workers, they are assumed literate in English.

Although there is an abundance of research on technology adoption, there is a limited amount of published work that has applied UTAUT or its predecessor's theories to sustainable technologies.

Guagnano, Hawkes, Acredolo and White (1986) used the innovation diffusion theory to find that perceptions of innovation of solar technology predicted the adoption of the systems. They found that adopters of solar systems were less worried about the pre- and post-adoption risks associated with the products. Through the diffusion of innovations framework, Chigona, and Licker (2008) and Labay and Kinnear (1981) looked at whether adopters and non-adopters of solar energy technology consider the same factors about the technologies or are the characteristics of the technologies looked at in a different manner. Therefore, the primary focus of this research was to evaluate the individual's knowledge about sustainable technologies and whether their insight or lack thereof, affected the likelihood of adoption. In another research paper about the adoption of green electricity, it

emerged that perceived personal benefit and access to information were important predictors of adoption of green electricity. Similarly, Lewis and Cassells (2010) did not utilise any particular research framework to look at environmental practices of SMEs in the manufacturing sector in New Zealand. They found that the businesses were driven by cost saving and financial benefits to implement pro-environmental practices. Most research on sustainable technologies used the Innovation Diffusion Theory, which is less comprehensive than the UTAUT.

The types of technologies that have dominated the sustainable technology adoption research do not cover the full range therefore creating a gap in the field. Arkesteijn and Oerlemans (2005) looked at an extended version of the TAM by considering technological factors, individual factors, and economic factors associated with the adoption of green electricity. They found that ease of switching, knowledge of the energy sources, attitudes towards the environment, and willingness to pay were all important determinants of intention to adopt green energy. A study in Malaysia by Hong et al., (2013) using the Theory of Planned Behaviour, looked at the adoption of hybrid vehicles and found that perceived behavioural control, relative advantage, and compatibility were the best predictions of adoption intentions. Gerpott and Mahmudova (2010) found that a consumer's attitudes or values towards the environment were an important determinant of green electricity adoption, together with the influence of close social contacts, although they found there were differences among high power users and moderate power users in terms of gender. The value add of the current research is that it focuses on a non-technological or information technology system. Although previously the research report argued that the Urban Retreat Carpet™ is a sustainable technology as it fulfils the characteristics (Vanegas et al., 1996) of minimising the use of non-renewable energy and natural resources; satisfying human needs and aspirations and minimal negative impact on the earth's ecosystems, previous research results cannot be fully generalised to the carpet. Solar energy systems, green vehicles and other technical systems are different from carpets.

It is easy to see how research studying the acceptance of solar energy systems or green vehicles may bring about consistent results about adoption. However with systems that do not have a direct usage by people such as carpets, it becomes difficult. The obvious benefits of solar energy systems are that adopters may reap the direct rewards of reduced electricity

costs as opposed to people who work in an office with the Urban Retreat carpet installed whose benefits may be less explicit. However, in the past, green energy was inefficient and more costly than other energy sources; from an economic viewpoint, solar energy was competitive only in certain limited applications. Recent technological advancements combined with the increased costs of conventional energy sources especially with the power crisis in South Africa have made this form of energy attractive. Furthermore, the issue is around the manner in which a person interacts with a carpet is completely different from the way they would interact with a solar energy product or system. A carpet in a building, especially in a commercial building, may be unnoticeable as workers are occupied with completing work tasks and going about business.

Having said the above, it is important to go beyond the utilitarian aspects of technology adoption captured by the UTAUT especially for an inconspicuous product such as the Urban Retreat™ carpet. The research looks at how amongst other factors, the attitude towards sustainability characteristics may influence the adoption of green products. The issue of attitude towards the environment leads to the next facet of the research- Concern for the natural environment.

2.4 Concern for the natural environment

EPD information, although not an "ecological label" (Arratia, 2011, p.35), provides standardised information for individuals that can be informative amidst unsubstantiated and exaggerated claims by the manufacturers of sustainable products (Anderson & White, 2009). The EPD tracks the lifecycle of a product and how it affects the wider environment. Caring or holding with esteem the technologies that aim to preserve the environment pertains to issues of what people like and do not like- it reflects the values. In the research, the concern for the natural environment aspect will be used to investigate attitudes towards sustainable practices in general, as outlined by the EPD system. In other words, the EPD system arranges all the aspects of the carpet (i.e. from manufacturing to delivery) and how they impact on the environment. Thus, by virtue of valuing these sustainability characteristics as well as behaviours, one has a concern for the natural environment. It is important to evaluate the attitude that people have towards knowledge about the product, sustainability characteristics, as there are very few studies that do this.

The determinants of why specific individuals adopt or do not adopt particular technologies despite widespread availability and access to information about them, is still a contentious issue (Thatcher & Ndabeni, 2011). A literature review by Kollmus and Agyeman (2002) found that the US linear models to achieving sustainability were flawed. The US linear models emphasise that education and access to information will lead to environmentally conscious behaviour. This is despite the fact that the above-mentioned studies such as Arkesteijn and Oerlemans (2005); Guagnano et al., (1986); Labay and Kinnear (1981) and Lewis and Cassells (2010) found that education about the benefits of a product increased the likelihood of its adoption. However, this approach of information dissemination with the intention to promote the adoption of sustainable technologies was found to produce only a small fraction of pro-environmental behaviour. Nisbet et al., (2009) omitted a fourth knowledge subscale in the Nature Relatedness questionnaire as many of the items required technical expertise as might only be found amongst individuals with a background in science. Therefore, it may be worthwhile to evaluate the attitudes that people hold about sustainability of products as opposed to testing their knowledge. The research does exactly this by evaluating participants' concern for the natural environment.

It is important to first describe environmental values and how these form attitudes. Foxcroft in Roodt (2005) posits that "*values are considered to be significant motivators of behaviour, because people strive to achieve or obtain things that they value and move away from things that they do not like*" (p.170). Values about the environment are defined, as the degree to which an individual believes that sentiments about looking after the environment and products that protect that environment are important (Dunlap, Van Liere, Mertig & Jones, 2000). In this study, values are referred to as green values, which influence attitudes towards the environment- one's concern for the natural environment. "*Attitudes are the mental dispositions people have towards others and the current circumstances before making decisions that result in behaviour* (Foxcroft in Roodt 2005, p. 170). Therefore, the definition for concern for the natural environment is outlined by (Wiese, Sauer & Rüttinger, 2004, p 1182) as "The general attitude and obligation towards the environment."

However, factors which may not have been internalised as beliefs and values can still influence a person's attitudes at the point of behaviour. Typical influences include the desire to please, political correctness, convenience, peer pressure, and knowledge (Wiese et al.,

2003). In the current study, factors such as perceived cost or effort that accompanies the adoption of the Urban Retreat ™ carpet are examples of influencers. In summary, concern for the natural environment looks at sustainable practices espoused by the EPD framework that are general and whether people endorse them. Agreeing to or disputing issues such as recycling and using technologies that are sustainable indicates their attitude towards sustainability.

Wiese et al., (2003) attempts to explain how behaviour can be modified in order to minimise environmental damage. "*Environmental concern alone is insufficient in inducing pro-environmental behaviour unless backed by appropriate knowledge"* (p. 1183). Although individuals may have strong obligations towards the environment, it is futile unless they are educated accordingly in order to shape their behaviours in ways that align their obligations about that natural environment (OECD, 2011). Pro-environmental behaviours include recycling, selecting sustainable products over non-sustainable ones and choosing long lasting products. These features are expressed in the Concern for the natural environment subscale, which will be discussed shortly. Thus, what is important here is that individuals need to be knowledgeable about how their actions impact the environment whilst at the same time being aware of how they can change their actions to minimise the damage on the environment. When looking at the current sample of lawyers, administration staff and cleaners may not know that, the cleaning and maintenance of the carpet may actually be causing damage to the environment through the consumption of energy thus affecting their acceptance of the product.

It is important to look at the evidence surrounding concern for the natural environment. According to the OECD (2011), individuals with a strong sense of civic duty play an important role in explaining individuals recycling efforts. Following the postulations of Dunlap et al., (2000) who established the link between values and behaviour, many studies have investigated the relationship between attitudes and behaviour (Kollmus & Agyemus, 2002; Ozaki, 2011). Schwartz's (1977) norm activation theory sees personal norms, such as strong moral obligation, as the only direct determinants of pro-social behaviours, and rejects the idea of behavioural intentions mediating the relationship of the two. In this theory, awareness of consequences and ascription of responsibility create personal norms, which lead to pro-social behaviour. Based on this perspective, Stern, Dietz, Abel, Guagnano & Kalof

(1999) develop a model of pro-environmental consumer behaviour: the value–belief–norm model. In this model, the acceptance of the 'green' values leads to awareness of consequences and ascription of responsibility, and the resulting personal norms lead to pro-environmental behaviours such as environmental citizenship, policy support and private sphere behaviours. Furthermore, Stern et al., (1999) also presents the attitude–behaviour–context model, which looks into the effect of individual attitudes towards a particular behaviour (e.g. values and personal dispositions) and contextual factors (e.g. monetary/ physical constraints and interpersonal influences). These theories are widely used in research on consumer pro-environmental behaviour, emphasizing the importance of values, consequential beliefs and the sense of responsibility that creates norms for pro-environmental action. The literature points towards the rationale to evaluate the attitudes towards the environment.

In contrast to the support of attitudes influence on behaviour, a literature review of empirical studies shows that environmental attitudes have been found to have a varying, usually very small impact on actual pro-environmental behaviour (Kollmus and Agyemus, 2002; Ozaki, 2011). Ozaki (2011) found that consumer's sympathetic to environmental issues do not necessarily adopt green electricity. This is due to lack of strong social norms and personal relevance, inconvenience of switching, uncertainty about the quality of green electricity and lack of accurate information. This is counterintuitive because it is common sense to believe that people live according to their values and attitudes. There are various explanations for this discrepancy, one of them being the low-cost/high-cost model (Diekmann & Preisendörfer, 2003), which may capture this personal relevance that Ozaki (2011) mentions.

According to this model, people choose to adopt technologies that demand the least cost from them. Cost in their model, is not defined in strictly economic terms. In the current research, the perceived time and effort needed to undertake the installation and maintain the carpet could be costly factors. However, this aspect is covered extensively in the functionality, UTAUT aspect of the research. Diekmann and Preisendörfer, (2003) showed that environmental attitudes and low-cost pro-environmental behaviour (e.g. recycling) do correlate significantly. Research has found that people who care about the environment adopt sustainable technologies but do not necessarily adopt more costly and inconvenient

activities such as driving less (Diekmann & Preisendörfer, 2003). As the installation of the Interface® Urban Retreat ™ carpet bares no direct cost, time and effort from the research participants, those with lower concern for the natural environment, would still have positive feelings towards the adoption of the carpet. Therefore, this aspect of the research looks at attitudes of saving money when purchasing products. The research hypothesises that concern for the natural environment may not predict the acceptance of the carpet.

Karahanna et al., (1999) cautions researchers when looking at technology adoption attitudes when people have not interacted with the system in question. The argument is that there is a difference between pre-adoption attitudes and post-adoption attitudes, which need to be taken into account. Karahanna et al. (1999) all acknowledge that adoption is necessary for utilisation however; the actual use of a product may have a significant impact on the beliefs and attitudes going forward. In other words, "beliefs before use are not the same as beliefs that lead to the use" (Karahanna et al; p 185). Therefore, attitudes before are not the same as after experience. With increasing direct exposure with the target system, individuals adjust their system specific perceived ease of use to reflect their interaction with the system" (Venkatesh, 2000; p. 343). The thrust of Karahanna et al. (1999) is to highlight the distinction between actual users and potential users therefore intention as argued by the TRA may be a strong predictor of use but the direct use of the product will be a defining feature of the acceptance.

Furthermore, attitudes based on direct experience with a technology predict better behaviour than attitudes formed on indirect exposure (Karahanna et al, 1999). When individuals receive information about a target object through direct exposure or even a trial they are able to report and make value judgements, which are more coherent and accurate in comparison to those that rely on product descriptions (such as the current study). Indirect exposure is not as effective as direct exposure (Karahanna et al, 1999). Therefore, the attitude behaviour relationship is stronger for actual users or trialists. This section of the literature review is important as the research participants did not get an opportunity to view and interact with the actual carpet. They were exposed only to images of the product installed in other office areas. Therefore, the research expected that concern for the natural environment would not significantly predict the feelings towards the intention to adopt.

2.5 Connection with the natural world: Biophilia

The research touched briefly on the affective design in previous sections and how these can be leveraged on to encourage the adoption of sustainable technologies. It is now that the research expands on affective factors. Affective design (and design for emotion in general) refers to many connections that exist between the user and technology pre and post adoption (Midden et al. (2007). The degree to which the individual agrees with general sustainability practices is captured by the concern for the natural environment (i.e. attitude to the EPD components). Another aspect is the internal affective experience that may be experienced outside of the interaction with the system that has an impact on the acceptance of the technology. The research refers to this component as biophilic tendencies.

Beyond cognitive assessment and rational choice, there are emotional influences and societal and cultural issues that impinge on consumers' domestic energy use behaviour (Ulrich, 1993, p. 31). Human action can be irrational as well as rational. Max Weber (1972) in Ulrich (1993 p. 38) categorizes human action into four groups: goal-instrumental action, in which both consequences and means are planned and calculated; value-rational action, in which valued goals are achieved without much consideration of means to achieve them; traditional action, which is routinized, e.g. an action that has always been done and affectional action, which is led by emotional factors. This classification implies that economic and functional goals alone cannot determine technological adoption behaviours: there are usually other motivational factors underlying adoption decisions, such as meanings people attribute to them seen in how they see themselves and how they live their lives. Fitzmaurice (2005) claims that people's purchasing behaviour can be affective, involving hedonic and self-expressive motivations. The literature of innovation consumption discusses this emotional dimension of decision-making (Ozaki, 2011). Therefore humans can be driven by emotion as much as they driven by function. Although the carpet has sustainable properties, there are affective aspects that apply to the product that needed analysis. It is thus paramount that the affective is incorporated into the enquiry.

Applying affective design to sustainable technologies, Midden et al. (2007) considered four roles: 1) intermediary role (i.e. getting people to use sustainable technology); 2) amplifier role (i.e. technology amplifies the attainment of sustainability goals but also amplifies the use of resources); 3) determinant role (i.e. technology shapes behaviour by its presence/absence or affordances/constraints); and 4) promoter role (i.e. technology specifically influences behavioural choices). Affective design (Khalid, 2006) attempts to understand how a user's feelings and emotions towards a product or system influence their likelihood of adoption. The affective design field can be seen as the acknowledgement and response by designers to emotional action. Intermediary role is of importance in this study.

The role of affective design to get people to use sustainable technology (intermediary role) is powerful. Thatcher (2012) argues that affect may play a role in pro-environmental behaviours such as the adoption of sustainable technologies. This is because the Urban Retreat™ carpet range is designed with the intention to mimic nature- its design principles are founded on biomimicry. According to Thatcher (2012, p.128) "*affect is considered to be one's intention, initial (and short lasting) reaction to a product or system*". This relates to the reaction to nature espoused in the look of nature. The Urban Retreat™ carpet mimics stone walls, bark and moss intending to evoke in those that have it installed, a tendency to connect with the natural environment (Interfaceflor, 2013).A relatively new area of emotional reactions is biophilia, which has been shown to relate to voluntary adoption and practice of sustainable behaviours (Naes, 1973). The quote by Wilson in Ulrich (1993, p. 31) summarises the concept that is biophilia:

"Biophilia… and I believe it exists us the innately emotional affiliation of human beings to other living organisms"

The Biophilia hypothesis (Wilson, 1984; Kellert & Wilson, 1995) encapsulates this affective quality, explaining the innate desire for humans to connect with the environment. These innate emotional affiliations are hereditary and hence part of human nature. However, this natural desire is also an evolutionary perspective, proposing that human beings over time acquired behavioural and emotional affiliations towards particular objects in nature that would reinforce their survival. Therefore, like other patterns of complex behaviour, biophilia is mediated by learning. These emotional reactions can be positive, encouraging an

approaching behaviour (biophilic) while at the same time negative, encouraging an avoidance action (biophobia).

Therefore, the study evaluated how innate emotional affiliation with nature can be triggered in people when interacting with the carpet and whether it predicts the acceptance of the carpet. In other words, the research report wanted to see how the love of nature or lack thereof could be leveraged upon to get people to accept the biophilic carpet (Thatcher, 2012). Few studies look at the influence of aesthetics or affective properties, on the adoption of green technologies.

In modern times, evidence for biophilia is in the popularity of outdoor wilderness activities, flowers and plants are brought into the home as well as the workplace (Thatcher, 2012). Due to space and maintenance, objects that mimic nature or biomimicry have been adopted into the workplace (Interfaceflor, 2013; Nisbet et al., 2009). Technological nature (Kahn et al. 2009) or biomimicry is a field that endeavours to fulfil these needs by humans to connect with nature- to bring the outdoors indoors. Kahn et al. (2009) defines technological nature as "*technologies that in various ways mediate, augment, or simulate the natural world*" (p. 37). Therefore, this connection to all living things that is emotional in nature and innate in all human species varies across people thus those that are inclined to it are more likely to endorse natural interventions. The study hypothesised that those that were inclined to display biophilic tendencies would have positive feelings towards the intention to adopt the Urban Retreat ™ carpet.

The study will turn to look at research that supports the existence of biophilia. Design that mimics nature (biomimicry) has been shown to have associations with positive organisational outcomes, both hard and soft (Terrapin Bright Green, 2012; Kahn et al., 2009). The idea of biomimicry closely relates to affective design as it intends to create designs that emphasise pleasure in the experience with the product. In a white paper, environmental consultants, Terrapin Bright Green (2012), showed how the introduction of biophilic technologies within the interior of an organisation or organic forms can improve productivity. The case for biophilia is supported by the ability to measure productivity accurately through customers served and absenteeism (Interfaceflor, 2013). In other studies of soft outcomes, Friedman, Freier, Kahn, Lin and Sodeman (2008) found that real

time displays of nature increased psychological wellbeing and cognitive functioning. In another study using the same technological nature, real-time plasma displays of nature were associated with positive heart rate levels in employees (Kahn et al., 2009). A robotic dog was also found to possibly facilitate social development in children with autism (Stanton, Kahn, Severson, Ruckert, & Gill, 2008). Although not the focus of the study, positive organisational outcomes of biophilia build a case for the field's study. Despite this evident attraction, there is considerable variability in the extent to which individuals are drawn to nature- this supports the evidence of biophobia. Thus, it was hypothesised that those higher on biophilic tendencies are most likely to reap the rewards of natural environments within the office and support 'green' interventions such as the installation of the Urban Retreat™ carpet range.

While human beings have an innate love for nature, they paradoxically have innate aversions to aspects of it. Phobias can be developed towards dogs, spiders, closed spaces, running water and heights. This brings about the idea of biophobia which, together with biophilia was also explored by Wilson (Ulrich, 1993). While biophilia is good, biophobia is defined as "*a partly genetic predisposition to readily associate, on the basis of negative information or exposure, and then persistently retain fear or strong negative/avoidance responses to certain natural stimuli that have presumed to have constituted risks during evolution*" (Ulrich, 1993, p. 76). The common phobic objects in western countries are snakes and spiders. The adoration and even the worship of these animals in the eastern Asian cultures are complex phenomena that may constitute some form of coping strategies of the phobias. Nevertheless, the argument for evolutionary biophilia and biophobia fails to explain entirely the individual differences between why some people feel strongly and positively connected nature, whereas others are unmoved.

Chawla (1999) approached the topic from studying environmentalist's life histories to understand individual differences of emotional attachments to nature. Numerous professional environmentalists in the United States and Norway were interviewed and asked which factors or people shaped their decision to become environmentalists. It emerged that experiences in nature (behavioural aspects), education (cognitive) and emotional attachment to nature (self-conceptualisation) were contributing factors. Kals, Schumacher, and Montada (1999) have investigated the emotional aspects of

environmental behaviour in their research on love of nature and interest in nature. Along with affinity, interest, and indignation, positive past and present nature experiences are predictive of nature-protective behaviour. 'Loving' the environment, was an important predictor of environmentally friendly behaviours (Allen & Ferrand, 1999). Therefore, there is evidence that past and present experiences with nature and affective relationships with nature influence pro-environmental behaviour. It is thus expected that those that have good experiences with nature, appreciate its entirety and see themselves as part of it will have positive feelings about their company's installation of a carpet which mimics nature.

Although the idea that humans can be emotionally attached or disconnected, leading to the presence or absence of environmentally friendly choices is attractive, empirical research in this regard is lacking (Thatcher, 2012). For instance, Chawla's (1993) research on professional environmentalists' measured indirect pro-environmental behaviour (i.e. protesting for efficient home appliances to be subsidised by government), as opposed to direct behaviour (adopting sustainable technologies). Furthermore, a broader methodology of understanding human's relationship with nature is insufficient (Nisbet et al., 2009). The New Ecological Paradigm (NEP) (Dunlap et al. 2000 in Nisbet et al., 2009) examines the human-nature relationship but lacks the affective component of 'being' in nature. While the Connection to Nature scale (CNS) (Mayer & Franzts, 2004) endeavours to measure closeness or attachment to nature on both an emotional and cognitive level, it fails to include an important part of the relationship which is the physical aspect. Schultz (2002) has also created a measure of Inclusion of Nature in Self (INS) by adapting Aron, Aron, and Smollan's (1992) Inclusion of Other in the Self scale (used to study interpersonal relationships). Although the INS scale addresses some aspects of the human-nature relationship, and is conceptually similar to Nature Relatedness, the single-item format limits the construct's breadth (Nisbet et al., 2009). The lack of empirical research into the construct that is biophilic tendencies is exacerbated by the construct's poor definition and conceptualisation.

As mentioned previously this research report specifically focusses on evaluating the role of emotional connections (in people and that may be triggered by the carpet) on the decision to accept the technology. In other words, whether one's nature relatedness or biophilic tendencies influence the feelings towards the intention to adopt.

The concept of Nature Relatedness (NR) espouses "one's appreciation for and understanding of our interconnectedness with all other living things on the earth… It is not simply a love of nature or enjoyment of only the superficially pleasing facets of nature, such as sunsets and snowflakes. It is also an understanding of the importance of all aspects of nature; even those that are not aesthetically appealing to humans (e.g., spiders and snakes)" (Nisbet et al, 2009, p. 718). Ultimately, it is the appreciation for the interconnectedness of living things on earth. After conducting a survey, Nisbet et al. (2009) selected items that were indicative of the affective, cognitive, and experiential aspects of Nature Relatedness. Their account of biophilia and biophobia is more comprehensive as opposed to the earlier evolutionary perspective. It is this last point, which the construct Nature-Relatedness captures. It captures many of the individual differences linked to personality in environmentally friendly behaviours, which includes the intention to adopt a sustainable technology (Nisbet et al., 2009). The Nature Relatedness scale will be used to assess people's affiliation to nature and will be used to see whether this relates to their likelihood to accept the adoption of the Urban Retreat™ carpet. Therefore, affective factors such as connection to nature or affiliations with nature may be the reasons why some people are concerned about the natural environment thus employing technologies that preserve it. An association between Concerns for the natural environment as well biophilic tendencies is expected.

In summation the research study was concerned with the utilitarian aspect of technology adoption which is captured by the use of the UTAUT model as well as an affective/emotional aspect.

2.6 Research Questions

Overarching research question

Which factors (functionality, Concern for the natural environment and affect) are more likely to lead to the intention to adopt the Interface® Urban Retreat™ carpet amongst employees?

Sub- questions

1. Are the measures of concern for the natural environment and biophilic tendencies (adapted Nature Relatedness measure) reliable?
2. To what extent does the Concern for the Natural environment demonstrate discriminant validity as a measurement of green values against Biophilic Tendencies?
3. What are the important factors that predict the positive feelings towards the intention to adopt the Urban Retreat™ carpet amongst employees?
4. How do age and gender moderate these relationships?

2.7 Variables

Table 1 Research variables

Predictor	Dependent
Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Concern for the natural environment (Green values) Biophilic Tendencies	Feelings towards the intention to adopt
Moderators	
Age Gender	

Chapter 3

3.1 Methodology

This chapter will describe the methodology applied to answer the proposed research questions. The research design employed will be described then it will be followed by a description of the research participants. The data collection along with the procedure will be provided. The measures used for every variable will be provided. Lastly, this section will provide the statistical analyses utilised as well as ethical considerations.

3.2 Research Design

The objective of research in the realm of social sciences is to find out why and how people behave and think about the things that they do (Rosenthal & Rosnow, 2008). The current

study aimed to find out the factors namely the UTAUT factors, concern for the natural environment and biophilic tendencies (interchangeably used with nature relatedness) that lead to employee's positive feelings about the adoption of the Urban Retreat™ carpet.

The research design of the current study was a cross-sectional correlational and non-experimental one using a survey. The survey was comprised of the UTAUT (Venkatesh et al., 2003), a self-developed scale on the concern for the natural environment, as well as the biophilic tendencies adapted subscale (Nisbet et al., 2009). Descriptive statistical techniques were used to analyse the sample with the use of frequency and table analysis. "The business of relational research …is the description of how changes in one variable correspond to changes in another variable" (Tredoux & Smith, 2006, p.170). The study was primarily a correlational, predictive study to be precise, which determined the degree to which one variable was able to predict values in another variable or factor (Hair, Anderson, Tatham and Black, 1995). It also employs an exploratory principal component factor analysis which can be used to analyse the interrelationships among variables and to explain these variables in terms of their common underlying dimensions or factors (Hair et al., 1995).

3.3 Sample

Sampling refers to "the selection of research participants from an entire population, and involves decisions about which people, settings, events, behaviours and/or social processes to observe" (Van der Rite & Durrheim, 2006, p.49), and often sample size "is determined in part by practical constraints" (Van der Rite & Durrheim, 2006, p.49). Non-probability sampling was the technique utilised to attain research participants. It was convenient to sample in this manner as it was affordable and time efficient. The Urban Retreat™ carpet range is a relatively new product on the South African market. As such, locating and getting access into organisations that intend on installing it, was a difficult task. Therefore this technique was applicable to the current study given the constraints of the scarcity of the sample. "Surveys use representative samples to ensure that descriptions of samples can be used to describe populations" (Van der Rite and Durrheim, 2006, p.91).

The sample consisted of law firm employees who were approached to voluntarily complete the survey. This was the ideal sample for the study because the company was relocating to new offices in three months and were considering installing the carpet at the time the survey was completed. The sample method used was a combination of convenience and

purposive sampling. Terre Blanche, Durrheim and Painter (2006) described purposive sampling as sampling that depends on the availability and willingness of respondents to participate, and that selected samples are typical or representative of the population.

According to Christensen (2007, p.388) and Green (1991) few consistent guidelines exist for determining how large a sample size should be and that the "reliability of the results of any study is partially dependent on the number of participants involved" (p.208). Christensen (2007) postulated that as sample size increased, the power increased, but as the sample size increased, the cost in terms of both time and money also increased. The sample size thus needed to be a realistic trade- off between cost and power. The assumptions for using exploratory principal component factor analysis are that data must be normally distributed, that there has to be at least three items per hypothesised factor (the value items in the Concern for the natural environment and biophilic tendencies scale), and in this case there were a minimum of five items, and lastly that the sample should have three times the number of participants as the number of items (Hair et al., 1995).

After refining the Green survey, in particular the UTAUT and concern for the natural environment scales, 36 items remained with a projected six factor loading, thus based on the previous assumptions that this particular research design needed three times as many participants as there were items, the sample should have consisted of at least 108 participants. The sample for this particular study peaked at N = 114 participants out of 150 who received the email link to complete the survey. Therefore, the study had a 76% survey response rate.

3.3.1 Descriptive statistics and biographical description of sample

A summary of the biographical descriptors is presented in Table 1. The employees that participated in the study were either administration staff, non-legal professionals, associates, partners or directors. All these employees were ultimately considered to be included in the study to increase the sample size. In terms of gender, 31 of the participants were male, and 82 were female (N=114). The average age of the participants was 43.15 years (Range: 21-70 years; SD = 12.63). 71 respondents having their first language as English

(all respondents worked in organisations where the medium of communication was English). Participants were well-educated with 44 respondents having completed a University education and a further 23 respondents having completed a post-matriculation diploma. The job positions included attorneys and candidate attorneys (N=27), directors and managers (N=22), and administrative staff (N=63).

Table 2 Biographical information

Biographical descriptor	N	Percent %
Age (years)		
21-29	21	18.3
30-39	22	19.1
40-59	54	47
60 and above	13	11.3
Missing	5	4.3
Gender		
Female	82	71.3
Male	31	27
Highest Qualification		
Standard 8	10	8.7
Matric	35	30.4
Diploma	23	20
Degree	42	36.5
Masters	2	1.7
Missing	3	2.6

Biographical descriptor Current Position	N	Percent %
Office administration staff	63	54.8
Non-Professional staff	9	7.8
Associates	18	15.7
Partners	7	6.1
Directors	15	13
Missing	3	2.6

3.4 Data Collection and Procedure

The subscales of the UTAUT (Venkatesh et al. (2003) and Marchewka et al. (2007), were adapted to apply to the sustainable carpet. These adapted scales in addition to the self-developed Concern for the natural environment scale were shown to two experts in the field who verified the consistency of the items with the underlying theory. A pilot study was conducted prior to data collection to evaluate the reliability and face validity of the adapted UTAUT scale and the Concern for the natural environment scale. The questionnaire was administered to 15 employees in a different organisation from the law firm. This resulted in several changes to the precise wording of the items. The final scale consisted of 3 items each for the perceived performance, perceived effort, social influences, facilitating conditions, and intentions subscales. Attached to the questionnaire was information on the carpets that respondents were required to read. This information described the characteristics of the carpets as well as pictures representing the carpet range that was supplied by the South African distributors of the carpets.

A meeting was set with the CEO of the company to request permission to access the employees of the law firm (See appendix 3). Once permission was granted, the purpose of the research was explained to the PA who relayed the message to all the 150 employees of the company. The same purposes were outlined to the employees via the Participant

information sheet attached to the survey on Survey Monkey (See Appendix 2). A link was sent to the 150 employees to access the survey online via their personal email addresses. Van de Vijver and Rothmann (2004) discussed types of bias in their article regarding the assessment of participants in multicultural groups, particularly item, method and construct bias. Although bias cannot be completely removed, the researcher took care to administer the questionnaires in a way to minimise these effects, for example, by not asking ambiguous and by giving unclear instructions to the respondents. No sample selection decisions were made using the results of this study; therefore the study was not biased or unfair toward the participants. Respondents were invited to read the Participant Information Sheet before commencing the completion of the questionnaires. Attached to the questionnaire was information on the carpets that respondents were required to read. This information described the characteristics of the carpets as well as pictures representing the carpet range that was supplied by the South African distributors of the carpets. Instructions were then provided on completing the relevant items, taking care not to bias the possible answers by indicating that there was no correct answer to any of the questionnaires to prevent, for example, pro-social behaviour responses (Anastasi & Urbina, 1908). Completion of the survey entailed completing 36 items which took approximately 20 minutes. After the survey had been completed the participants were redirected to a page thanking them for participating in the research. Informed consent was indicated by the completion and handing in of the completed questionnaires and this was communicated to the participants.

3.5 Measures

3.5.1 UTAUT factors

The UTAUT scale was utilised to measure participant's feelings towards the intentions to adopt the Interface® Urban Retreat ™ carpet (Venkatesh, Morris, Davis & Davis, 2003). This UTAUT questionnaire was concerned with the functionality or instrumentality questions of the research study. The items originate from Venkatesh et al.'s (2003) scale which traditionally assesses the intentions to adopt and adoption of information technology. Therefore, revisions were made to suit the technology that were of interest in the current study, with minor changes such as replacing the name "Online Meeting Manager" (Venkatesh et al., 2003) with "Urban Retreat™ carpet". As mentioned previously this has been done in other studies where non-information technology products such as food kiosks

(Dabholkar & Bagozzi, 2002); advertising (Rogers and Chen 2002 in Venkatesh et al., 2007) and green electricity (Labay & Kinnear, 1981; Guagnano et al. 1986 Ozaki, 2010). By rewording the items and putting in place the name of the appropriate technology, the UTAUT was successfully applied to different technologies.

As the study intended to measure intention which was anticipatory, indicating that an action was expected, the tense was changed to the future tense. According to the UTAUT the predictors are namely; performance expectancy, effort expectancy, social influence and facilitating conditions. As outlined in the model by Venkatesh et al (2003), age and gender were assessed as moderators of the relationship between the four predictor variables and the outcome variable. Similar to Venkatesh et al. (2003) and Marchekwa et al's. (2007) scales, the UTAUT scale consisted of four items per subscale. After the pilot, the number was reduced to include the most face valid and consistent three items per subscale. The intention to use subscale, (feelings towards the intention to adopt in this case) consists of three items. In total there were 18 UTAUT items. In a confirmatory study, Venkatesh et al (2003) found the internal consistency reliability was .70. This result was also found in a study about South African University students (Maluleke, 2011). This level of consistency was considered to be acceptable and adequate (Anastasi & Urbina, 1908). A high score on the UTAUT indicates a higher inclination to adopt the Urban Retreat™ carpet whereas the lower score indicates the opposite.

3.5.2 Concern for the natural environment

A self-developed subscale on concern for the natural environment was included in the survey (Hopwood et al, 2005; What is an EPD®, 2012). The degree to which an individual endorses sustainable practices or looking after the environment, indicates their attitude orientation concerning sustainability. Foxcroft in Roodt (2005) discussed the importance of values and attitudes. However, other research shows that people do not always behave and live by their values (Kollmus and Agyemus, 2002; Ozaki, 2011). Individuals who are aware of the importance as well as acknowledge the importance of the impacts on the environment, in which they live, will score high on this scale. This high score will indicate an orientation of being concerned about the natural environment.

The subscale consisted of 6 items. The subscale consists of one item measuring overall concern for the natural environment on a five point Likert type scale ranging from (1) very concerned to (5) not at all concerned. This overarching question was followed by five items related to the EPD system. High scores will indicate higher concern for the natural environment.

3.5.3 Biophilic Tendencies

A subscale assessing an individual's affiliations with nature or biophilia (Wilson, 1984; Kellert & Wilson, 1995) was included. This component of the survey was concerned with the affective aspects of adoption of technology (Rafaeli & Vilnai-Yavetz, 2004). Items on Biophilia are adapted from the Nature Relatedness (NR) questionnaire which assesses the affective, cognitive, and physical relationship individuals have with the natural world (Nisbet et al., 2009). The original scale had three factors or subscales namely; NR-Self (represents an internalized identification with nature, reflecting feelings and thoughts about one's personal connection to nature), NR-Perspective (reflects an external, nature-related worldview of a sense of agency concerning human actions and their impact on all living things), and NR-Experience (reflects a physical familiarity with the natural world, the level of comfort with and desire to be out in nature, includes items such as "I enjoy being outdoors, even in unpleasant weather") (Nisbet et al., 2009, p. 723). As the NR-Perspective factor was found to be similar to other measures of environmental sustainability, items from this subscale within the original version were excluded from the survey. Cronbach's alpha for the original NR scale was .87, and .84 for NR-Self, .66 for NR-Perspective, and .80 for NR-Experience, demonstrating good internal consistency (Nisbet et al, 2009). The low Cronbach of the NR-Perspective subscale further justifies removal of the subscale. Test-retest correlations over a six to eight week period were 0.85 for NR Perspective 0.81, for NR Self and 0.85 for NR-Experience (Nisbet et al, 2009). Items 32, 34 and 35 were reversed scored items. These results confirm the stability of the NR measure over time.

3.6 Data Analysis

The following analyses were performed:

1. A correlation analysis was performed to assess the internal consistency of the survey, primarily focusing on the self-developed subscales (Concern for the natural environment) and the adapted subscales (biophilic tendencies). For a psychological measure to meet technical standards it needs to fulfil validity as well as reliability requirements (Anastasi & Urbina, 2005). Reliability refers to the consistency in which the items in instrument measure the same underlying concept (i.e. whether they cohere), while validity refers to the degree to which a test measures what it purports to measure. Cronbach alpha, which was a technique to test for reliability was used. Generally a Cronbach alpha that falls between the range of .70 to .89 was considered good; <.60 was not ideal and >.90 indicates that the scale may have redundant items (Cohen, Swerdlik, & Phillips, 1999).
2. The following analysis that was performed was an exploratory principal component factor analysis (PCFA) (Cohen et al., 1999). This technique was used to test for the common variance shared by variables or to assess the underlying constructs within a measure with minimal loss of information (Hair, Anderson, Tatham & Black, 1995). The benefit of using this statistical analysis to assess the self-developed and adapted questionnaires was that insight was provided about the dimensions that underlies the original scale (which was self-developed) by inspecting the grouped together factor. Another benefit was that, the concern for the natural environments sub-scale, which was self-developed, (based on the characteristics of the Urban Retreat™ carpet) can be understood better.
3. The factor loadings table from the exploratory factor analysis was used to assess the relationship between the variables in each subscale (Hair et al., 1995). Therefore this analysis intends to understand the convergent and discriminant validity of the measures. Convergent validity refers to a measure correlating highly with other measures that measure similar constructs or factors whereas discriminant validity was whether the scale doesn't correlate with variables or factors that it should not correlate with (Anastasi, 1986). For instance, the adapted biophilia tendencies subscale should correlate highly with measures such as The Connectedness to Nature Scale (CNS) which measures how emotionally connected people feel to the natural world and to animals (Mayer & Frantz, 2004). The items of the concern for the natural environment subscale and biophilic tendencies subscales are all expected

to share a high proportion of variance but load on separate factors. This will be seen if the factor loading adherence to the rule of thumb which posits that they should be statistically significant in addition to being appropriate for the sample size. The latter refers to the rule of thumb that factor loadings in the range of ±.30 to ±.40 are considered to meet the minimum level for the interpretation of structure (Hair et al., 1995).

4. A multiple moderated linear regression was the last statistical analysis that was performed on the data (Hair et al., 1995). It was utilised when the intention was to assess whether a single dependent variable was predicted by several independent variables as well as the impact of a moderator variable.
5. A moderator effect is the impact of a third independent variable on the relationship between the primary predictor variable and the outcome variable (Stangor, 2010). In the current study, the predictor variables (performance expectancy, effort expectancy, social influence, facilitating conditions, environmental concern, and biophilic tendencies) of employees were hypothesised to predict the outcome variable (feelings towards the intention to adopt the Interface® Urban Retreat™ carpet) while being impacted by age and gender (moderators) as outlined by the UTAUT model (Venkatesh, Morris, Davis & Davis, 2003).

3.7 Ethical Considerations

The researcher needed to ensure that the study complies with the ethical codes stipulated by the Ethics Committee. This was done by applying for ethics clearance which was granted and a certificate was issued by the Ethics Committee (See Appendix 8). Firstly, the researcher ensured that the participants were aware that participation in the study was voluntary by outlining this in the Participant information sheet (See Appendix 2). The participants were then informed that they could choose to withdraw from the study at any point up until they had submitted their responses (See Appendix 2). The completion of the survey was considered consent to participate in the study. No one other than the researcher and supervisor had or has access to the research material and no identifying information was reported, therefore anonymity and confidentiality was ensured. The questionnaires as well as the coding sheets were kept for as long as required, for research purposes. They

were stored in an electronic file which was password protected. There was no information within the questionnaires or the coded sheets that would identify the participants. Thus, Survey Monkey provided each participant with a number, such as participant 1. The biographical inventory was used to find out the age and gender of the sample as well as for the purposes of describing the data (See appendix 4). The researcher provided the participants with contact details so as to allow them to query anything about the study. A summary of the findings was given to the organisation.

Chapter 4

4.1 Results

The aim of this chapter is to present and discuss the results of the study's research questions as derived from the statistical analyses performed and described in the methodology section. Prior to presenting these results distribution analysis to test parametric assumptions were performed. This will be followed by the results of each research question with the aid of tables.

Distribution analysis

In order to ensure that the correct statistical techniques were used, a distribution analysis was conducted on all interval variables. This would assist in determining whether the variables matched parametric or non-parametric parameters and thus aid in guiding the most relevant method of approaching the analysis. Interval variables included the subscales of the green survey, age and highest qualification. A total of five items were reversed as outlined before. Skewness and Kurtosis coefficients of the UTAUT subscales were acceptable. The distribution histograms for all other variables indicated relatively normal distributions for all the scores for the subscales with the exception of the Concern for the Natural Environment (-.83) for the present sample. Although the kurtosis of the Concern for the Natural Environment displayed a kurtosis slightly out of normal range (1.46), it was decided to not use transformation logs on the data for the current study as the skewness coefficient was in the relatively acceptable range. Parametric assumptions were therefore met which permitted the use of parametric tests. A summary of distribution analysis summary statistics is presented in Table 1.

Table 3 Distribution Analysis summary statistics

Variable	Mean	Standard deviation	Skewness	Kurtosis
Performance Expectancy	3.52	.56	.32	.82
Effort Expectancy	3.54	.44	-.354	-.33
Social influence	3.72	.55	-.173	.45
Facilitating Conditions	3.80	.53	-.23	.30
Feeling towards Intention to	3.97	.39	-.47	.84
Concern for the Natural	4.09	.70	-.83	1.46
Biophilic Tendencies	3.60	.58	-.10	-.59

4.2 Research question results:

Question 1**:**

1. Are the measures of concern for the natural environment (green values) and biophilic tendencies (adapted Nature Relatedness measure) reliable?

In order to answer this research question a few steps had to be taken by the researcher. The first was to find out which items were most appropriate and statistically significant for the Concern for the Natural Environment Scale as well as the biophilic tendencies scale. Cronbach coefficient alpha was performed on each of the subscales of the survey, with particular focus on the Concern for the Natural Environment Scale to determine

their reliability. Table 3 summarises the Cronbach Alpha coefficients for each of the subscales of the Green Survey. In order of the survey subscales the Cronbach alpha for the total UTAUT scale was r=.75; Concern for the Natural Environment r= .70 and for Biophilic Tendencies r= .87. For more detail on the each variable's Cronbach Alpha Coefficient, refer to table 3.

Table 4 Cronbach alpha for survey variables

Subscale name	No of items	Cronbach Alpha
Performance expectancy	3	.42
Effort Expectancy	3	.50
Social Influence	3	.56
Facilitating Conditions	3	.74
Feeling towards the intention to adopt	3	.71
Concern for the natural environment	5	.66
Biophilic Tendencies		.87

The Cronbach Alpha levels of the Performance Expectancy, Effort Expectancy and Social Influences subscales were low (Cohen et al., 1999). However, it is important to mention that item in the performance expectancy scale was removed reducing the number of items in the

subscale to two because the overall Cronbach Alpha was too low (0.42). This resulted in the performance expectancy not being a scale but rather two items that correlate with each other. The same applies to Effort Expectancy and Social influences which also had lower consistency levels. The reason for this, may be that the low number of items which reduced the Cronbach Alpha of the scales. The fewer the items of a scale the lower its reliability (Cohen et al., 1999). For the purposes of the research the subscales items were retained for the remainder of the analysis.

Table 5 Cronbach Alpha for the Concern for the natural environment

	Concern for the Natural environment item	Cronbach Alpha	If Alpha is deleted
C_ENV1	**In general, I am concerned about the environment**	.56	.57
C_ENV2	**I value environmentally friendly products**	.55	.57
C_ENV3	**It is important that our actions today do not impact negatively on future generations**	.47	.59
RC_ENV4	**(R) It does not matter to me whether materials of a product can be reduced, reused**	.58	.55

	Concern for the Natural environment item	Cronbach Alpha	If Alpha is deleted
C_ENV1	**In general, I am concerned about the environment**	.56	.57
C_ENV2	**I value environmentally friendly products**	.55	.57
C_ENV3	**It is important that our actions today do not impact negatively on future generations**	.47	.59
	or recycled		
C_ENV5	**A product needs to save me money in the future**	.22	.66
RC_ENV6	**(R) Nothing I do can make a difference in reducing the degradation of the environment**	.34	.63
C_ENV7	**I will always choose a product that lasts longer regardless of price**	-.07	.73

(R) = Reversed scored items.

C_ENV7 has a Corrected Cronbach Alpha of < .2 therefore item was removed.

It was evident that the Corrected Item-Total Correlation of UT3 (.92) and C_ENV7 (-.07) are <.2 and its alpha would increase if the item was removed. Hence, these items were removed and were not used for the consecutive analysis.

To answer the research question, all survey subscales displayed acceptable internal reliability coefficients therefore were reliable subscales for the study. For all six remaining items of the Concern for the Natural Environment scale, the coefficient alpha was computed raw at 0.74, which was acceptable and indicates the internal reliability of the concern for the Natural Environment as a measurement of green values. The same goes for the Nature Relatedness scales which have coefficient alphas of 0.87 respectively.

Question 2**:**

To what extent does the Concern for the Natural environment demonstrate discriminant validity as a measurement of green values?

Exploratory Principal Component Factor Analysis (PCFA) was used as a main analysis technique for this question to determine if groups of items or variables shared common variance. UT3 and C_ENV7 had a corrected item-to-total correlation of < .2 and were therefore removed from the survey. PCFA was first performed on the Concern for the Natural Environment scale. A factor analysis was also run on the Biophilic Tendencies subscale to determine if the items would load in a similar manner on the various factors as purported by Nisbet et al. (2009). This was also done to determine the underlying structure of the original scale that the authors purported would consist of two factors namely; NR-Self and NR-Experience.

Principal Component Factors Analysis with Oblimin rotation (related variables) and a factor extraction according to the MINEIGEN criterion (all factors with eigenvalues greater than 1) was employed. Hair et al. (2010) advises that only factors having eigenvalues greater than 1 are considered significant and all those less than 1 are considered non-significant and are discarded. An initial unrotated PCFA was performed to determine initial eigenvalues greater

than 1. Two factors emerged. C_ENV 1-4 loaded on the first factor and C_ENV5 loaded on the second factor while C_ENV6 loaded on both factor 1 and factor 2. Hair et al. (2010) presented guidelines for identifying significant factor loadings based on sample size. He also stated that a minimum sample size of 100 was adequate to perform factor analysis. For a sample of 100, an acceptable factor loading of .40 was considered significant, at a power level of 80% and alpha of .05. The sample consisted of 104 participants, thus factor loadings of .40 and above were considered significant. The two factors accounted for 67% of the variation in the data. Within the domains of the social sciences where information was often less precise, Hair et al. (2010) maintained that it was not uncommon to consider a solution that accounts for 67% of the total variance as satisfactory. From the component matrix in Table 5 it can be seen that Items 1,2,3,4 and 6 loaded on Factor 1. Item 5 loaded on Factor 2. Item 6 however cross-loaded on factor 1 and 2. Item 5 was removed from subsequent analysis as it loaded on a separate factor. The label provided to Factor one was concern for the physical environment and it was sensible to label Factor 2 concern for money. However, the scale will be considered as consisting of one factor that was the concern for the physical environment. It was evident that the self-developed scale was a relatively good scale as the factors have items that load on them consistently despite problematic items cross loading. The final Concern for the natural environment scale consisted of C_ENV 1 to 4 and C_ENV6.

On closer inspection, Factor 1 (Concern for the Psychical environment) contributed 45% of the variance, which was more than half of the total variance explained by all of the factors combined. This variation reinforces the choice to keep the structure of the subscale as consisting of one factor. See Table 6 and 7 for a summary of these findings.

Table 6 Factor loadings of the Concern for the natural environment items

Rotated Component Matrix				
			Factors	
			1	2
C_ENV1	Concern for the physical environment 1	In general, I am concerned about the environment	.74	
C_ENV2	Concern for the physical environment 2	I value environmentally friendly products	.82	
C_ENV3	Concern for the physical environment 3	It is important that our actions today do not impact negatively on future generations	.78	
RC_ENV4	Concern for the physical environment 4	It does not matter to me whether materials of a product can be	.75	

Rotated Component Matrix				
			Factors	
			1	2
		reduced, reused or recycled (R)		
C_ENV5	Concern for money	A product needs to save me money in the future	.18	.52
RC_ENV6	Concern for the physical environment/Concern for money	Nothing I do can make a difference in reducing the degradation of the environment (R)	.53	.6

*** Item C_ENV 5 removed in Obliman rotation**

Next, the coefficient alpha was computed for the biophilic tendencies scale, which originally included two factors namely; Nature Relatedness- Self (NR-Self) subscale and Nature Relatedness- Experience (NR-E). The entire subscale had an internal reliability of .90 which was considered acceptable and confirms the internal consistency of the Biophilic Tendencies as a measure of emotional connection with nature. In the PCFA, three factors emerged instead of two (See table 7). All the items from BIO1 to BIO 14 had correlations >.40. The three factors accounted for 63% of the variation in the data. Theoretically, Items BIO3, BIO5, BIO6, BIO9 and BIO11-14 belonging to NR- Self were supposed to load on a separate factor.

Item BIO8 loaded on all factors instead of loading on factor 1. As a result this item was removed from the Varimax rotated PCFA. BIO10 cross-loaded onto factor 3 and BIO11 cross-loaded onto factor two. Interestingly these items were the ones that were reversed scored. It would appear that the expected structure of the Nature Relatedness scale did not remain intact as per the underlying factor constructs as stipulated by Nisbet et al., (2009). All the items loaded on one factor thus for the subsequent analysis they were treated as such. There remained problematic items that cross-loaded across other factors for this sample of in a law firm. These problematic items belong both to the original subscales of NR-Self and NR-Experience. See Table 7 and 8 for summaries.

Table 7 Factor loading of the Nature Relatedness Scale

Rotated Component Matrix				
		Factors		
		1	2	3
BIO1	I enjoy being outdoors, even in unpleasant weather	.67		
BIO2	My ideal vacation spot would be a remote, wilderness area.	.55		
BIO4	I enjoy digging in the earth and getting dirt on my hands.	.66		

BIO7	I take notice of wildlife wherever I am.	.73		
		Factors		
		1	2	3
RBIO8	I don't often go out in nature. (R)	.40	.56	.50
RBIO10	The thought of being deep in the woods, away from civilization, is frightening. (R)	.63		
BIO3	I always think about how my actions affect the environment	.55		
BIO5	My connection to nature and the environment is a part of my spirituality	.65		
BIO6	I am very aware of environmental issues.	.65		
BIO9	I am not separate from nature, but a part of nature.	.63		
RBIO11	My feelings about nature do not affect how I live my life (R)	.40	.58	
BIO12	Even in the middle of the city, I notice nature around me	.65		

BIO13	My relationship to nature is an important part of who I am.	.76		
BIO14	I feel very connected to all living things and the earth	.71		

'R' Reverse items

In addition to the above, the communality estimates were adequate in the PCFA analysis. Hair et al. (2010) purports that communality estimates for variables should approximately be more than .50. On analysis of the final communality estimates for this particular PCFA, BIO item 2 and 6 presented with communalities <0.50. This indicated that although the variables were possibly loading significantly, they were still poorly accounted for by the factor solution (Hair et al., 2010). However, they loaded sufficiently in the factor loadings in the component matrix. An optimal structure exists when all variables have high loadings on one single factor, which is argued to be the case with two out of the 14 items.

Lastly, the above results will be related to validity. Validity is the extent to which a scale accurately represents the concept being measured (Hair et al., 2010). Factorial validity was achieved through factor analysis that provided a scientific means of assessing the inter-relationships among the variables (Hair et al, 2010). Most of the items in the Concern for the natural environment scale, which was self-developed, loaded on one factor named Concern for the physical environment. On the other hand, the Nature Relatedness items loaded on one factor as opposed to two as originally expected. Within both subscales, as discussed previously, there were problematic items that cross loaded across factors.

Discriminant validity was determined by correlating the Concern for the natural environment subscale with the Nature Relatedness scale. Conceptually all the Concern for the natural environment items should not strongly correlates with the Nature Relatedness scale as these subscales measure separate but not exclusively distinct concepts. Some correlation between these two variables is expected. A Pearson Correlation coefficient analysis was thus performed. Consequently, the Concern for the natural environment subscale moderately correlated with the Nature Relatedness scale r=.40 at .001 level of significance, thus demonstrating some discriminant validity of the former with the latter.

Next the individual five Concern for the natural environment subscale items were correlated using the Pearson's Correlation coefficient (r) with each individual item of the Nature Relatedness scale. Table 7 represents the main relationships and significant findings between the individual Concern for the natural environment items and individual Nature Relatedness items. The rest of the correlations were not significant and therefore were not included in the table. Item C_ENV 1 correlated the most with other items from the Nature Relatedness (BIO 3, 7 and 12) scale. The correlations ranged from moderate to strong positive relationships between the C_ENV 1 and the where coefficients ranged from .40 to .61. Item C_ENV 1 asked about the general concern for the environment. Item C_ENV 4 and BIO 11 also had a strong positive relationship r= .60. None of the items in the Nature Relatedness scale were removed because the aim of this analysis was to determine the similarity between the two scales and not for reduction purposes. Although the overall correlation between the scales indicated that there is a weak relationship.

Table 8 Pearson's Correlations between individual items of Concern for the natural environment and Biophilic Tendencies scales

Variable	C_ENV1	C_ENV2	C_ENV3	C_ENV4	C_ENV6
BIO1	.37	.42			
BIO2					
BIO3	.59	.41	.26	.44	
BIO4		.36	.25		
BIO5			-.27		
BIO6		.35			

Variable	C_ENV1	C_ENV2	C_ENV3	C_ENV4	C_ENV6
BIO7	.53	.37	.32	.40	
BIO8	.29	.39	.36		
BIO9					
BIO10					.27
BIO11	.43	.49	.40	.60	.38
BIO12	.61	.36		.40	
BIO13					
BIO14					

Significant at 0.01 level of sig

It is at this point that the average scores on the survey's subscales are reported on to establish the relevant importance that the sample placed on each separate survey subscale value, on positive feelings towards their organisation's intention to adopt the Urban Retreat™ Carpet. The subscale names are Performance Expectancy, Effort expectancy, Social influence, and Facilitating conditions, Concern for the natural environment and Nature Relatedness. See Table 8 for a summary of these findings.

Table 9 Subscale Mean scores per item for the Survey

Subscale Variable	Mean (M) per item	SD per item	Min per item	Max per item	N
Performance Expectancy	3.52	.565	2	5	**106**
Effort Expectancy	3.54	.45	2	4	**106**
Social Influence	3.72	.55	2	5	**106**
Facilitating Conditions	3.80	.53	2	5	**106**
Concern for the natural environment	4.09	.70	1.6	5	**106**
Biophilic Tendencies	3.61	.59	2.25	4.9	**106**

The mean scores per item indicated that the Performance Expectancy subscale ranked the lowest in importance of all the value subscales (M=3.52) closely followed by Effort expectancy subscale (M=3.54). Concern for the natural environment subscale ranked first (M = 4.09), followed by the Facilitating conditions, Social influence and Nature Relatedness (M=3.80, M=3.72 and M=3.61) respectively. Although the Performance expectancy subscale ranked lowest with respect to the relative subjective importance of these subscales on having positive feelings about the organisation's intention to adopt the Urban Retreat™ Carpet, the subscale still maintained a high expectancy of the technology to perform in a

positive direction. Of more interest to the study, is the highest average score in the survey which is the Concern for the natural environment. This subscale mean indicated that the sample was indeed environmentally conscious, but other value factors remained more important universally in this sample

Question 3:

What are the important factors that predict the positive feelings towards the intention to adopt the Urban Retreat™ carpet amongst employees?

Prior to conducting the forward stepwise regression, assumption tests were performed on the data. The first assumption that the analysis looked at is the outlier violations, which is gathered from the case diagnostics table. Case 39 (z=3.90) had a residual outlier in excess of three standard deviation units above the mean. Based on this result the case was eliminated from the subsequent analysis. Looking at the residuals scatterplot the normality can also be determined. The 'rectangularity' within the residuals indicates that the residuals are normally distributed among the dependent variable scores.

It is good practice to look at the high inter correlations between variables or consider collinearity issues. The first diagnostic multicollinearity assessment beyond a simple bivariate correlation matrix are found in the Tolerance and Variance Inflation Factor statistics. Tolerance coefficients for the predictors are 1.00, .95 and .95. Multicollinearity is indicated for a particular variable if the tolerance level is .01 or less. As it can be seen in Table 9, all the tolerance values are in excess of .01 and therefore suggest that multicollinearity is not a problem. In addition to this assessment of multicollinearity, is the VIF, which is the reciprocal of the tolerance value. It is evident in Table 9 that VIF levels are well below 10. Stevens (2002) recommends VIF values greater than 10 are indicative of multicollinearity. Multicollinearity is not an issue in this analysis. In summary, the data meets the assumptions to conduct a multiple moderated regression.

Table 10 Forward Stepwise Regression Coefficients Table

Model	Standardized Coefficients	t	Sig.	Collinearity Statistics

	Beta			Tolerance	VIF
Step 1 Performance expectancy	.54	6.11	.00	1.0	1.0
Step 2 Performance expectancy	.50	5.66	.00	.96	1.04
Step 2 Facilitating conditions	.22	2.48	.02	.96	1.0

A forward stepwise procedure was run in order to investigate what the main UTAUT factors are that assists predict the positive feelings towards the intention to adopt the Urban Retreat™ carpet. When all explanatory variables namely the UTAUT subscales, Concern for the natural environment and Nature Relatedness were entered into the model the model summary was significant (R-Square= 0.30, p=0.04, p< 0.05). Performance expectancy was the first explanatory variable to be included into the model. Facilitating conditions was the second explanatory variable which was included into the model producing an R-Square= .35. The relationship between Performance expectancy and the positive feelings towards the intention to adopt was significant F (1; 87) =37, 45, p=.00, p<0.05), but moderate (r=.55). These two variables were entered into the model sequentially as they had the highest correlation with the dependent variable. These results suggested that Performance expectancy as well as Facilitating conditions contributed the most to explaining the variance of the positive feelings towards the company's intention to adopt the Urban Retreat™ carpet. This is in the presence of other UTAUT variables.

People's perception of the effort and social influences, are non-significant predictors of positive feelings towards the company's intention to adopt the carpet. These variables were thus eliminated as the least explanatory variables explaining the feelings.

The remaining variables namely, Concern for the natural environment and biophilic tendencies were entered into the regression analysis. Both these variables were non-significant predictors of positive feelings towards the company's intention of adoption of the carpet. As a result, they are not reported in the findings.

Question 4:

How do age and gender moderate these relationships?

A moderated regression was run to ascertain whether there existed a moderating impact of age and gender on the positive feelings towards the intention to adopt the Urban Retreat™ carpet. This was done separately for each of the hypothesised moderators. There was some evidence that age was the only moderating effect found between the outcome variable and facilitating conditions. However the results for this moderation were insignificant. This section will focus on the possibility of age as an interacting variable. Gender was not found to have a moderating effect on the relationships therefore they will not be reported on.

Three steps were taken to perform the multiple moderate regression with age as the moderator. Step 1 the UTAUT variables were regressed on the outcome variable as was in the initial analysis. As expected Performance expectancy ($t= 5.22$, $p=0.00$, $p< 0.05$) and Facilitating conditions were significant predictors ($t= 1.67$, $p= 0.09$, $p< 0.05$*) R-Square= 0.37 $p=0.00$. In the second step age was entered together with all the UTAUT explanatory variables into the model, the test statistic for the model remained the same. Performance expectancy remained as a predictor ($t=5.07$, $p=0.0$ $p<0.05$) however, facilitating conditions was no longer a predictor ($t= 1.49$, $p=0.14$). The presence of age changed the relationship between facilitating conditions and feelings towards the intention to adopt the Urban Retreat™ carpet. When all UTAUT explanatory variables, age and the interactions terms were entered into the model, the R-Square remained unchanged however all the variables were insignificant predictors of the outcome variable. Therefore, age was not found to be a statistically significant moderator of the relationship between facilitating conditions and the acceptance of the intention to adopt. The second step alluded to age acting as a possible moderator of the relationship between Facilitating conditions and the acceptance of the

intentions to adopt the Urban Retreat™ carpet, however the third step confirmed that this was not the case. This is because the introduction of age into the model altered the relationship between independent variable and the outcome variable. Issues around sample size may have affected this outcome. This will be elaborated upon in the discussion section.

Table 11 Coefficients of multiple moderated regression

Step 1		Step 2		Step 3	
	UnStandardised Coefficients (Beta)		UnStandardised Coefficients (Beta)		UnStandardised Coefficients (Beta)
Performance Expectancy	0.48*	Performance Expectancy	0.48*	Performance Expectancy	0.51
Effort Expectancy	0.05	Effort Expectancy	0.38	Effort Expectancy	0.32
Facilitating Conditions	0.16*	Facilitating Conditions	0.13	Facilitating Conditions	0.08
Social Influence	0.114	Social Influence	0.11	Social Influence	0.57
		Age	0.44	Age	0.54
				Performance Expectancy X Age	-0.08
				Effort Expectancy	-0.89

Step 1		Step 2		Step 3	
	UnStandardised Coefficients (Beta)		UnStandardised Coefficients (Beta)		UnStandardised Coefficients (Beta)
				X Age	
				Facilitating Conditions X Age	0.19
				Social Influence X Age	0.19

Chapter 5

5.1 Discussion

In this section, the results of the various research questions are discussed. The purpose of the discussion is to derive possible meaning from the results obtained. From this discussion it will emerge if any practical significance is warranted within the findings of the research. Furthermore, any possible overlaps or links between the various research questions will be discussed. Any emergent questions or findings are also delineated.

Reliability of the measurements: Concern for the natural environment and the biophilic tendencies scales

The reason for this question was to refine the Concern for the natural environment subscale and to assess the reliability of the biophilic tendencies scales in South Africa. Although the study focussed on these two scales, the internal reliability of the UTAUT was also evaluated. Based on the results discussed previously, the most statistically appropriate items were retained for inclusion in the Concern for the natural environment subscale. Based on the significant Cronbach alpha coefficient for this subscale (.70), it was determined to have moderate inter-item consistency and therefore moderate reliability as a measurement of employee's beliefs about conservation.

As for the measurement of biophilic tendencies, the Nature-relatedness scale, the results showed that all of the items were statistically appropriate. Based on the high significant Cronbach alpha coefficient for this subscale (.87), it was determined to have high inter-item consistency therefore high reliability as a measurement of emotional connection with nature.

Lastly, the Cronbach alpha coefficients were also determined for the adapted UTAUT subscales, the highest being Facilitating conditions followed by the Feelings towards the intention to adopt subscales, with coefficients of .74 and .71 respectively. This would

indicate that the items in these subscales more consistently measured the relevant constructs across various samples. The lowest coefficient alpha was the Performance expectancy subscale, with a coefficient alpha of .42 which is below the minimum acceptable level of overall reliability for a measurement scale (Foxcroft in Roodt, 2005). The Effort expectancy and Social influences subscales were also problematic as these had Cronbach Alphas of .50 and .56 respectively.

The low levels of internal reliability were an indicator that there were items that warranted removal from the subscales as they could have low inter-item consistency. These items were UT3 (*If the Urban Retreat™ carpet was durable it would mean that there will be less disruption over time for carpet installations)* and C_ENV7 (*I will always choose a product that lasts longer regardless of price*) with inter-item coefficients of 0.09 and. -0.07 respectively. Their removal saw the Cronbach Alpha of their scales increase to 0.76 and 0.73 respectively showing that these items did not match the items that were in the scale and were subsequently removed from the rest of the analyses.

Inter-item consistency refers to the consistency of responses to all the items within each subscale, and Smit (1996, as cited in Foxcroft in Roodt, 2005) encouraged a reliability coefficient of .80 to .85 for measures specifically of interest or personality. There were other subscales (namely Effort expectancy and Social influence) that failed to demonstrate the reliability and good inter item consistency as found by Marchekwa et al (2007). As for the Effort Expectancy (r=0.50) and Social Influences (r=0.56) subscales, no items were removed regardless of the low Cronbach Alpha values. The reason for this was that the consistency of the subscales were relatively better (closer to 0.60). Unlike, Performance Expectancy which was too inconsistent warranting the removal of the weak item. In the study by Venkatesh et al (2003) the alpha for the original 32-item UTAUT was found to be .80. The coefficient alpha for the revised UTAUT with a different technology, was determined to be r = .78 for the overall scale (Marchekwa et al., 2007), whereas for the current scale it was .75. The removal of items from the Effort Expectancy and Social Influences would have not impacted the overall consistency of the UTAUT scale. Nevertheless, the results of the current study provide strong evidence for its continued reliability in measuring the functionality aspect of the study.

On closer inspection, although the overall Cronbach alpha of the scale was acceptable, it became evident that the internal reliability of the individual subscales ranged from poor to good. As mentioned above those with the lowest internal consistencies were the Performance expectancy, Effort expectancy and Social influence scales. In the performance expectancy scale it seemed that the items were measured were different whereby one measured personal workspace and other work performance therefore it is unsurprising that the Cronbach alpha was low. These items were constructed to gauge the levels of performance of the carpet yet these items require rethinking. In terms of Effort expectancy, it suggests that each item refers to the effort of another person rather than the individual effort of the person answering the items (e.g. perceived effort of the person installing the carpet, and perceived effort of the people responsible for maintaining and cleaning the carpet – there were no maintenance or cleaning staff in the sample). It was therefore unsurprising that this scale also displayed low levels of internal reliability. The items of effort expectancy need to be revised to better capture the effort required by an individual employee within an organisation to maintain the carpet. For example, to avoid the carpet getting dirty, worn, or damaged. And lastly, in the subscales that had low internal reliability, the Social Influences items assessed influence from different people such as superiors, peers and clients. It is quite likely that the individual influences of each of these groups would differ from person to person and so the poor internal reliability was understandable. On the contrary the Performance Expectancy scale and Effort expectancy subscales correlated with feelings towards the intention were both high and therefore there is an argument to be made for considering these subscales as they are currently worded.

The low internal consistency levels were exacerbated by the small number of items within the respective scales. All the subscales had three items which meant that there was insufficient variation.

Factor structure of the Concern for the Natural environment as a measurement of green values.

As mentioned, organisations are increasingly becoming aware of how sustainable technologies can be of great importance to employees and their overall image to customers.

Yet, as the creators of these innovations will attest, the actual adoption of these sustainable technologies has lagged behind in many organisations. Therefore, the interest or attitude towards conservation or the determinants of the adoption of sustainable technologies are not clear. Economic and functional factors alone have failed to explain why some people are more inclined towards the acceptance of sustainable technologies over others. Concern for the natural environment, people's emotional connection with nature, aesthetics, are believed to encourage adoption (Nisbet et al., 2009). Douthwaite et al. (2001) advised that organisations as well as innovators of sustainable technologies need to take into account the role of the user in the adoption process. In no way does the current study claim that an individual's relationship with his/her's environment is the only factor that determines the likelihood of accepting sustainable technologies – but all things being equal, it is a differentiator (Nisbet et al., 2009).

The present study aimed to determine the factors that underlie the self-developed Concern for the natural environment scale and on the other hand whether the same factors of Nature Relatedness could be extracted. In other words, one of the aims of the study was to construct the antecedents of the concept of one's concern for the natural environment. In addition to this the current research evaluated whether other scholar's (in particular Nisbet et al., 2009) conceptualisation of emotional connections with nature is evident in the current sample. It appeared that for the current sample of employees, the study yielded different results in particular to the Nature Relatedness subscale. One coherent factor was extracted with a total of five items in the Concern for the natural environment scale. One item consistently loaded onto its own component or factor in the Concern for the natural environment subscale. This item was concerned with sustainability defined in a monetary manner (i.e. a product needs to save me money in the future). All items of Nature Relatedness loaded differently on components or factors as compared to the study by Nisbet et al. (2009). All items in the Nature Relatedness subscale loaded on one factor in addition to that other items cross loaded on other factors.

On closer inspection of the Concern for the natural environment scale, the item that loaded on its own factor captured an economic dimension. The "Concern for money" as noted

previously is one of the factors highlighted by the EPD system, which determines the degree to which the longevity of a technology can allow for its increased life span which then can save its user money as the purchase of replacements, is reduced. Perhaps, this connection between a product's agility and financial rewards was not made clear and may have warranted background knowledge of sustainable products. For instance, a person who is aware of the financial benefits of purchasing sustainable quality products is more likely to make that connection. It is important to know that no known participant in the sample was a sustainability expert.

When this particular problematic item was removed from the Oblimin rotated PCFA, five factors emerged. This provides support for the coherent factorial structure as relating to one construct namely the concern for the physical natural environment. The current structure accounted for 67% of the variation of the data, leaving 33% unaccounted. Hair et al. (2010) maintained that in the social sciences 60% of total variance was satisfactory.

As for the problematic item that cross loaded in the Concern for the natural environment scale and was subsequently removed, the item loaded more strongly onto factor two than on factor one. The item asked whether the individual believed that he/she could do anything to reduce the degradation to the environment. Perhaps the phrasing of the item in a negative manner by reversing it may be the reason why it came across as ambiguous. Research in South Africa on item analysis has shown that reverse items are problematic for second language English speakers (Vijver & Rothmann, 2004). This may be coupled with the sample not seeing them as having any control over what happens in nature. In addition, the current sample may have not seen themselves as agents in nature but from the position of a possible part of the inherent structure of the environment, as such he/she may have been disengaged from the item. The study's intended purpose was to explore their sense of control which was particularly about their own subjective impact of their behaviour on the environment. Thus, it may be that the sample was disengaged from the item and did not identify with the study's meaning- this is a conjecture that requires further investigation.

The findings of the biophilic tendencies support the above assertions. All items of the Nature Relatedness loaded differently on components or factors as compared to the study

by Nisbet et al. (2009). All items in the Biophilic scale loaded on one factor in addition to that, other items cross-loaded on other factors. This is in stark contrast to the findings of Nisbet et al. (2009) where three distinct subscales namely NR-Self and NR-Experience and the NR-Perspective subscales emerged and constituted the Nature Relatedness Scale. The latter subscale, the NR-Perspective, was not included in the study. The items that cross-loaded namely RBIO8 and RBIO11 on other factor other than the first one, were negatively phrased. This finding is similar to the one in the Concern for the natural environment scale. Although the factor loading of .40 for both items loaded on the 'correct' factor, a higher factor loading of .56 for RBIO8 and .58 for RBIO11 was observed on the second factor. This is despite the fact that these items theoretically belonged to two separate constructs. Nevertheless, the removal of the knowledge scale changed the factor. Perhaps, these items may have also read in an ambiguous manner due to their phrasing in a negative manner. In addition, the loading of items from the different constructs onto the same factor may indicate that an internalised identification with nature through feelings and thoughts about one's personal connection to nature (NR-Self) may be seen as the same as the level of comfort with and desire to be out in nature (NR-Experience).

However, RBIO10 was also reverse scored yet it did not have issues of cross-loading as did RBIO8 and RBIO11. RBIO10, which asked participants whether "The thought of being deep in the woods, away from civilization, is frightening," was positively phrased and was asking the opposite of the scale's main question-, which was the degree to which one is pro-nature. RBIO10 was easier to understand than the negatively phrased RBIO 8 and 11 items. These items show that there is merit in phrasing a statement by stating what something is than expressing it by saying what it is not especially, where there are second language English speakers. These items could thus possibly also be revised or removed completely.

It is important to turn back to the issue of the structure of the Nature Relatedness subscale that was extracted in the sample. Nisbet et al., (2009) agreed that judging content validity of the Nature Relatedness scale was difficult because the construct of an ecological or environmental paradigm was inherently vague. The items of the scale all loaded onto one factor unlike in previous studies. Although Nisbet et al. (2009) alludes to the distinctiveness of these constructs in terms of one's feelings towards nature and one's experiences with the natural world. He also makes note that there is more commonality than differences. For

instance a person who scores high on NR-Self (has an internalised connection with nature) will also score high on NR-Experience (as they would often seek out physical experiences in nature). Similarly, a person who is familiar with nature is more likely to have developed an affinity for nature. Looking at Biophilia from this perspective shows the fluidity of the perception of one's feelings as an experience of nature. The fragmentation of the Biophilic Tendencies scale seen in the extraction of one factor instead of two mirrors that of the Concern for the natural environment scale. These findings support the notion that further investigation into the constructs surrounding nature conservation, in this manner, is warranted.

Factor 1 as summarised in table 5, identified those items as contributing most to the concern for the natural environment for the current sample in a Johannesburg law firm. Factor 1 (Concern for the physical environment) contributed 45% of the variance, which is more than half of the total variance explained by all of the factors combined. Thus these items are the most important.

Discriminant validity of the Concern for the Natural environment as a measurement of green values.

Discriminant validity was determined by correlating the Concern for the natural environment subscale with the Biophilic Tendencies scale. Consequently, the Concern for the natural environment subscale moderately correlated with the Biophilic Tendencies scale r=.40 at .001 level of significance, thus demonstrating some discriminant validity.

The item correlations between individual Concern for the Natural Environment items and individual Nature Relatedness items showed that the two scales were related to each other. The most significant relationships were determined to be those between the C_ENV 1 (*In general I am concerned about the natural environment*) and some of the items of the Biophilic Tendencies scales (The generalised caring about the environment). These items include BIO 3, 7 and 12. Other items that correlated significantly with each other are C_ENV 4 and BIO 11. This item's correlation with many items from the Biophilic Tendencies scale was inevitable because of its generic and broad statement. It encompasses many aspects of

the environment, which could be interpreted differently from one person to the next. BIO 3 (NR-Self), BIO 7 (NR- Experience) and 12 (NR- Self) refer to all aspects of the general environment hence their close relationship with C_ENV 1. Item BIO 1, 8 and 11 also positively correlated with C_ENV. The same findings occurred for C_ENV 3 where eight of the items from the Nature Relatedness scale. Concern for the natural environment items are associated with most of the Nature Relatedness items.

Both the Concern for the natural environment and Biophilic Tendencies subscales measured pro-environmental attitudes and behaviours. However, on closer inspection, due to the variability in discourse of the two measures, including the amorphous wording and structure of the former scale, it seems plausible that the issue was not so much about the relationship between two questionnaires measuring similar constructs, but more about the expansive and often confusing definition of sustainability (Dunlap et al., 2000). It may seem that the issue of being knowledgeable about the environment which are reflected in values or attitudes (Concern for the natural environment); being emotionally connected to nature (NR-Self in Biophilic Tendencies) and physical familiarity with nature (NR-Experience) are all in the samples eye's the same thing. In reality or practice The Concern for the natural environment scale is similar in content with the Nature Relatedness scale. However, are different in theory.

The important factors that predict the positive feelings towards the intention to adopt the Urban Retreat™ carpet amongst employees.

As discussed previously, research in the field of technology adoption has shown that there is a plethora of predictors of the intention to use sustainable technologies. The results showed that indeed there was a significant relationship between the UTAUT variables, Concern for the natural environment and Biophilic Tendencies and the positive feelings towards the intention to adopt the Urban Retreat™ Carpet. It is thus the research turns towards interpreting the results of the main question, which focuses on the important predictors of positive feelings towards the intention to adopt the carpet.

It appears that the current sample believed that Performance expectancy was the best predictor followed closely by Facilitating conditions to the adoption of the carpet. People's view of Effort Expectancy and Social influence explained by the UTAUT model, were all non-significant predictors of positive feelings towards the company's technology adoption. In other words, there was a relationship between the beliefs about the carpet's performance, facilitating organisational factors with positive feelings towards their organisation adopting the technology. Performance perceptions and facilitating conditions were thus the best predictors of the outcome. The perceived effort to maintain the carpet and other people's influences were considered to be insignificant predictors.

The research report now turns its focus to the findings of performance expectancy being a significant predictor of the positive feelings towards the intention to adopt the carpet. These findings coincide with those of Venkatesh et al. (2003) who found that in most cases people were most likely to accept or adopt sustainable technologies if they perceived them as having high performance characteristics. The results of this study confirm the results that Venkatesh et al. (2003) documented in their research report. Other studies have also found the dominance of this factor (Cheng, Yu, Huang, Yu & Yu 2011). Performance expectancy in the current study refers to perception that having the Urban Retreat™ carpet installed in their working space will assist them in completing their job related tasks. Perhaps it was inevitable that performance strongly predicted positive feelings towards the adoption of the carpet because of the sample. As mentioned previously the sample was from one of Johannesburg's top medium-sized law firms that is well known for high-performing employees. While the culture might vary between law firms it has been shown the nature of the profession is characterised by the drive towards professional competence and delivery (Hartog & Vernburg, 2004).

On the contrary, the items that were in the performance expectancy subscale pertained to the increase in performance of the employees as a result of the change in workspace and not the performance increase as a result of the direct use of the carpet itself. As mentioned previously, this subscale's items had a low internal reliability as they measured different facets namely personal workspace and other work performance. The last item in the subscale however, attempts to capture the capacity of the carpet i.e. "if the Urban Retreat™

carpet was durable it would mean that there will be less disruption over time for carpet installations". In other studies, the user interface was direct. For instance in the Marchekwa et al. (2007) study the technology being studied was a teaching management software. It thus is surprising that although the carpet is not been used directly as with other technologies, particularly information technology (e.g. Davis et al. 1992; Marchekwa et al. 2007), the perceived effects that it would have on one's performance makes it valuable.

This finding relates to extrinsic motivation first discussed by Davis et al. (1992). Extrinsic motivation was defined as (Davis et al. 1992, pp. 1113) as the "the perception that users will want to perform an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself." In other later models such as the TAM this was referred to as perceived usefulness (Venkatesh & Davis, 2000). Perhaps the law firm employees would value anything that is most likely to contribute to their productivity, likelihood of a pay increase or promotion. Wang Wu and Wang (2009; p. 110) suggests that if creators could create the perception in potential users of the usefulness of a system by creating the impression that "increase their competitive advantage in learning and business" the feelings towards the intention to adopt is also likely to increase. Whether the connection between the carpet's installation and salary increments, increased productivity and promotions were made, is unknown. Nevertheless, the properties of the carpet were viewed as somehow benefitting their performance.

In terms of the other significant predictor which is Facilitating conditions, organisational aspects come to the forefront. Facilitating conditions is concerned with addressing the barriers that hinder the adoption of technology. The research participants viewed their law firm as enabling the installation of the carpet through its image, through open communication and through provision of maintenance services. Perhaps these factors, which were captured in the subscale, are seen as valuable in any intervention initiated by an organisation at a given time.

This finding is surprising, as facilitating conditions were not found to have a significant effect in predicting the intention to adopt technologies in some previous research where Effort Expectancy was significant (Venkatesh et al. 2003). Issues related to the support structure- a core concept in facilitating conditions were usually captured in the Effort expectancy scale

(Venkatesh et al. 2000). Therefore, if Effort expectancy was present in the model of the research than facilitating conditions would not have an effect (Venkatesh et al. 2000). If effort expectancy was not present in the studies then the facilitating conditions would then become predictive of intention. In this study, Effort expectancy may not have an effect because the research participants did not know enough or had enough exposure to know how much effort is required in its upkeep. This may explain why the significant prediction of Facilitating conditions was weak in the current study. In the current study both factors were present and yet facilitating conditions was more significant than effort expectancy. Perhaps the effort expectancy (which was a non-significant predictor of feelings about adoption) weakened the predictive capacity of the outcome variable. Nevertheless, there was a concept in facilitating conditions that wasn't present in effort expectancy that may have increased the power of prediction of facilitating conditions.

On closer inspection, Facilitating conditions highlights the role of branding and image. At the time when the research was conducted, the law firm was undergoing an image change to a more environmentally consciousness one and was expressing these new ideals in their planned move to a green building where the carpet would be installed. The Urban Retreat™ carpet was planned to be installed in the new green building which at the time was still under construction. Perhaps the organisation's conscientisation of its employees about the need to be aware of the environment may have made the employees see the installation of an environmentally friendly carpet as a good thing (Facilitating conditions). The participants may have even seen the adoption as compatible with the direction that the organisation was taking. Therefore, the participants may have been positive about the adoption of the sustainable technology as it was consistent with the new values, needs and experiences of the law firm. Facilitating conditions in this study takes on a new dimension which is related to branding.

The research report will turn to discussing the results of concern for the environment and biophilic tendencies failing to explain any significant variance in the intention to adopt the Urban Retreat ™ carpet. The research participants scored high on the Concern for the environment scale evidencing that indeed they had a positive view towards general sustainable practices. Similarly, they rated themselves as having biophilic tendencies seen in the high Nature Relatedness subscale scores.

There are various possible reasons for this this 'green bias' (Ozaki, 2011). The study found that people reported themselves as environmentally conscience- it was conducted with a group of people with a 'green' bias. However, they found great hesitation among them about adopting a sustainable technology. Positive green attitudes towards pro-environmental behaviours do not necessarily translate into the performance of the behaviours or in the current research the acceptance of the Urban Retreat ™ carpet. People are capable of being contradictory or hypocritical. This coincides with numerous other studies (Guagnano et al., 1986; Labay & Kinnear 1981).

Perhaps another reason for the gap between acceptance and concern for the natural environment may be that people may not be knowledgeable about how behaviour can be modified in order to minimise environmental damage. "Environmental concern is not sufficient to induce pro-environmental behaviour unless backed by appropriate knowledge" (Wiese et al., 2003, p. 1189). Although individuals may have strong obligation towards the environment, it is futile unless they are educated accordingly in order to shape their behaviours in ways that align their obligations about that natural environment (OECD, 2011).

Age and gender as moderators of the relationships

Age was found to have no moderating effect on the relationship between facilitating conditions and the acceptance of the organisations intention to adopt the Urban Retreat™ carpet. However, its introduction caused the alteration of the relationship between facilitating conditions and the outcome variable... These findings coincide with those by Hall and Mansfield (1975) in Venkatesh et al. (2000) where the latter focuses on the development of the UTAUT model. Hall and Mansfield (1975) in Venkatesh et al. (2000) found that facilitating conditions only became a predictor of the intention to use a system for certain age groups particularly older groups. Older people unlike young people valued organisational conditions that enabled the adoption of new technology. Morris and Venkatesh (2000) found that in predicting usage behaviour, facilitating conditions was a significant predictor and was moderated by age (the effect being more important to older workers). Gender and race were not found to have a moderating effect on the relationships

therefore they will not be discussed. This section will focus on the possibility of age as a possible significant interacting variable. This is surprising as previous research found that performance expectancy, social influence and effort expectancy were moderated by age as well as gender. These explanatory variables did not interact with the hypothesised moderators. Perhaps, these incompatible results were as a result of a Type II error (Foxcroft in Roodt, 2005).

Type II error (or error of the second kind) is when there is a significant difference in the population but the research fails to find this statistical difference (Foxcroft in Roodt, 2005); VanVoorhuis and Morgan, 2007). For example what may have happened in the current research is that age or any of the other hypothesised moderators may have not shown their effect due to sample size. The sample size was 114 excluding anomalies. However, all statistical hypothesis tests have a probability of making type I and type II errors as the effort to reduce one type of error generally results in increasing the other type of error (Foxcroft in Roodt, 2009). Larger sample sizes generally lead to increased precision when estimating unknown parameters (VanVoorhuis and Morgan, 2007). Nevertheless, the only way to reduce both error rates is to increase the sample size.

The general rule of thumb is no less than 50 participants for a correlation or regression with the number increasing with larger numbers of independent variables (IVs) (VanVoorhuis and Morgan, 2007). Green (1991) provides a comprehensive overview of the procedures used to determine regression sample sizes. He suggests $N > 50 + 8 m$ (where m is the number of IVs) for testing the multiple correlation and $N > 104 + m$ for testing individual predictors. For the current study it is evident that the sample size of 114 was insufficient as there were seven IVs meaning that there were 16 participants per variable. Perhaps a larger sample size would have increased the probability of producing a statistically significant outcome in testing for the interaction terms. This may have helped show the relationships between age with the explanatory variables such as performance expectancy, effort expectancy and social influences (Venkatesh et al., 2003). However, finding or even attaining access into organisations intending to adopt the Urban Retreat™ carpet was difficult. Although increasing sample size was ideal, it was not feasible for the study.

A solution to this may have been the approaches by Bagasse and Edwards (1998) in Tredoux and Smith (2006) who discuss alternatives to coping with the inherent tension between sample size requirements and the number of items. This includes full or partial aggregation of items therefore reducing the number of items within a scale and reducing the burden of having a large sample size. For instance the effort expectancy and facilitating skills scales were similar in that they captured the Theory of Planned Behaviour's perceived behavioural of control (Ajzen et al. 1991 in Venkatesh's et al. 2003). Although, they were supposed to be distinct constructs where one measured individual's perception that an organisational and technical infrastructure exists to support use of the system (Venkatesh et al. 2003, p 450) (facilitating conditions) and the other degree of ease associated with the use of the system (Venkatesh et al. 2003, p 453) in the current study their domains overlapped.

Unlike information technology, the carpet made it difficult to operationalise these constructs accurately as the participants did not interact with it in a direct manner. An organisation may train its employees on how to use a new software (facilitating conditions) and the employee may have to learn how to operate the new system (effort expectancy). In reality employees may not be informed about the installation of a new carpet (facilitating conditions) and do not need to learn how to clean the carpet (effort expectancy). This information would be given to maintenance and cleaning staff. Due to the indirect relationship with carpets the constructs do not necessarily apply adequately to the study's system. Having said this, it may have been optimal to aggregate these constructs into one so as to reduce the number of items in the scale and reduced some burden on sample size requirements.

Having discussed the reasons why testing for the insignificant statistical results and how they could have been mitigated, the research report turns to discussing the significant age interaction findings and the reasons for their occurrence. With the constantly changing demographics of workforces, age becomes an important factor for organisations in a technologically savvy world. It has always been believed that aging was accompanied by a decline in intellectual ability and information processing. However, more contemporary models focus on different types of abilities across ages. For instance learning ability becomes important over crystallised intelligence. This influence on job needs such as technology usage and preferences which change vary with age.

The current study found that there were age differences in the perception of the facilitating conditions of the organisation. This finding coincides with previous research. Morris and Venkatesh (2000) reported that older workers will tend to comply with others, their organisation and be willing to accept systems that are provided to them. At the same time these older people will value help when a new system is introduced. This finding was not related to organisational factors but to social influences. Older workers are also reported to have higher levels of job satisfaction, decreased turnover and motivation. It could be that because older workers are inclined to have a more positive view of their company in general, they resultantly believe that they have conditions in place that would facilitate the adoption of a new system. It may also be due to experience with the organisation. Because the older workers have been with the organisation the longest, they may view the recent efforts by their employer to be environmentally friendly as compared to the past.

On closer inspection, these high levels of agreement of the facilitating conditions in the organisation are not limited to the older groups. The average score for perceived facilitating conditions for all groups was 11.4/15. However, the older groups had higher scores of the perception of facilitating conditions. This Acquiescence bias, where respondents were in agreement or rated positively with all the statements of the facilitating conditions could have occurred due to factors such as wanting to present a good image to the organisation (Foxcroft in Roodt, 2005). As mentioned the survey link was emailed to all employees from the CEO's email address. Despite being told that their responses were confidential and anonymous, they might have wanted to appear as optimistic about the organisation because they believed that the CEO would have viewed their responses. Respondents may also have decided to respond through purposive falsification, by choosing one option for all the items of the scale (Foxcroft in Roodt, 2005). This bias where responses were mostly very positive was probably as a result of the participants wanting to present a positive view of the organisation for the facilitating conditions subscale but this was most likely due to the scale being developed in such a way as to invite respondents to respond in a particular way. Likert-type scales also amplify extreme responses (Swart, Roodt and Scheper, 1999, as cited in Foxcroft in Roodt, 2005).

This positive view of facilitating conditions was applied mostly to older workers and not younger ones. The reason for this may have been that younger workers have another type

of experience- experience with working with different organisations. Younger people have less experience and commitment to organisations especially if they possess superior skills or knowledge (Gluek, 1974 in Wang Wu and Wang, 2009; Van dyk and Coetzee, 2012). This is surprising considering that in 2013 unemployment rates were at a high rate 24, 9% and 6% amongst graduates (CDE, 2013). Young workers are now looking to work for organisations that do not harm the environment (Market News, 2007, par. 7). Therefore it is possible that the younger participants may have changed their jobs more frequently and may have experience with other organisations that they perceive to have greater facilitating conditions for the adoption of sustainable products. This point was discussed by Bush (2012). It is widely believed that a new generation is rising; a generation of new employees that is looking to "enter the green arena" (Market News, 2007, par. 7), where the need for a job is more than its prospective economic value. Therefore, the younger participants may be scrutinising the organisation a bit more than the older participants who may have a biased view. The current research was able to support that organisational facilitating conditions increase the likelihood of acceptance of a sustainable technology in addition it was able to show that different age groups perceive their organisation differently. Further research focusing on this factor is warranted.

5.2 Limitations

Prior to discussing the implications of the research findings, it is necessary to recognise some of its limitations.

The first limitation is that, research participants had not interacted with the Urban Retreat™ Carpet physically and thus it was an abstract product to them. They were provided with a description of the product as well as pictures of it installed in other offices. Two problems arise here. Firstly, reading the written description of the carpet was time consuming and perhaps some participants missed while others gained some information thus having different views of the product. Secondly, it is possible that the carpet's characteristics was based on their subjective interpretation of the information that they read in the survey pack. Therefore, respondents could not hold accurate value judgements of the carpet.

Another limitation concerns the customisation of the UTAUT scale. Traditionally, The UTAUT has been used to assess Information technology systems. In the present study the

constructs in the UTAUT were operationalised according to the Urban Retreat™ Carpet. This was done by using the highest- item-total correlations and removing those that were below the required level from each of the respective scales. This poses a problem where facets of each construct that were not necessarily relevant to carpets (e.g. cleaning the carpet captured in effort expectancy which is beyond the control of the employee) were preserved resulting in the measure possibly being confounded. The same principles apply to the self-developed Concern for the natural environment scale. A preliminary pilot study was conducted to test the scale for construct and face validity and experts were consulted. Although, all measures were taken to ensure best practice where, it is possible that models that were irrelevant were preserved thus threatening content validity. Therefore, the measures for UTAUT should be viewed as preliminary and future research should be targeted at more fully developing and validating appropriate scales.

The sampling was too small and relatively homogenous. Due to these factors, it made it difficult to identify differences in the findings. In terms of sample size, it is postulated that the more variables there are in a given study, the observances there should be (Green, 1991). The clustering of age into groups also made it difficult to analyse the effect of age as there were insufficient cases in each block. In terms of homogeneity of the sample, the findings could not be generalised towards people that are different to the type of law firm employees within this study. Similarly, law firm employees may have limited understanding of carpets and environmental consciousness awareness. Therefore, results of this study should not be generalised to other populations.

The last limitation relates to the outcome variable- the feelings towards the intention to adopt. As noted previously intention to adopt a technology does not always lead to actual behavioural adoption (Karahanna et al., 1999). This is because people are hypocritical and do not always live by their values. Furthermore, pre-adoption beliefs are different from post-adoption beliefs. Which may explain differences in behaviour or usage after people have adopted a technology. It may be valuable to conduct research on actual adoption as opposed to intentions or even to evaluate the behaviour of employees post the adoption.

5.3 Practical Implications

The adoption of technologies particularly, sustainable technologies is of crucial importance to organisations (Anderson and White, 2009; Venkatesh and Davis, 2000; Venkatesh et al., 2003; Venkatesh et al., 2007). In a time when technology is fast replacing or complimenting tasks conducted by humans, it is important to know the factors that influence the initial acceptance or rejection and feelings towards the systems. Organisations need to also prioritise environmentalism as is supported by the OECD (2011) report which argues the importance of education and knowledge in changing people's behaviours towards the environment such as adopting sustainable technologies. It is important that the organisations and designers first know these issues to manage expectations and design technology that will be accepted by workers (Douthwaite, 2001). Installing, a carpet that is designed in a way so as to mimic nature may not change people's attitudes or behaviour, however it is crucial that the organisation in the study consistently promotes the new image through actions throughout the organisation. The organisation needs to create awareness in the new building around systems including the carpet that promotes pro-environmental behaviour and seeks to bring employees closer to nature. This study's value add has been highlighting that some factors are more important than others in explaining technology adoption especially that the organisation has an active role in how people feel about new systems. The study also showed that the sample was indeed environmentally conscious.

On the basis of the findings of the study particularly performance expectations, it is important that the carpet helps the employees become more productive at their work or at least not hinder their work. Issues such as maintenance, installation and communication need to be addressed and controlled. As part of the new strategy on becoming more environmentally aware, they need to foster behaviours that align to this and make up part of the working experience. Communication with the employees may need to vary slightly according to age. This is because of the finding that older age categories strongly perceived their company to have facilitating conditions as compared to their younger counterparts. This has importance for internal company branding as well as how they position themselves in the market (Terrapin Bright Green. (2012). Therefore, it is important for organisations to consider young workers perceptions of how an organisation runs its operations including how well they facilitate the introduction of new technologies. Being perceived to be more

sustainable may build credibility and attractiveness to the organisation both improving competitive edge (Senge, Smith, Kruschwitz, Laur and Schley, 2010). Senge et al. (2010) argues that it is a powerful motivator for younger employees today to know that an organisation is working in the right areas, and doing the right things.

The predictors of sustainable technology adoption may not be easy to truly ascertain in a research study. This is because human behaviour and feelings varies across various factors in a non-linear manner (Cohen et al., 1999; Van der Rite AND Durrheim, 2006). Organisations as the initial adopters of these technologies, play an integral role in the acceptance and usage of these technologies by its employees (Linn, n.d). Research into the acceptance of sustainable technologies provides insights into people's thinking at the initial stages that needs to be expanded on with research into post adoption behaviour. Stangor (2010) has advised however that a common motivating factor amongst organisations and employees is their need for their 'green' behaviour to also benefit, particularly if green strategies save them time and money. This is implicit given the nature of business as well the human psyche (Rosenthal & Rosnow, 2008; Anderson and White, 2009). Psychological evidence has shown over time that people will often engage in behaviour that yields rewards for them in whatever way that they perceive it to (Diekmann & Preisendörfer, 2003). Hatcher (2007) elucidates that this requires a commitment by organisations to eradicating those behaviours that possibly cause environmental damage and reinforce those that seek to preserve the environment. Hatcher (2007) and Linn, (n.d) stresses that this does not necessarily translate into punishing 'bad' behaviours, particularly because this is a personal and ethical choice, affected and influenced by many variables. What Hatcher (2007) does suggest is that organisations commit to a goal of creating facilitating conditions that reduce and eliminate behaviours that causes environmental damage, and that organisations should reward those individuals that choose to be pro-environmental. Des Jardins (2001, as cited in Hatcher, 2007) advised that this ultimately becomes a question of "What kind of person do I want to be", which puts individuals on the path of becoming part of nature and not conquerors of it.

People possess different levels of this concern with nature which is translated into experiential connection with nature- that is physically experiencing nature. Yet little has been written about the role of the environment and ecosystems within the organisational psychology or human resource development field (Hanson, 2013) and Hatcher, 2007). As a profession we need to realise that nature is not a product to be used for the sole purpose of humankind. "It is imperative that we employ a discourse of stewardship, particularly among the youth of South Africa, to instil in them the mentality of sustainability and eco-centricity" (Hatcher, 2007, p. 8). Critical thinking is needed by all of us, within our professions, to remedy the plight of nature, particularly in putting forward the notion as purported by Hatcher (2007), that "what we do to ourselves we do to nature that sustains us" (p. 54). Anderson and White (2009) also warn that professionals need to be cognisant of the long struggle that involves the deconstruction of current schools of thought or paradigms, such as the competing paradigms of business and nature. For employees, meaning in the form of values is important (Hatcher, 2007), and these values have moved past the purely economic to include humanistic concerns.

5.4 Future Research

A starting point for research into pro-environmental behaviour would have to start with how South African's conceptualise and understand the notion of sustainability (Maluleke, 2011). Previous research has found that people's upbringing, social environment, education status, family, community or political leaders influence individuals' green values affects. In a country where there are high levels of poverty and illiteracy, environmental issues may not be of greatest concern to many people as they are considered higher order needs. Attaining food, shelter and education may be more important than buying a pro-environmental product. There are various explanations for this discrepancy, one of them being the low-cost/high-cost model (Diekmann & Preisendörfer, 2003). According to this model, people choose to adopt technologies that demand the least cost from them. Cost in their model, is not defined in strictly economic terms. In the current research, the perceived time and effort needed to undertake the installation and maintain the carpet could be non-economic costly factors. However in the context of limited resources such as South Africa, they could very well be economic in nature. Although, there is a plethora of evidence on these contextual issues, their influence on sustainable behaviour warrants further research.

Secondly, the development of the measurements of these constructs would be an area of research that is valuable. The research report recommends that a scale be developed that combines UTAUT and Concern for the natural environment or green values. There is a gap that exists between these two areas and doing the above would assist in bridging it. This is because respondents may have struggled to see the link between the items of the whole scale, thus it may be helpful to find an instrument that has an environmental theme while testing UTAUT factors. As a scale of this nature is not available (as far as the research is concerned), its development is warranted. Having said this, the sample should be diverse perhaps being sourced across different industries and organisational types so as to make comparisons across different fields. This will assist investigate how people in different fields are environmentally concerned or connected to nature as well as what factors matter the most when accepting a technology.

Lastly, future research could also consider aesthetic elements (including pleasure and other emotional experiences) in influencing feelings towards the carpet. This branch of technology adoption research therefore also considers the emotional or aesthetic appeal of the innovation or technology. This is referred to as Affective design (Khalid, 2006). Although the Nature Relatedness questionnaire (biophilic tendencies) attempted to capture this domain of study by looking at personal characteristics such as one's connection and experiential aspects with nature (Nisbet et al., 2009), research should encompass the design characteristics. These self (NR-Self) and experiential (NR-Experiential) aspects failed to explain variance in the model. Affective design, would consider people's full range of human emotional experience in different situations. The popular manner of measuring these emotional constructs is through the semantic differential scale technique where participants are asked to rate signs, words, or objects on bipolar scales (Osgood, et al., 1957). The advantage of using such scales is that they are easily adaptable to any technology as they are generic. This approach would provide new insights into the specific design factors that are connected to emotion that influence the adoption of sustainable technologies.

5.5 Conclusion

The results of this study indicated that the sample believed that Performance expectancy was the best predictor followed closely by Facilitating conditions to the positive feelings

towards the adoption of the carpet. People's view of Effort Expectancy and Social influence explained by the UTAUT model, were all non-significant predictors of positive feelings towards the company's technology adoption. When Concern for the natural environment and Biophilic Tendencies were entered into the regression analysis, both failed to significantly predict the outcome variable. Age was the only hypothesised factor that was found to be a moderator role and this was between facilitating conditions and the outcome variable. Gender was not found to predict the relationship between the explanatory variables and dependent variable. The Concern for the natural environment scale showed a stable factorial structure providing validity to the scale as a measure of green values.

In conclusion, the interesting factor when it comes to the adoption of sustainable technologies is that employees are not against to installation of new technologies within their workspaces. It seems they expect a certain amount of commitment and resources to be dedicated to facilitating them to better understand, integrate and use these products for the places of work to be more environmentally friendly (Stangor, 2010). To compliment these characteristics these employees want their organisations to choose technologies that make them more productive and efficient in their work. Contemporary employees, including lawyers, are knowledgeable about environmentalism and should be viewed as source of information about what individuals want from their employers to increase competitive advantage in a global marketplace (Stangor, 2010).

Going green comes down to individual behaviour and psychology can make vital contributions to understanding the behaviour of these people towards greener alternatives, both personally and in the workplace (Hanson, 2013). Psychologists can do this by disseminating the inquiry of sustainability that goes beyond functionality and attitude. A sustainability that is evoked by the predisposition or emotional need to do right by the planet. Although biophilic tendencies did not explain any variance in acceptance of technology adoption, it is a field worth exploring. Green ergonomics, as defined by Thatcher (2014) has a pro-nature focus capitalising on understanding the linkages and interplay between humans and their natural environment. This is captured in understanding how human systems preserve, conserve, and restore nature and enhancing the systems where humans benefit from the ecosystem services. Thatcher's (2014) approach, while stated to

be subservient to argues for the pre-eminence of the ecosystem (i.e. natural capital). Perhaps psychologists should follow suite.

The results of this study indicate that workers are becoming more aware of environmental

Reference list

Abdul-Gader, A.H., & Kozar, K.A. (1995). The Impact of computer alienation on information technology investment decisions: An exploratory cross-national analysis," *MIS Quarterly, 19*(4), 535-559.

Allen, J. B., & Ferrand, J. L. (1999). Environmental locus of control, sympathy, and proenvironmental behaviour: A test of Geller's actively caring hypothesis*. Environment and Behavior, 31*, 338-353.

Anastasi, A. & Urbina, S. (1908). *Psychological testing (5th ed.)*. New York: Macmillan

Anastasi, A. (1986). Evolving concepts of test validation. *Annual Review of Psychology 37*, 1-15.

Anderson, R. C., & White, R. (2009). *Confessions of a radical industrialist: Profits, people, purpose- doing business by respecting the Earth*. London, England: Random House Business Books.

Aron, A., Aron, E. N., & Smollan, D. (1992). Inclusion of other in the self-scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology, 63*, 596-612.

Arratia, R. (2011, October 19). *Let's be clear* [Online brochure]. http://www.interfacecutthefluff.com/tag/lets-be-clear/

Arkesteijn, K., & Oerlemans, L. (2005). The early adoption of green power by Dutch households: An empirical exploration of factors influencing the early adoption of green electricity for domestic purposes. Energy Policy, 33(2), 183-196.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational behavior and human decision processes, 50*(2), 179-211.

Benyus, J. M. (2009). Biomimicry. *The Top 50 Sustainability Books, 1*(116), 104-107.

CDE (Centre for Development and Enterprise) 2013. *Graduate unemployment in South Africa: A much exaggerated problem.* CDE Insight. April 2013. http://www.cde.org.za/index.php/joomlaorg/2012-10-16-08-07-50/83-jobs-and-growth/403-graduate-unemployment-in-south-africa-a-much-exaggerated-problem - See

more at: http://www.econ3x3.org/article/how-high-graduate-unemployment-south-africa-much-needed-update#sthash.hmNKd3OW.dpuf

Chawla, L. (1999) Life paths into effective environmental action, *The Journal of Environmental Education, 31*(1), pp. 15–26.

Cheng, Y. S., Yu, T. F., Huang, C. F., Yu, C., & Yu, C. C. (2011). The comparison of three major occupations for user acceptance of information technology: applying the UTAUT model. *Business, 3*(02), 147.

Chigona, W. & Licker, P. (2008). Using Diffusion of Innovations framework to explain communal computing facilities adoption among the urban poor. *Information Technologies and International Development, 4*, 57-73.

Christensen, L.B. (2007). *Experimental methodology*. (10th ed.). Boston: Allyn & Bacon.

Cohen, R. J., Swerdlik, M. E., & Phillips, S. M. (1999). *Psychological testing and assessment*. Mayfield Pub.

Cole, R. J., & Kernan, P. C. (1996). Life-cycle energy use in office buildings. *Building and Environment*, *31*(4), 307-317.

Dabholkar, P. A., & Bagozzi, R. P. (2002). An attitudinal model of technology-based self-service: moderating effects of consumer traits and situational factors. *Journal of the Academy of Marketing Science*, *30*(3), 184-201.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* (Doctoral dissertation, Massachusetts Institute of Technology).

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of applied social psychology*, *22*(14), 1111-1132.

Diekmann, A., & Preisendörfer, P. (2003). Green and greenback the behavioral effects of environmental attitudes in low-cost and high-cost situations. *Rationality and Society*, 15(4), 441-472.

DoE (U. S Department of Energy). (2008). *Buildings energy data book.* [Online brochure]/ Retrieved from http://buildingsdatabook.eren.doe.gov/

Douthwaite, B., Keating, J.D.H. & Park, J.R. (2001). Why promising technologies fail: the neglected role of user innovation during adoption. *Research Policy, 30(5)*, 819–836.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale. *Journal of social issues, 56*(3), 425-442.

Durrheim, K. & Painter, D. (2006). Collecting quantitative data: Sampling and measuring. In

M. Terre Blanche, K. Durrheim & D. Painter (Eds), *Research in practice: Applied methods for the social sciences* (2nd ed., Chapter 7). Cape Town: UCT Press.

Fitzmaurice, J. (2005). Incorporating consumers' motivations into the theory of reasoned action. Psychology & Marketing, 22(11), 911-929.

Friedman, B., Freier, N.G., Kahn, P.H., Jr., Lin, P., & Sodeman, R. (2008). Office window of the future? Field-based analyses of a new use of a large display. *International Journal of Human–Computer Studies, 66*, 452–465.

Green, L. (2001). *Communication, technology and society*. London: Sage Publications.

Green, S. B. (1991). How many subjects does it take to do a regression analysis? *Multivariate behavioural research, 26*(3), 499-510.

Guagnano, G., Hawkes, G. R., Acredolo, C., & White, N. (1986). Innovation perception and adoption of solar heating technology. *Journal of Consumer Affairs, 20*(1), 48-64.

Hair Jr., J., F., Anderson, R. E., Tatham, R. & Black, W. C. (1995). *Multivariate data analysis with readings*. London: Prentice Hall

Hartog, D. N., & Verburg, R. M. (2004). High performance work systems, organisational culture and firm effectiveness. *Human Resource Management Journal*, *14*(1), 55-78.

Hanson, M. A. (2013). Green ergonomics: challenges and opportunities. *Ergonomics*, (ahead-of-print), 1-10.

Hatcher, T. (2007). The fallacy of ethics and HRD: how ethics limits the creation of a 'deep' profession. In C. Rigg, J. Stewart & K. Trehan (Eds.), *Critical Human Resource Development: Beyond Orthodoxy* (pp.43-58). Great Britain: Prentice-Hall.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986-1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education, 18,* 1-8.

Hopwood, B., Mellor, M., & O'Brien, G. (2005). Sustainable development: mapping different approaches. *Sustainable development*, *13*(1), 38-52.

Interfaceflor. (2013, January 4). *Interface Urban Retreat*™. [Online brochure]. Retrieved from http://www.interfaceflor.co.uk/web/inspiration/urban_retreat_magazine

International Ergonomics Association. *What is Ergonomics?* Website. Retrieved 20 April 2013 from http://www.iea.cc/01_what/What%20is%20Ergonomics.html

Kahn, P. H., Severson, R. L., & Ruckert, J. H. (2009). The human relation with nature and technological nature. *Current Directions in Psychological Science*, *18*(1), 37-42.

Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. Environment and Behavior, 31, 178-202.

Karahanna, E., Straub, D. W., & Chervany, N. L. (1999). Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, *23*(2), 183-213.

Kellert, S. R., & Wilson, E. O. (1995). *The biophilia hypothesis*. Washington D.C, Island Press.

Khalid, H. (2006). Embracing diversity in user needs for affective design. Applied Ergonomics, 37(4), 409-418.

Labay, D. G., & Kinnear, T. C. (1981). Exploring the consumer decision process in the adoption of solar energy systems. *Journal of consumer research*, 271-278.

Lewis, K., & Cassells, S. (2010). Barriers and drivers for environmental practice uptake in SMEs: A New Zealand perspective. *International Journal of Business Studies, 18*(1), 7.

Linn, A. (n.d). *Employees say show us the green, and the commitment to green*. Life Inc., The Economy and You. Retrieved April, 16, 2013 from http://lifeinc.today.com/_news/2011/04/04/6385058-employees-say-show-us-the-green-and-the-commitment-to-green?lite

Maluleke, M. (2011). *UTAUT factors that lead to the acceptance of Solar Recharge Booth,* (Unpublished Honours Thesis). University of the Witwatersrand, South Africa.

Marchewka, J. T. Liu, C & Kotiswa, K. (2007). An application of the UTAUT Model for Understanding Student Perceptions Using Course Management Software. *Communications* of the IIMA, 7, 93-104.

Market News. (2007). Working for the Earth: Green companies and green jobs attract employees. Retrieved March 23, 2011 from http://www.kleanindustries.com/s/environmental_market_Industry_news.asp?ReportID=

268054

Mayer, F. S., & Frantz, C. M. (2004). The nature connectedness scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology, 24*, 503-515.

Moons, I., De Bont, C. J. P. M., De Pelsmacker, P., & Standaert, A. (2009). The motivational determinants for adopting sustainable products. In *Design, Rigor and Relevance. Proceedings of the IASDR Congress*.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2,* 193–222.

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel psychology*, *53*(2), 375-403.

Musa, P. F. (2006). Making a case for modifying the technology acceptance model to account for limited accessibility in developing countries. *Information Technology for Development*, *12*(3), 213-224.

Naess, A. (1973). The shallow and the deep ecology movements. *Inquiry, 16,* 95-100.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The Nature Relatedness Scale Linking Individuals' Connection with Nature to Environmental Concern and Behavior. *Environment and Behavior*, *41*(5), 715-740.

OECD (2011). *Greening Household Behaviour: The Role of Public Policy*, OECD Publishing. Retrieved from http://dx.doi.org/10.17879789264096875-en

Oshlyansky, L., Cairns, P., & Thimbleby, H. (2007, September). *Validating the Unified Theory of Acceptance and Use of Technology (UTAUT) tool cross-culturally*. In Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI... *but not as we know it-Volume 2* (pp. 83-86). British Computer Society.

Osgood, C. E. (1952). The nature and measurement of meaning. *Psychological Bulletin, 49(3)*, 197.

Ozaki, R. (2011). Adopting sustainable innovation: what makes consumers sign up to green electricity? *Business Strategy and the Environment, 20*(1), 1-17.

Rafaeli, A., & Vilnai-Yavetz, I. (2004). Instrumentality, aesthetics and symbolism of physical artifacts as triggers of emotion. *Theoretical Issues in Ergonomics Science*, *5*(1), 91-112.

Roodt, G. (2005). *An introduction to psychological assessment in the South African context*. C. Foxcroft (Ed.). Cape Town: Oxford University Press.

Rosenthal, R., & Rosnow, R., (2008). Essentials of behavioural research. *Methods and Data Analysis (3rd Eds.).* New York: McGraw Hill.

Schwartz, S. H. (1977). Normative influences on altruism. Advances in experimental social psychology, 10, 221-279.

Schultz, P. W. (2002). Inclusion with nature: The psychology of human-nature relations. In P. Schmuck & W. P. Schultz (Eds.), *Psychology of sustainable development* (pp. 62-78).

Senge, P., Smith, B., Kruschwitz, N., Laur, J., & Schley, S. (2009). *The necessary revolution*. Sound view Executive Book Summaries.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of consumer Research*, 325-343.

Stangor, C. (2010). *Research methods for the behavioral sciences*. Wadsworth Publishing Company.

Stanton, C.M., Kahn, P.H., Jr., Severson, R.L., Ruckert, J.H., & Gill, B.T. (2008). Robotic animals might aid in the social development of children with autism. Proceedings of the 3rd ACM/IEEE International Conference on Human-Robot Interaction 2008 (pp. 97– 104). New York: Association for Computing Machinery.

Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review, 6*(2), 81-98. Straub, D., Keil, M., & Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & Management*, *33*(1), 1-11.

Steimle, U., & Zink, K.J., (2006). Sustainable development and human factors. In W. Karwowski, *International encyclopedia of ergonomics and human factors (pp.99-120)* (2nd ed.). Taylor & Francis: London.

Terrapin Bright Green. (2012). *The economics of Biophilia: why designing with nature in mind makes financial sense*. [Online document]. Retrieved from http://www.chriswalker.com.au/uploads/6/5/8/9/6589178/the-economics-of-biophilia_terrapin-bright-green-2012e.pdf

Thatcher, A. (2014). Theoretical definitions and models of sustainable development that apply to human factors and ergonomics. In O. Broberg, N. Fallentin, P. Hasle, P.L. Jensen, A. Kabel., M.E. Larsen & T. Weller. (Eds.). *Proceedings of the 11th International Symposium on Human Factors in Organisational Design and Management and the 46th Annual Nordic Ergonomics Society Conference* (Vol. 1 and 2), pp. 747-752. Santa Monica, CA: IEA Press

Thatcher, A. (2012). Affect in designing for sustainability in human factors and ergonomics. *International Journal of Human Factors and Ergonomics*, *1*(2), 127-147.

Thatcher, A., & Ndabeni, M. (2011). A psychological model to understand e-adoption in the context of the digital divide. *ICTs and Sustainable Solutions for the Digital Divide: Theory and Perspectives*, 127.

Tredoux, C., & Smith, M. (2006). Evaluating research design. Research in Practice, 2, 160-186.

Ulrich, R. S. (1993). Biophilia, biophobia, and natural landscapes. In S.R Kellert, *The biophilia hypothesis,* 73-137, Washington D.C, Island Press.

United Nations Environmental Programme (UNEP) (2012). Waste and climate change: Global trends and strategy framework. [Online document] Retrieved from http://www.unep.or.jp/ietc/Publications/spc/Waste&ClimateChange/Waste&ClimateChange.pdf

United Nations News Centre (2013, March 14). *Sustainable development goals must address threats to environment – UN official.* [Online forum comment]. Retrieved from http://www.un.org/apps/news/story.asp?NewsID=44378#.UX_GbrVTApM

Van der Rite, M. & Durrheim, K. (2006). Putting design into practice: writing and evaluating research proposals. In M. Terre Blanche, K. Durrheim. & D. Painter (Eds*), Research in practice: Applied methods for the social sciences* (2nd ed., Chapter 5). Cape Town: UCT Press.

Van der Vijver, A. J. R., & Rothmann, S. (2004). Assessment in multicultural groups: The South African case. *South African Journal of Industrial Psychology, 30*(4), p-1.

Van Dyk, J., & Coetzee, M. (2012). Retention factors in relation to organisational commitment in medical and information technology services. *SA Journal of Human Resource Management, 10(*2), 1-11.

Vanegas, J. A., DuBose, J. R., & Pearce, A. R. (1996, November). Sustainable technologies for the building construction industry. *In Proceedings, Symposium on Design for the Global Environment,* Atlanta, GA.

VanVoorhuis, C. R. W., & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in Qualitative Methods for Psychology, 3*(2), 43-50.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science, 46,* 186–204.

Venkatesh, V., Davis, F. D., & Morris, M. G. (2007). Dead or alive? The development, trajectory and future of technology adoption research. *Journal of the association for information systems*, *8*(4), 267-286.

Venkatesh, V., Morris, M. G., & Ackerman, P. L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational behavior and human decision processes*, *83*(1), 33-60.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: toward a unified view. *Management Information Systems Quarterly, 27*(3), 424–478

Wang, H. Y., & Wang, S. H. (2010). User acceptance of mobile internet based on the Unified Theory of Acceptance and Use of Technology: Investigating the determinants and gender differences. *Social Behavior and Personality: an international journal*, *38*(3), 415-426.

Wang, Y. S., Wu, M. C., & Wang, H. Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, *40*(1), 92-118.*What is an EPD®*? (2012). [Website]. Retrieved from, http://www.environdec.com/en/What-is-an-EPD/#.UViiNJNTBLk.

Wiese, B. S., Sauer, J., & Rüttinger, B. (2004). Consumers' use of written product information. *Ergonomics, 47*(11), 1180-1194.

Wilson, E. O. (1984). *Biophilia*. Harvard University Press. *(3rd Eds.).*New York: McGraw Hill.

Appendices

Appendix 1: Participation Information Sheet

Appendix 2: Organisational Access

Appendix 3: Biographical Questionnaire

Appendix 4: UTAUT subscale

Appendix 5: Concern for the natural environment subscale (Green Values)

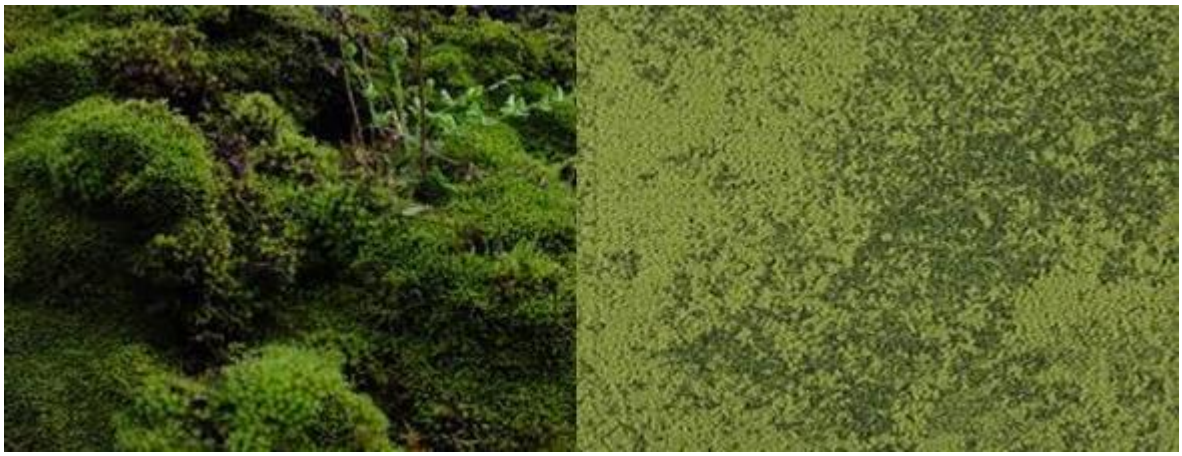
Appendix 6: Biophilic Tendencies subscale

Appendix 8: Description of the Urban Retreat™ carpet

Appendix 1: Description of the Interface® Urban Retreat™ carpet

The Urban Retreat™ carpet range is described as "a collection inspired by human's instinctive love of nature or biophilia". The range intends to create an interior environment that mimics the outside environment. The range's colour pallet is neutral with natural hues similar to those found in the forest, moss, flax, grass or lichen-covered stone. Here are some pictures of the carpet and beside it a picture of what has inspired it.

Inspired by Grass



Inspired by Stone

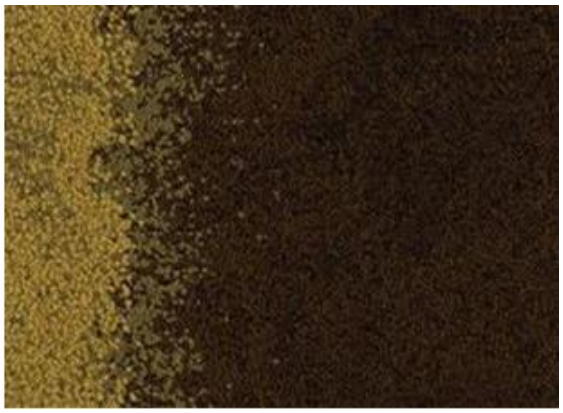


Inspired by Bark



Different styles are available in the collection, with a range of commercial colours for each product. The carpet tiles can be mixed and matched and installed in various ways, with some designed to be a combination of contrasting patterns. Examples of these combinations are Straw and Grass as well as Bark and Moss.





Here are images of the Urban Retreat™ carpet installed in commercial areas.





The carpet is made from 80-81% recycled content mainly recycled yarn, 35% of which is post-consumer. Post-consumer recycling refers to use of materials generated from

residential and consumer waste for new or similar purposes. The carpets are imported from Europe but are installed by South African employees who work for the local distributing company. The tile form of the carpet, modular carpet tile, is designed in a way that it is intended to stay on the floor with no upcurl, no rippling and no tapping. The Tac Tiles used during installation are glue less adhesives which stick together the tiles to form a floor that 'floats', making refurbishments and moving easier. The Urban Retreat™ carpet is treated in mould protection technology which is an antimicrobial preservative. The mould protection preservative protects against mould growth and odour causing bacteria. Lastly, the Urban Retreat™ carpet has been verified by several third party on its reduced impact on the environment.



Appendix 2: Participation Information Sheet

Psychology
School of Human& Community Development
University of the Witwatersrand
Private Bag 3, WITS, 2050
Tel: (011) 717 4500 Fax: (011) 717 4559

Hi

My name is Mpho Lekitlane, and I am conducting research for the purposes of obtaining a Master's degree at the University of the Witwatersrand. The main aim of the study is to find out which factors are most likely to make employees feel positively towards their company installing a sustainable technology, in this case the Urban Retreat™ Carpet. The Urban Retreat™ carpet is a sustainable carpet which mimics nature. For instance some of the carpets are inspired by grass, stone or bark. The factors that the research focuses on are how functional the carpet is, concern for the natural environment and emotions. These aims will be explored through the application of The Unified Theory of Acceptance and Use of Technology (UTAUT) theory. I would like to invite you to participate in this study.

Participating in this research will entail completing a survey consisting of 35 questions, at a time and place that is convenient for you. Completing this survey will take approximately 15-20 minutes. Submitting the survey will be considered as consent to participate.

Participation is voluntary, and no person will be advantaged or disadvantaged in any way for choosing to participate or not to participate in the study. All of your responses will be kept confidential, and no information that identifies you would be included in the research report and excel sheets. The survey material will not be seen by any person, and will only be processed by myself. The survey responses will be kept for as long as possible for research purposes. You may refuse to answer any questions you would prefer not to, and you may choose to withdraw from the study at any point up until you have submitted the survey.

If you choose to participate in this study, please continue onto the next part. If you have any queries regarding the research you can contact me at 060 485 0703 or (011) 494 1399 or via email at lekitlanem@gmail.com. Your company will be provided with a copy of a summary of the results.

Your participation in this study would be greatly appreciated.

Kind Regards,

Mpho Lekitlane (MA Student) Professor Andrew Thatcher (supervisor)

Appendix 3: Organisational Access

Psychology
School of Human& Community Development
University of the Witwatersrand
Private Bag 3, WITS, 2050
Tel: (011) 717 4500 Fax: (011) 717 4559

To whom it may concern,

I am writing to you to request access to your organisation to conduct research in partial fulfillment of my Master's degree in Organisational Psychology at Wits University. I sincerely hope that your organisation can assist us in this endeavor.

My research intends to investigate employee's feelings about the company's intention to install the Urban Retreat™ carpet. The Urban Retreat™ carpet is a sustainable carpet which also has biophilic characteristics. The research will look at factors that lead to positive feelings about the installation. These factors include perceptions of functionality; concern for the natural environment and emotional qualities. My research intends to do this by requesting that employees at an organisation, such as yours complete the survey.

Participants will be requested to fill out a confidential biographical questionnaire for the purposes of describing the sample. This questionnaire does not require any identifying information. Completing the survey will take a maximum of 20 minutes online. If you are interested, please request the survey items.

Besides providing data for my research report, your organisation could gain insight into the feelings that employees have towards changes to their workspaces, namely the refurbishment of carpets. This research will reveal your employee's views on the company going 'green.' The results of this type of research has shown that physical changes to the workspace that are valued by employees increase wellbeing and productivity. The findings will be reported in a thesis at the end of the year and will be readily available to the participants as well the organisation.

Thanking you in anticipation,

Mpho Lekitlane Professor Andrew Thatcher

_____ _____

Researcher Supervisor

Appendix 4: Biographical Questionnaire

(For describing the sample and for age and gender)

Please fill in the form and tick where appropriate.

Age: _____

Sex: Male ☐ Female ☐ Other: ☐

What is your race: _____?

Highest Qualification: Matric ☐ Diploma ☐ University Degree ☐ Master's degree ☐

Other (specify) _____

Employer's industry: _____

Name of position occupied presently: _____

Marital status: Single ☐ Married ☐ Divorced ☐

Appendix 5: UTAUT subscale
Performance Expectancy

I expect that…

	Performance expectancy Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
UT1	I think the Urban Retreat™ carpet would create a work space that will result in me working harder.					
UT2	I think the Urban Retreat™ carpet would create a work space where it feels good to work.					
UT3	If the Urban Retreat™ carpet was durable it would mean that there will be less disruption over time for carpet installations.					

Effort Expectancy

I expect that…

	Effort Expectancy Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
UT 4	I think it would be easy to install the Urban Retreat™ carpet.					
UT 5	I think the Urban Retreat™ carpet would be easy to maintain.					
UT 6	I think the Urban Retreat™ carpet would be easy to keep clean.					

Social Influence

I believe that…

	Social influence Questionnaire item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
UT7	I would be more likely to accept the Urban Retreat™ carpet if management endorsed it.					
UT8	I would be more likely to accept the Urban Retreat™ carpet if my colleagues also accepted it.					
UT9	I think the Urban Retreat™ carpet would give a positive impression to our customers/clients.					

Facilitating Conditions

I believe that…

	Facilitating conditions Questionnaire Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
UT10	The Urban carpet is a good representation of the image					

	Facilitating conditions Questionnaire Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
	of my organisation.					
UT11	My organisation would clearly explain why it chose to install the Urban Retreat™ carpet.					
UT12	My organisation would probably provide the necessary support for the maintenance of the carpet.					

Intention to Adopt

	Intention to adopt Questionnaire Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
UT13	Whether or not the company					

	Intention to adopt Questionnaire Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
	decides to install the Urban Retreat™ carpet I feel that it is a good product.					
UT14	I would support my organisation in its choice to install the Urban Retreat™ carpet.					
UT15	My feelings towards the installation of the Urban Retreat™ carpet are positive.					

Appendix 6: Concern for the natural environment subscale(Green values)

Concern for the natural environment scale

	Questionnaire Item	Very Concerned	Moderately Concerned	Neutral	Not Particularly Concerned	Not at all Concerned
C_ENV1	In general, I am concerned about the environment					
	Concern for the natural environment Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C_ENV2	I value environmentally friendly products					
C_ENV3	It is important that our actions today do not impact negatively on future generations					
RC_ENV4	It does not matter to me whether materials of a product can be reduced, reused or recycled					
C_ENV5	A product					

	Questionnaire Item	Very Concerned	Moderately Concerned	Neutral	Not Particularly Concerned	Not at all Concerned
	needs to save me money in the future					
RC_ENV6	Nothing I do can make a difference in reducing the degradation of the environment					
C_ENV7	I will always choose a product that lasts longer regardless of price					

Appendix 7: Biophilic Tendencies subscale

Biophilic Tendencies

Nature Relatedness Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I enjoy being outdoors, even in unpleasant weather					
My ideal vacation spot would be a remote, wilderness area.					
I always think about how my actions affect the environment					
I enjoy digging in the earth and getting dirt on my hands.					

Nature Relatedness Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My connection to nature and the environment is a part of my spirituality					
I am very aware of environmental issues.					
I take notice of wildlife wherever I am.					
I don't often go out in nature.					
I am not separate from nature, but a part of nature.					
The thought of being deep in the woods,					

Nature Relatedness Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
away from civilization, is frightening.					
My feelings about nature do not affect how I live my life					
Even in the middle of the city, I notice nature around me					
My relationship to nature is an important part of who I am.					
I feel very connected to all living things and the earth					

Appendix 8: Ethical Clearance (HREC Non-Medical)