SUSTAINABILITY IN GREEN DESIGN PRACTICE WITHIN INTERIORS OF COMMERCIAL BUILDINGS IN NAIROBI CITY COUNTY, KENYA

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A THESIS SUBMITTED TO THE SCHOOL OF LAW, ARTS AND SOCIAL SCIENCES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY OF KENYATTA UNIVERSITY

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DECLARATION

Candidate

I, Oduho, Achieng Rose, declare that this thesis is my original work and has not been presented for the award of a degree in any other University or any other Award.

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DEDICATION

This work is dedicated to my beloved family and friends. For they celebrated my every milestone and shared in my disappointments through the journey. To my beloved Mum Elizabeth and Dad Prof. George Oduho, thank you so much. Your prayers, love, wise counsel, diligence, generosity, support and encouragement practically modelled a concrete foundation for me. Dad, your constant and tireless reminders indeed, kept me on track. To my siblings Millicent, Caroline, Benedict, Austine, Clementine and Jacob, thanks for the prayers, encouragement and support. To my nieces Comfort and Abigael, thanks for your prayers and the loaded smiles.

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ABBREVIATIONS AND ACRONYMS

EEBA	Evaluation of Environment in Buildings in Africa
GCB	Green Certified Buildings
HCB	Historic-Conventional Buildings
IAQ	Interior Air Quality
IEQ	Interior Environmental Quality
KGBS	Kenya Green Building Society
LEED	Leadership in Energy and Environmental Design
MCB	Modern-Conventional Building
MR	Mean Rating
NBR	National Building Regulations
NCBD	Nairobi Central Business District
SBS	Sick-Building-Syndrome
SDG	Sustainable Development Goals
UNEP	United Nations Environmental Programme
USGBC	United States Green Building Council
WHO	World Health Organization
WSSD	World Summit on Sustainable Development

OPERATIONAL DEFINITION OF TERMS

Adaptive Measures: Adjustments made on buildings to adopt green concepts in their designs to reduce on the impact of Sick Building Syndrome and environmental degradation.

Conventional Building Interiors: Interiors created from traditional design approaches based on function and aesthetics with no considerations for the environment.

Commercial Buildings: Buildings whose interiors host activities aimed at profit making.

Green: The environmental aspect of sustainability in relation to buildings that is addressed to reduce their impact on the environment.

Green Adoption: The uptake/integration of green concepts within interiors of buildings.

Green Building: Designing/constructing/retrofitting interiors with systems that use environmentally responsible and resource-efficient processes/products. They have a reduced negative impact on the environment and users' health throughout a building's life cycle.

Green Concepts: Ideas, principles and products that when adopted in a building's life cycle (siting, design, construction, occupation & demolition) creates a healthy and resource-efficient environment with lowered negative impact. For example recycling, reusing, reduce, retrofitting, etc.

Green Materials and Technologies: Construction and finish products/processes that incorporate green principles during harvest, processing and installation in buildings.

Green Model-Framework: A basic and formal plan proposed to aid integration of green content into the training and practice of Interior Design.

Interior Air Quality: Interior space quality resulting from manipulation of indoor design space elements such as lighting, acoustics, thermal comfort and technical space performance.

Interior Design: A systematic and conscious process of creatively manipulating the interior environmental quality to achieve functional specifications to solve indoor space problems.

Interior Design Course Training Guide: An institution's laid-out training plan, containing programme of activities and topics taught at the undergraduate level.

Interior Environmental Quality: The overall quality of an interior space that is determined by assessing and summing up green levels in IAQ elements, water efficiency, materials and technology.

Mitigation Measures: Interventions taken to create awareness so as to increase adoption of green concepts in buildings for a reduction in cases of Sick Building Syndrome and environmental degradation. The interventions include educating/raising of awareness, creating national laws, policies and action plans that encapsulate green.

Practice: Deliberate and repeated actions of adopting green concepts in building.

Pseudo-Green: Green level whose description is neither entirely green nor conventional but fits in between.

Water Efficiency: Building designs that adopt water systems that provide for adequate consumption of water through conservation or preservation.

ABSTRACT

Adopting green concepts in the designs of buildings is a key abatement measure to environmental degradation and sick building syndrome. However, green adoption remains insignificant worldwide, and the facts surrounding the dynamics of its adoption locally are vague. Facts documented on green building regionally and locally are scanty and this topical area remains under-researched. Yet, such information is vital to inform decision-making for the increased adoption of green buildings locally. This study therefore aimed at bridging the gap by documenting on the extent of green adoption in Kenya's buildings. The documented facts are specific to interiors of commercial buildings and especially in Nairobi City County. The specific objectives that guided this investigation were to determine the extent of green concept adopted in buildings across Nairobi City County; to establish factors influencing adoption of green by interior designers and building users; and to identify the amount of green content integrated in the training guides for interior design at undergraduate level. A conceptual framework derived from two theories guided the study: Sustainability-Model-Theory by Brundtland (1987) and the Practice Theory by Bourdieu (1972). Mixed-methods approach was employed to measure green variables and determine the interior environmental quality of 17 commercial buildings across Nairobi City County. The perceptions of 56 interior designers and 22 building users on the subject green building were gathered. The amount of green integrated in the content of 4 sampled design training guides was examined too. Findings from training guides were corroborated by the 4 respective Heads of the Art and Design Curricula from sampled universities. Data analysis was performed using descriptive and inferential statistics. The results showed insignificant (Mean Rating 2.84) amount of green concept adoption within interiors of commercial buildings in Nairobi. Consequently, 71.4% of interior designers were significantly aware of green concepts with a correct perception of it but minimally adopted it. At the same time, 63.6% of building users were primarily unaware of green building. Lack of legislation and technical expertise on green building were identified as the critical factors hampering adoption in Kenya. In addition, there was insignificant (6.3%) integration of green content in the interior design training guides for undergraduate at local universities. These findings point to a need to increase green adoption within interiors of commercial buildings through retrofitting exercises. The Kenyan government also needs to urgently address the concept of green building in its National Building Regulations. This move should include devising of incentives and awareness campaigns on green to increase adoption among building stakeholders. This study recommends increased integration of green content into local training of interior design at undergraduate level. This is foreseen as a major way of increasing future adoption of green in interior design in Kenya. Based on the findings of this study, a framework was developed and recommended to aid integration of green content into the training of interior designers. The integration will ensure that future interior designers (building experts) are equipped with technical skills on green building.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Sustainability in buildings is considered as the practice of constructing structures that are environmentally responsible and resource-efficient throughout a building's life cycle (Haytham, Omar, Mohammad and Islam, 2024). Sustainability is composed of three aspects social-cultural, economic and environmental. The environmental aspect is the focus of this study and is denoted by the term green. The environmental aspect is further divided into interiors and exteriors. This study's focus was on the interior environment but as influenced by the exteriors (Bardi, 2011). The practice of green building aligns with a persistent call in the construction sector for adoption of green concepts worldwide. The call is due to the enormous contribution made by buildings to environmental degradation (WGBC, 2017). These concerns have heightened interest in green building as a critical strategy in improving environmental sustainability (Shen *et al*., 2017a). The concept green is well received by governments worldwide because of its ability to curb ecological imbalances and create cost-effective and healthier environments (UNEP, 2020). Adopting green building achieves healthier interiors free of the Sick Building Syndrome (SBS). This practice is essential now that scientists foresee a crisis with the rise in numbers of buildings suffering from SBS (Kumar & Kaur, 2021).

In addition to the aforementioned, interactions between the effects of climate change causing reduced thermal comfort; increased greenhouse-gas emission and environmental degradation have heightened the problem of SBS (IAIS, 2018; UNEP, 2021). The problem has increasingly exposed building users to health risks and poor job productivity, linking the condition to 60% of users' mental and physical health problems. Users of sick buildings have reduced job productivity and concentration levels in office and classroom environments (Nduka *et al.,* 2018; Qayyum *et al.,* 2020; Efua & Fianu, 2012). The condition plagues over 30% of existing buildings (EPA, 2021; Fisk, 2018; Belachew *et al*., 2018). The health of users in sick buildings is worsening daily since humans are known to spend on average 90% of their time indoors, where contamination could be up to 900 pollutants. In fact, contamination levels within interiors are 2-5 times more polluted than in the exterior environments

(Nici *et al*., 2017; Yan *et al.*, 2016).

In the United States of America (USA), United Kingdom (UK), and China, SBS is among the top four health risks associated with cancer deaths and respiratory difficulties yearly (EPA, 2021; Qilong, Cao, Ying, Liang and Xueting, 2017).; Li & Kong, 2013). In Kenya, the burden of respiratory illnesses linked to SBS stands at 40% (Economic Survey, 2023; Nici *et al.*, 2017). The problem is worsening with the high air pollution levels especially in Nairobi, where it is 70% above the World Health Organization's (WHO) recommended standards (Kipruto, 2015). The standards recommended annually average PM 2.5 of concentrations and not exceeding 5ug/m^3. However, Nairobi's pollution level is four times higher than the recommended standards (Briton, 2023). On the other hand, the deteriorating ecological environment has worsened levels of pollution because of ongoing building activities such as excessive harvesting of natural resources and waste production (Brown, 2020). For instance, building activities worldwide contribute 50% of raw material and 13% of water consumption, 40% of waste/landfills and 50% of Green House Gas emissions (Bonoli *et al.*, 2021; Yan *et al.*, 2016). In Kenya, 56% of the total electricity energy resource generated is consumed by buildings alone; exceeding those of transport and industry sectors combined (Mohammed *et al.*, 2021).

The building industry has been on a massive growth in Sub-Saharan Africa, and by the year 2050, estimates show that the building stock will be three times greater than that of Europe. The population then would have doubled thus, raising a demand for more buildings (Bonoli *et al*., 2021). This growth points to the concern on vast amount of resources required to meet the housing demand and the increasing numbers of low-quality interiors that continue being constructed. In addition, there will be an increased production of waste if adoption of green concept is ignored (Nicole-Steffano *et al*., 2020). In Kenya, the building industry has grown, providing 10% of employment and contributing to 8.8% of the Gross Domestic Product (Economic Survey, 2022). However, despite the sector positive contributions, is plagued with immense problems on environmental degradation. Therefore, there is an enormous need to adopt green building practices in both emerging economies such as Kenya and in developed ones worldwide (Kamalofe & Oyewole, 2016; Bonoli *et al*., 2021).

However, the Kenyan government recognizes the importance of adopting green concepts in buildings. The support is confirmed by her ratification of international environmental protocols, committing to act on the environment, climate change and sustainable development. Some protocols that Kenya is party to at the international level are the Paris Agreement, the Sustainable Development Goals (SDGs) of 2015 and the New Urban Agenda (2016). At regional level, the protocols include Africa Union's Agenda 2063, Africa Urban Agenda Programme (AUA), African Ministerial Conference on Housing and Urban Development and New Partnership for Africa's Development (Otieno, 2018). She also has protocols at the national level with green requirements entrenched in its national policies, laws and action plans as detailed in section 2.6.3 of this study.

Adopting green concept in the design and building of interiors thus, remains pivotal to lowering buildings negative impact on its users and the environment. Adoption of green within buildings corresponds with the adaptive and mitigation measures outlined in Sustainable Development Goals 6, 7, 11 and 13 (Yan. *et al.*, 2016). These goals encapsulate green elements and principles calling for efficiency in water, energy and material use during buildings' life cycle. The principles are achieved through recycling, re-using, reducing, retrofitting, renewing, re-furbishing, avoiding and creation of safe building designs (SDGs-2015; SBCI, 2012). The standard elements/principles that denote green concepts are grouped as follows: Sustainable sites, provision for Interior Air Quality (IAQ) and water efficiency, green materials, technology and operations. Yan *et al.* (2016) further recommends other elements deemed relevant when evaluating 'greenery' within interiors of buildings (though they were not included in the green standard tools). Yan's recommendation was supported by Kamalofe & Oyewole (2018) and Otieno (2018) studies which informed the design of this study.

There are benefits that are experienced in adopting green concepts in buildings in different countries such as the United States of America, Canada, Australia, China and Kenya. This is as detailed in Section 2.2.2 of this study (Peng & Deng, 2017; Weishu *et al.*, 2023; Alessia *et al.*, 2019; Kimani & Kiaritha, 2019; Faris & Abdulqadir, 2019). Although adopting the green concept has several benefits, its practice has been low and slow worldwide (Mosly, 2015). Available statistics confirm that in the USA, China, the Middle East and South Africa, the adoption of green in buildings is practiced at the rate of 38%, 27%, 10% and 12%, respectively, while in Kenya the rates are below average (Gunby, 2017; Yan et al., 2016; Khaleel, 2013; Hankinson & Breytenbach, 2012; Otieno, 2018). A Kenya Green Building Society report further confirms a low practice as shown by existence of only six green-certified buildings (UN-Habitat, 2018).

Equally, the availability of documented facts on the adoption of green concepts by Kenya's building industry remains a challenge, probably because it is a relatively new trend. Furthermore, green issues were not incorporated in Kenya's National Building Code (NBR, 2014). However, smaller neighbouring economies such as Rwanda, Burundi and Uganda have already adopted the concept green in their building code and, with positive outcomes (EEBA, 2018). Kenya's lack of green inclusion in the building code could be hampering an increase in its adoption. This omission raises concern about Kenya’s commitment to fulfilling the international protocols i.e., to build sustainably as ratified in 2005 (Kyoto Protocol). Further gaps were identified during the review of past studies and they informed the objectives of this study. The gaps were as summarized in the subsequent paragraphs.

The formation of Kenya Green Building Society (KGBS), a non-governmental body registered under the World Green Building Council, is a step towards the growth of green movement in Kenya (Otieno, 2018). However, in order to support the development and adoption of green buildings locally as aligned in SDG no. 13, it was necessary that detailed and documented facts on the practice locally, be availed. This is important to inform decision making locally for an increased adoption of green buildings. Usually, availing facts on the adoption of green concept falls under mitigation measures. Mitigation measures are incorporated in the following areas: education/creation of awareness among building stakeholders (Interior designers), national policies, legislation, marketing and innovative financing of green (Andric *et al.*, 2019; Kamalofe & Oyewole, 2018). Nevertheless it was notable that, available facts documenting the practice of green locally (Kenya) was a challenge as in most African countries (Kamalofe & Oyewole, 2016). Studies existing on green building were based in USA, Saudi Arabia, Russia, Nigeria and Kenya and are as follows: Chan et al., (2017); Susilawati & Al- Surf, (2011); Remizov *et* al.,(2021) Kamalofe et al., 2018; Were 2015).

Although Chan (2013) provided insight into the subject, its findings failed to detail specifics of green concepts adopted within the buildings sampled; especially those elements that were deficient of "greeneries". However, Susilawati and Al-Surf's (2011) study focused on evaluating perceptions of building professionals' green adoption rather than establishing information on it. The appropriate method would have been to do a physical evaluation of the sampled buildings to capture the relevant information. Nevertheless, findings from these studies were relevant in informing on challenges faced in adoption of green concepts, especially for the developing economies. Notable too was that, such finding were necessary for the purposes of benchmarking, marketing and retrofitting exercises in buildings.

Research documenting green adoption has received minimal attention, especially in Sub-Saharan African countries (Otalil & Oladokun, 2018). Even fewer were they that documented on green practice in Kenya and they included Were (2015) and Irungu (2016). Although Were (2015) provided pertinent information on green practice locally, it mainly focused on buildings' core/shell, sites and exteriors. Thus, it was limited and lacking in certain aspects, since SBS worst affects users within interiors and not in exteriors as was the focus of Were's study. Another gap noted was that, many studies were carried out on institutional buildings where building activities were more controlled and regularized, unlike in commercial ones.

Apart from limited documentation on factors influencing the rate of green adoption among interior designers and users, past studies failed to show the diversity in factors normally presented by different geographic regions. Studies on developing economies were mainly based in West African countries (Darko *et. al.*, 2018; Olatunde & Olabode, 2021). Yet, Chan *et al.* (2018), Karji *et al*. (2020), Lentov (2021) and Miosander *et al.* (2010) stress the importance of diverse information to increasing adoption of green locally. This is because climate, building/maintenance policies, economic levels and cultures differ and so determines the critical factors influencing green adoption in an area.

In order to significantly increase the adoption of green concepts among building stakeholders, Umar (2023) recommended upholding of adaptive and mitigation initiatives in the training of building experts of which interior designers are included. Mitigation initiatives are designed to morph building experts' (interior designers') perceptions and behaviour towards adopting green practices. Studies by Wimala *et al.* (2016) and Hill *et al*. (2013) emphasized that mitigation initiatives were achieved effectively through integration of green content in the education, national policies and laws of a country. Further, Elmaash *et al.* (2020), Kamau (2019), Komalofe and Oyewole (2018), Olweny (2018), Hankinson and Breytenbach (2012), and UNESCO (2015) recommended integration of green content into higher education/training of building designers. The integration would enable achievement of the desired paradigm shift in thinking by building experts, to adopt sustainable building by 2030.

Few studies exist to the understanding of green integration into the content of interior design training. These studies are mainly tailored towards engineering, economics, psychology and architecture thus, limiting their adequacy to inform green integration in interior design training locally (Kenya). Studies focusing on Kenya, such as those of Mukhwana (2016) and Olweny (2018), contradicted in findings. For instance, Mukhwana indicated that 95% of the design course instructors were conversant with green and were actively teaching it. On the other hand, Olweny (2018) and Cossette and Melody (2013) found that course instructors were not conversant with green philosophy and therefore, rarely taught it. Thus, existing studies displayed several inconsistencies/discrepancies in findings arising either from the methods used or theoretical frameworks applied or both.

Studies also showed that the main challenge faced by instructors in teaching green philosophy was, identifying green content relevant to areas of design specialization for example in interior design (Emblen-Pery, 2018; Yilin, 2020); Olweny, 2018). Additionally, there lacked a simple method/framework for aiding green integration into the training content of interior design with minimal disruption to the programme. Notable too, is that the frameworks available to aid integration of green content are mainly from other disciplines (engineering & architecture) and based on developed economies (Giurco *et al.*, 2011). Yet, adoption of green concept is unique to climate, socio-cultural and time aspects with the focus and emphasis of each discipline, being different. Thus, there arouse the need to develop a model-framework that was unique and especially focused on interior design training in

Kenya.

Owing to the gaps briefly discussed above and detailed in Chapter 2, this study reduced them to form three specific objectives that were then addressed. Therefore, the general objective of this study was to explore and document detailed facts on the extent of green concept adoption: within commercial buildings, by interior designers and its integration in the training guides for undergraduate at local universities in Kenya. The findings of this study were then used to develop a framework, recommended to aid integration of green content into interior design training at the undergraduate level.

1.2 Statement of the Problem

Adopting green concepts within building interiors remains a key measure in reducing the rising cases of environmental degradation and Sick Building Syndrome. Sick Building Syndrome plagues 30% of existing interiors and is linked to 60% of building-related illnesses suffered by users today. For instance, the World Health Organization reports that building-related respiratory disease burden causes 5000 deaths yearly in Africa. While in Kenya, the building-related respiratory disease burden stands at 39%. Despite the environmental and health benefits experienced with adoption of green concepts, the practice still needs increasing worldwide. In Africa, especially Kenya, research and documentation of facts on green practice needs improvement, with the rate of its adoption locally needing clarification. Important facts on critical factors influencing the rate of green adoption among interior designers as building experts were also vague. In addition, integration of green concept within the training of interior designers at undergraduate level in Kenya was not clear.

Despite the government's effort to support adoption of green in buildings, local facts documented on it remain a challenge. Thus, factual documentation needed improvement in order to inform decision-making for an increased adoption of green. Moreover, Kenya’s National Building Regulations Code-2014 excludes issues on green building. Yet, regulation among other factors identified by the study was critical in influencing increased adoption of green among building experts (interior designers). Additionally, trainings on green building among interior designers in remains vague, with several design instructors either not conversant with it or teaching it. The instructors further acknowledged lack of a framework to conveniently aid integration of green concept into interior design training. Thus, there was need to develop a framework that would guide integration of green into the training content. Consequently, this study addressed the need which was also in tandem with recommendations made by Rasha (2012); Celadyn (2019). Since models in the studies mentioned could not be adopted directly as they were designed for nations that had environmental, economic and social factors differing from those of Kenya. Therefore, it was important for this study to develop a framework that took into consideration Kenya's local dynamics, noting that, adoption of green is a factor of the same.

Owing to the stated concerns, this study addressed gaps identified by documenting in-depth, facts highlighting the extent of green concept adoption in Kenya. The gaps addressed mainly established: levels of green adoption within interiors of commercial buildings in Nairobi City County; critical factors influencing adoption of green concept among interior designers and its integration in Kenya's design training programmes. The study findings were then used to develop a model-framework, to guide integration of green content into interior design training in Kenya

1.3 Objectives of the Study

The general objective of this study was to examine and document facts on the extent of green design practice within commercial buildings in Kenya. The following specific objectives guided the research:

1. To assess levels of green concept adoption within interiors of commercial buildings in Nairobi City County.
2. To determine critical factors influencing adoption of green concepts by Interior Designers in Kenya.
3. To examine extent of green content integration in Interior Design training at undergraduate level in Kenya's universities.

1.4 Research Questions

To achieve the above-stated objectives, the study endeavored to answer following specific research questions:

1. How are green levels within commercial buildings of Nairobi City County?

2 . What critical factors affect green adoption among Interior Designers in Kenya?

3 . How is the integration of green content in Kenya's Interior Design training at undergraduate level in the universities?

1.5 Hypothesis

The study hypothesized that:

$H0_1$ There is no significant level of green design practice in commercial buildings in Nairobi City County (upheld).

$H0_2$ There are no critical factors affecting interior designers' adoption of green concept in Kenya.

$H0_3$ There is no significant level of green in the content of Interior Design training at university undergraduate in Kenya.

1.6 Rationale and Significance of the Study

Adopting green concept within interiors of commercial buildings is crucial in reducing the disease burden linked to Sick Building Syndrome and environmental degradation. There was need for more research and documentation on the extent of green practice in commercial buildings especially, in developing economies such as Kenya. Additionally, few studies focused on green practice within institutional buildings (schools) in developed economies, and not commercial ones and in emerging economies. Further, much research on green practice examined building exteriors and the initial phases of their life cycle (design construction) except in Irungu's (2016) which examined interiors of hospitality buildings. The life-cycle phases of a building occurring towards the end such as occupation, re-modelling and demolition were largely ignored in past studies. However, they are the main cycle phases contributing to environmental degradation and users' negative health (Yan *et al*., 2016; SBCI, 2012)., This study therefore enabled addressing of the gaps mentioned and availed comprehensive documentation of the facts discovered.

Most studies exploring factors influencing building expert's rate of green adoption locally, ignored the profession interior design. The studies also failed to examine the criticality of the factors they identified for ascribing magnitude (Momanyi, 2020; Were, 2016). Largely, mitigation measures such as integration of green content in the education of building experts locally were minimally explored except in Olweny (2018) who investigated it in architecture. Olweny provided insight on the topic from an architectural perspective, which does not sufficiently inform the interior design aspect. Many frameworks for guiding the integration of green content into the training of building experts were largely for disciplines like engineering and not interior design. Therefore, the frameworks could not be used for integration in interior design as different fields have their own dynamic in relation to green. Past studies were on residential buildings and not commercial ones and especially, those in the occupation phase of their life cycle. This study, thus, presented an opportunity to explore and addressed the gaps mentioned on green practice locally (Kenya) and from an interior design perspective. This was largely to inform the interior design discipline to enable evidenced decision-making.

In addition to basing this study in three disciplines (environmental design, art and education) this study was significant in that, it contributes to cross-disciplinary literature and by using a mixed-method approach to research. In addition, a contribution is made by documenting green practices in commercial buildings and in interior design education from a standpoint of a developing nation. Further, findings of this study contribute a framework that is recommended to aid integration of green content into the training of interior designers. The study findings would inform or benefit policy decision-making, planning education/awareness programmes, research, innovation, marketing and management of green supplies. Therefore, it will allow for practical implementation of awareness programs in order to catalyze increased adoption of green among building industry stakeholders in Kenya.

This study also contributes towards efforts underpinning Sustainable Development Goals and Kenya's developmental objectives. The objectives include providing healthy environments and lowering building-related disease burden. This study does support an outcome of the World Summit on Sustainable Development held in

Johannesburg in 2002. The summit's agreement was that governments focus more on the environment, household water, renewable energy and sanitation that is the core of green practice. The outcome is aimed at improving environmental health and halving the disease burden by 2020 (WSSD, 2002).

Further, this study supports Sustainable Development Goals 6, 7, 11 and 13; Kenya's Vision 2030 goals no. 6 and 7, and the Big Four Agenda on Affordable Housing. Affordability in terms of reducing building resource use throughout a building's life cycle by adopting efficient concepts. The goals focus on ensuring provision of quality and healthy environments for citizens' well-being, Kenya's National Housing Policy 2004 Sessional Paper No.3 (GoK, 2004). The study is also in congruence with National Climate Change Policy 2018, Climate Change Act No. 11 (2016) and Action Plan 2018-2022 Article 4.1.2 (C.10), calling for integration of green into interior design education (GoK, 2018). The findings of this study were used to inform the development of a framework for guiding integration of green content into interior design training in Kenya. The integration would enhance the adoption of green concepts by interior designers in projects.

Lastly, this study was intended to act as a catalyst to initiate discussions on green practice by policymakers and Kenya's building authorities. This is because green and interior design issues were largely excluded from the National Building Regulations-2014. The findings were therefore, meant to stimulate insight and catalyze green inclusion by policymakers in design innovation, education and research. Such a move would create jobs and market for green products and technologies. The beneficiaries of this study's findings include all building stakeholders and regulatory authorities in Kenya. These two on accessing the vital information would promote green building locally.

1.7 Scope of the Study

The Theory of Sustainability that guided this study had three pillars Social, Economic and Environmental. This study only focused on the environmental pillar as denoted by the term 'green'. The focus on green was because the theory postulates that at any given time; only one pillar can be achieved. An attempt to achieve all the pillars simultaneously may not be successful, as espoused by Harrington (2016).

Moreover, the environmental pillar (green) represents the most extensive system in the world. It also hosts the social and economic systems/pillars. Therefore, in any aspect, it should be given priority and greater attention (Califano, 2020; Purvis *et al.*, 2019).

The main categories of existing buildings include institutional, commercial, residential, legal, and industrial or storage (Sourabh, 2021). Since most of previous research was based on exteriors of institutional and residential buildings, this study restricted itself to the interiors of commercial buildings. Unlike previous studies based on developing economies, this one was carried out in Nairobi City County, Kenya, a country listed among developing nations. The interiors of commercial buildings were scoped because, in Kenya, they host a large population of users during the day compared to those of residential (Muchemi, 2017). Therefore, a bigger population of users is primarily vulnerable to illnesses associated with Sick Building Syndrome. Secondly, users act as a market force that demands for green spaces thus the reason this study investigated their awareness/perception on green buildings.

Further, the study limited its investigations to building interiors, especially ones in the occupancy phase of their life cycle. Other phases like construction, re-modelling/renovation and demolition were not included since Interior Designers do not directly make decisions on them. Furthermore, those phases take extended period to occur, which would have been beyond the stipulated time for this study (Ayalp, 2013; Kubba, 2012).

The buildings examined were limited to specific areas such as Kitusuru, Gigiri, Muthaiga, Karura, Upper Hill and Nairobi Central Business District of Nairobi City County. The reason being that these areas hosted the most significant number (80%) of green/LEED-Certified and Conventional commercial buildings in Kenya (KGBS, 2017; Economic Survey, 2018). The areas were also characterized by tropical climatic conditions, which are unique and different from those in temperate regions. For instance, in Middle East and Egypt where similar studies had been conducted by Mahdavenejad *et al.* (2014) and Ayalp (2013). The extent of green adoption in those commercial buildings was determined by identifying concepts integrated into the Interior Environmental Quality elements. The method was unique and informed by

Yan *et al.* (2017) and LEED-certification points.

The sample population was limited to those Interior Designers who were members of the Interior Design Association of Kenya (IDAK) and the Association of Designers Kenya (ADKE). This was informed by the fact that they were the only design bodies recognized by the government to represent Interior Designers' interests. Interior design was selected because it is mandated to prescribe and integrate finish materials within building envelopes (Guerin, 2010). Other building professionals such as contractors, managers, architect and engineers were not included as there were existing studies carried out involving them while, those involving interior designers based in Kenya were a challenge. The population also involved only users of buildings sampled for the study. They were selected because those users had worked in the buildings for some time and, thus, provided definite feedback on their experiences with the interior spaces.

Though some mitigation measures are aimed at increasing green adoption, such as inclusion in national policies, legislation, law, education and awareness, this study only focused on education/training in interior design at the undergraduate level. This follows the assertion by Leddy (2013) and Cosette and Melody (2013) that educating on green achieves greater uptake compared to the other measures. In determining the extent to which green content is included in interior design training, Leddy (2013) observed that examining undergraduate training guides would give information that is more valid. The observation was compared to questioning tutors, as Mukhwana (2016) study had previously undertaken. Therefore, all interior design course guides used for training at the undergraduate level in Kenyan Universities were examined in establishing levels of green content inclusion.

1.8 Delimitations of the Study

The study did not examine categories of buildings such as residential, industrial, educational or judicial. The building experts investigated excluded architects, engineers, construction managers, building managers and quantity surveyors. Those curricula for schools offering interior design as part of an architectural course were not examined since; a number of studies already had been based in that area. So there was need to then examine the integration of green building in courses offered by Art and Design schools.

1.9 Limitations of the Study

The study sampled commercial buildings in Nairobi City County, being that it hosts the most significant number of buildings in the country. Data collected, therefore, may only represent extent of green concept adopted in some buildings and not necessarily a representation of all counties in Kenya. However, the information availed provides insight and could direct similar researches in future that are based in other locations/counties.

Due to issues on terrorism, insecurity and being that the research was carried at the onset of COVID-19 pandemic in the country, some sampled buildings declined to grant permission for research. This resulted in sample replacement, as there was difficulty from the management in allowing access to the sampled buildings and especially in some areas of interest. Photography was forbidden in all the sampled buildings thus, affecting the quality and depth of anticipated data availed by the study. This study surmounted the challenges by introducing alternatives that sufficiently addressed issues that arose as elaborated in Chapter 3.

1.10 Summary

The chapter elaborates on backgrounds that lead to environmental problems such a Sick Building Syndrome among other degradation issues. From the problem statement, research objectives were formulated. The rationale and significance of the study pinpoints the benefits alluded to different stakeholders in the industry. Limitations and delimitations/scope of the study were also highlighted.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter reviews literature relating to: sustainability, Sick Building Syndrome, Green Design Concepts (elements of Interior Air Quality; provision for water efficiency besides materials & technology), conventional and green buildings, factors affecting rates of green adoption among interior designers, the extent of green concept integration in interior design training guides, and models to aid integration of green in interior design programmes. Lastly, it presents the theories and the related conceptual framework that guided this study.

2.1 Sustainability in Buildings

Sustainability in buildings refers to the process of planning, designing, constructing, and operating buildings to consider the environmental, economic and social aspects of a building's life cycle. Adopting sustainable building is in favour of lowering buildings' impact on users' environment, health, and well-being (Usha *et al.*, 2021). Sustainability, as a philosophy, encompasses the social, economic, and environmental (green) pillars (Califano, 2020). Purvis *et al.* (2019) argue that since the environmental pillar hosts the social and economic systems, it deserves, therefore, to be accorded priority and greater attention in any activity/process. The governments worldwide do acknowledge sustainable building and have enacted policies to support its initiatives in the form of Sustainable Development Goals (Bonoli *et al.*, 2021). The practice of sustainable design and building exists to mitigate the potential adverse effects of climate change in buildings. The link between climate change and growth of unhealthy building interiors, with increased cases of Sick Building Syndrome, is now evident (UNEP, 2021).

The interior design sector promotes sustainable building to curb or adapt to the effects of climate change. The endorsement was in form of adopting sustainable building initiatives (Andric *et al.,* 2019; Mohanty & Dash, 2018). The adoption of green concepts demonstrates sustainable building, is a practice that is growing worldwide. McGraw-Hill Construction and United Technologies Climate, Controls and Security report confirms this growth and indicates that 51% of global firms and other building experts worldwide focus on green building to gain market attention (WGBT, 2018). Adopting green concepts in building/construction industry also emerges as a long-term business, innovation idea, improves livelihood and provides research opportunities. Also confirming the growth of sustainable building are volumes of green built projects that had increased from 28% in 2012 to 60% in 2015 worldwide (Simpeh & Smallwood, 2018). Studies portray Sick Building Syndrome (SBS) as a catalytic agent and a positive force in the building industry. SBS has caused the industry to be conscious of green concepts and hence, increased its adoption (Andreza *et al.*, 2020; Afolabi *et al.*, 2022; Belachew *et al.*, 2023). The interplay between climate change and SBS has also pushed and enabled the interior design industry to arrive at various innovative green solutions to the problem.

On the contrary, the opportunities and challenges presented by issues linked to climate change (for instance environmental degradation, SBS) are not unique but, typical aspects of risk management in buildings. Therefore, climate change should be accorded lesser attention and priority than they have received (Prasad and Snow 2011). Prasad and Snow downplay the potential impact caused by sick buildings and environmental degradation. The authors imply that buildings and their related activities seem harmless. Yet, the negative impact of buildings on users and the environment can be harmful and devastating (Bonoli *et al.*, 2021). It is thus, paramount that Interior designers also join in contributing efforts to curb the negative impacts of buildings. Interior designers could contribute by gaining relevant knowledge/skills to adopting green concepts in designing and creation of healthier interiors. This mitigation initiative would be more practical than ignoring negative impacts caused by sick buildings or underestimating their capabilities.

Further, sustainable building receives lots of support worldwide. Fisk (2015) agrees that in combating SBS adoption of sustainable building initiatives should be a proactive measure rather than a reactive one. Adoption is imperative considering that some insurance companies, in the USA, UK, Sweden, Netherlands, Italy, Australia, and Brazil, have already begun assessing the vulnerability of building asset to environmental and climate change impacts (IAIS, 2018; Brown, 2020). Although Mohammad *et al.* (2021) and some players in the building industry are still skeptical about the magnitude of SBS and environmental degradation, soon, only those interior designers with knowledge and skill in green building will be better placed in the market.

Several rating systems exist to evaluate sustainability levels in buildings. The systems are based on local attributes and apply to modern and yet-to-be-constructed buildings. Recognizably, the rating systems are yet to offer guidelines for assessing historic buildings especially in Europe, Asia, and Africa. This is because the assessment is important in informing policy, rehabilitation, and renovation decisions in buildings (Abobakar *et al.*, 2020). Recommendations are therefore, lauded for developing native rating systems that would guide the evaluation of different aspects of sustainability in historic buildings and, at the lowest budget. Although Abobakar *et a*l. (2020) examined an essential topic of sustainability in historic buildings, more studies are needed in that area. Also wanting in Abobakar *et a*l. was an appropriate design of methodology for a future study. The research investigated such a vast geographic area nevertheless; its findings shallowly reflect the depth of details that could have emerged in the results. Possibly, the weakness was in the method used for analysis and documentation of the findings. Abobakar *et a*l. thus failed to achieve the information specificity required for such huge studies, especially now that it was based in local areas.

The significant indicators for determining sustainability/green levels in buildings in India are advanced to include those of topography and climate change, health and safety of construction workers, project management consultancy, risk management, security measures and solid waste management (Thanu *et al.,* 2022). Initially, several existing green-evaluation tools did not highlight these indicators, and evident was that issues concerning the assessment of building users were excluded. Nevertheless, in Nigeria, Uchenna and Ngwu's (2021) indicate that users (neighbourhood), interiors and building components were adequate for evaluating greenness/sustainability of buildings. These variables were established in a 384 household’s survey in Anambra State where the adequacy and green performance of multi-family residential buildings in urban areas were examined. Although Uchenna and Ngwu (2021) provided valuable data in the area of green buildings, the research problem was not clearly stated and variables were poorly defined thus casting lots of uncertainty on the viability of the results.

The literature on sustainability in buildings was mainly focused on the environmental aspect (Simpeh & Smallwood, 2017; Momanyi, 2019) and the economic (Alessia *et al.*, 2019; Kimani & Kiaritha, 2019). Rarely did past studies focus on the social aspects of sustainability in buildings. Past studies, involved methodologies deemed inappropriate to inform the interior design perspective. The results were minimal on details especially visual ones. Some studies did not clearly state their research problems, and variables. These needed to be better defined with operationalization of crucial concepts not being as vague as those in Uchenna and Ngwu (2021). It therefore, followed that design and analysis procedures employed in those studies needed to be revised and appropriate methods used in future. In many of the studies, the main populations examined were green certified buildings and building experts mainly: architects, engineers, and building managers (Were, 2015). Many of the studies ignored interior designers and building users as their sample population. In response to the gaps identified above, this study broadened the information base by detailing the local green building scenario while focusing on the environmental and the social aspect (education of interior designers) of sustainability.

2.1.1 Sick Building Syndrome (SBS)

Building interiors are harming users' health and well-being through a severe phenomenon termed Sick Building Syndrome (SBS). Empirical evidence reveals that this is among the significant causes of increased healthcare costs, loss of employee productivity, and user discomfort in buildings (Nduka *et al.*, 2018). However, the chronic causes of SBS may be avoided since persistent or cumulative exposure to it is potentially life threatening and may lead to irreversible allergies and hypersensitivity syndrome (Nduka *et al.*, 2018). Findings by Efthymia *et al.* (2022) shows that, two aspects usually determine the degree to which SBS plagues an interior. They include the amount and number of pollutants present (chemical & disease pathogens) indoors and faults in the design of a building. This was established in a survey involving 613 employees aimed at examining perceived Indoor Air Quality (IAQ) and the prevalence of SBS in a university in Greece. Findings further confirmed that prevailing environmental hazards perceived to cause sick buildings were high indoor air velocity, elevated noise, low or high humidity (24.9%), and vapours/dust (63.2%). The main symptom associated with SBS in users was fatigue (34.1%). Generally, mucosal and dermal symptoms were the main ones reported at 40.8% and 19.8%, respectively, with the following risk factors resulting: atopy, sleep problems, and exposure to biological and chemical agents.

Similarly, Sarafisa *et al.* (2010) identifies factors aggravating sick building conditions either alone or in combination as: high temperature and lack of air circulation, low/high humidity (toxic black mould growing from excessive humidity), poor lighting, especially during the day, airborne chemical pollution, airborne organic matter from the air conditioning system, low morale and general lack of satisfaction from work and the work environment. The Environmental Protection Agency (EPA, 2014) was also in congruence with those findings and added that chemical pollutants contribute immensely to rising cases of SBS. The emission of chemical pollutants was through combustion, off-gassing of volatile organic compounds, and permeation of radon gas through cracks in building foundations. Thus, it was essential to establish the extent of green concept adoption in contributing to adaption and mitigation of SBS and environmental degradation.

To some degree, mental illnesses (psycho-social stress, depression, poor concentration) among building users are attributed to SBS. Runson and Norback (2013) observed this in a study carried out in Sweden among 1000 respondents (building occupants) of ages between 25-60 years. The findings by Melrose (2015) further agree and explain the link to mental health as influenced by limited daylighting in interior spaces. Poor lighting causes a drop in the production of a brain chemical, serotonin. Serotonin is the chemical responsible for a happy mood experienced by users of buildings. If the production of serotonin is low, emotional stress and depression is likely to occur. Fotoula (2011); Qayyum, Tariq, and Younas, (2020) adds that the frequency and severity of these symptoms depend on the duration users take within the interiors of infected buildings. Fotoula argues that the longer users spend indoors in sick buildings, the worse it affects their physical and mental health.

Further demonstration shows that about 42% of building users developed either one or two symptoms of SBS, with backaches and fatigue dominating the complaints. Mainly females developed more symptoms than males, with prevalent symptoms such as eye irritation having significant correlations (P=0.002) followed by upper respiratory symptoms (P=0.049). Brown *et al.* (2021) generated these findings from a mixed-method approach to explore the prevalence of SBS symptoms among 19 PhD students in a university building in China. Brown *et al*. recommended adopting green concepts to alleviate and reduce cases of SBS. Although Brown *et al*. provided an impetus to carry out this current study, it failed to elaborate on the extent of green adoption in the buildings it sampled or stipulate a standard level of green effect for eradicating SBS in the future.

The conditions aggravating SBS in residential and office spaces are usually linked to lighting quality, headroom, and positioning of windows. Afolabi *et al.* (2022) exhibited this in a cross-sectional survey in Kaduna State, Nigeria, aimed at assessing levels of SBS based on indoor pollution in residential and office spaces. The level of pollutants in the sampled residential and office interiors was at PM 2.5 and PM 10, respectively, above the standard WHO Health Organization recommended annual levels of average PM 2.5 of concentrations and not exceeding 5ug/m^3 (Briton, 2023). In addition, Ankeli *et al.* (2021) added that in Nigeria's Alekwoudo and Gbemo areas, biological, chemical, and psychological aspects contributed by the interiors were significant causes of SBS in the 250-building samples investigated. Consequently, the condition affected the rental values of the properties and was responsible for the low occupancy rating experienced in those buildings.

Among interior space dynamics, results showed that higher room temperatures (>25 degrees Celsius) were linked to more significant symptoms of SBS among building users. Nduka *et al.* (2018) proved it in studies that examined the impact of environmental and physical qualities on the emergence of SBS symptoms in staff and worshipers in Lagos (Nigeria) public buildings. Those findings by Nduka *et al.* (2018) also agreed with those of Eghosa and Asotie (2014) that remained cognizant of the problem of SBS experienced in Nigeria. The conclusion was that sick building syndrome was more prevalent in public buildings than in private ones.

In Kenya, the least prevalent symptom of SBS among users was eczema (3%), while allergy (24%), eye irritation (21%), headache (27%), sore throat (25%), and fatigue (31%) were the most prevalent symptoms experienced by the 153 sampled users in Nairobi's buildings. The symptoms were proven in an investigation to determine the prevalence of SBS among office workers by Marete and Waweru (2016). To add on, prevalence to asthma (X2 6.805, P<0.05), eczema (X2 7.75, P<0.05), hay fever (X2 34.306, P<0.01), fatigue (X2 16.337, P<0.01) and dizziness (X2 9.504, P<0.01) were significantly associated with a building category. This demonstrated that different building categories, i.e. historic, modern and green, impacted occupants in varied degrees because of different levels of SBS. Lastly, in a Nairobi-based study, Ndichu (2017) holds that interiors of buildings that were fully air-conditioned, artificially lit, completely sealed and without windows, increased the intensity of SBS and depression among many users.

Based on the literature reviewed, it is concluded that SBS affected buildings not only in Kenya but worldwide. The effects of SBS being prevailing symptoms such as fatigue, eye irritation, and allergies. Although the studies reviewed provided valuable data that would inform future similar studies, they needed more information portraying characteristics of the sampled buildings and the knowledge levels of the users of green buildings for an analysis exercise (Marete & Waweru, 2016; Nduka *et al.*, 2018). The current study, thus, acknowledges that users' and their awareness of green buildings for a sample population needed to be researched, as evidence by past studies. Furthermore, many studies investigated and operationalized variables of SBS using methodologies physical science perspective (Khaleel, 2013; Brown *et al.*, 2021). Yet, findings from such studies needed to be adequate in informing aspects of green from an interior design perspective. This is because an interior design field would benefit more from data based on the perspective of visual arts and so more so detailed on use of materials. The observation confirmed a need for the current study to fill the gap by documenting information on sustainability-green building concepts from an interior design perspective.

2.1.2 Benefits of Adopting Green Concept

Green concepts are ideas, principles, and products that, when integrated into a building's life cycle (siting, design, construction, occupation & demolition) create healthy and resource-efficient interior environments with less negative impacts (USEPA, 2016). The principles involved in greening design elements in building interiors, as outlined by Davidi *et al*. (2019) and Mohammed *et al.* (2019) include: recycling, re-using, reducing, retrofitting, rethinking/remodel, repairing, and restoring. Green concepts involve adopting physical elements within building interiors to facilitate the achievement of the principles mentioned above (Alessia *et al.*, 2019). There are benefits associated with adopting green principles and concepts concerning building interiors. Peng and Deng (2017) argue that adopting green concepts improves interior environmental quality (IEQ) by up to 25%. Aram *et al.* (2019) adds that green concepts lower the effect of urban heat island by up to 7%; reduces construction and management costs; resource consumption, therefore increasing interior space sales and lease value. Alessia *et al.* (2019) continues to assert that adopting green concepts increases retail sales of building spaces by 15-40% higher when compared to conventional buildings. Therefore, the conclusion was that green heightens property/space absorption rates to less than half the usual time (Ankeli *et al.,* 2020).

Findings show that a 2% minimum rise in cost of funding a green design results in a life cycle savings of 20% of the total construction costs. These were observations by Kimani and Kiaritha (2019) in a study based in Kenya together together with Windapo and Alireza (2020) in South Africa. Further, studies by Ojo-Fatore *et al*. (2018) and Terrapin (2012) agree that adopting green concepts achieves savings indirectly on health bills, in that hospital stays are shortened by 8.5%. Moreover, users of green buildings are 18% more productive at work, while students' performance in such environments significantly improves by 5-20% in test scores (Faris & Abdulqadir, 2019; Pulay, 2010). Lastly, adopting green buildings creates avenues for growing new business opportunities, research, and innovation ideas (Wakhungu, 2021).

2.1.3 Government Support for Green Adoption

To experience the above-mentioned benefits and, in turn achieve the 100% zero carbon goal by 2050 (WGBC, 2017), countries such as the USA, UK, Canada, Germany, Japan, China and South Africa set targets to green 75% of their new public and private large scale buildings by 2030 (EU, 2020; UNEP, 2021). The Kenyan government too, set a similar target and is committed to achieving it. The commitment was confirmed by Kenya’s ratification of international environmental protocols. The protocols include the African Union Agenda 2063 with its aspiration for sustainable development (Otieno, 2018). This move would enable lowering of buildings' negative impact on both users and the environment. Additionally, it would contribute to achieving adaptive and mitigation measures outlined in Sustainable Development Goals 6, 7, 11, and 13 (UNDAF, 2018-2022). The USA a step was further taken to make green certification mandatory before building plans are approved. This step is facilitated by Leadership in Energy and Environmental Design (LEED) organization formed by the United States Green Building Council (USGBC). The body was mandated with evaluating buildings' environmental performance and promoting sustainable building designs (Morris, 2012). The US government also offers grants and incentives to Interior Designers keen on adopting green concepts (Kubba, 2012; Kang & Guerrin, 2009).

The adoption of green building has continued to receive a lot of government support worldwide, especially in developed nations. Maomen (2016) highlights some major building projects in the world that have adopted the green concept and includes: Richard Buckminster's geodesic dome (Manhattan City), Eden project (United Kingdom), Maison Productive House (Montreal, Canada), and Cool Paris project in France (Vinci, 2021), Kronsberg Village, Freiburg, and Vauban in Germany. These projects further confirm that this concept on green concept can also be practiced in a large scale (Coates, 2013). Germany no longer needs to use incentives as motivators to increase the adoption of green concepts. Sangster (2016) elaborates that the observation is because designers in Germany take initiative and pride in building green, though even their national building code stipulates mandatory requirements for green adoption (up to the local government level). Germany leads in the adoption and generation of renewable energy and its technologies, green roofs system, and initiatives on public awareness on green (Burszta & Wieslaw, 2019).

Fietkiewicz and Wolfgang (2015) reveal that adopting green buildings in Japan also enjoys governmental support, with significant projects such as Frei Otto and Kenzo Tange in Tokyo confirming the goodwill. Furthermore, the Japanese government awards loans at reduced rates and cost-of-setting subsidies as incentives to building owners who engage in energy efficiency retrofits. This gesture is a move by the government to adopt the much-lauded circular economic system pertinent to sustainable development. In China, plans are underway by the government to increase green buildings by 30% come the year 2030, with the concept of green now guiding its construction and financial sectors (Yan *et al.*, 2017).

In analyzing the progress made by South Africa's government in the adoption of green, Bank (2012) concludes that this concept was embedded in and characterizes her National Constitution and Building Regulations Act (103). Adopting green concepts in the country's building regulations, has enabled her local municipalities to device and implement unique green building standards. Simpeh and Smallwood (2018) add that the government in South Africa projected that with this Act in place; there would be an increased adoption of green buildings from 16% in 2012 to 52% by 2015. Fortunately, the prediction for green growth was achieved, as Windapo *et al.* (2020) confirmed. In Windapo *et al.,* the main drivers to the growth of green were attributed to the existence of: legislation, rating systems, and competitive advantage, which had mostly stayed the same over the years. Ebekozien *et al*. (2021), in examining the promotion of green buildings across Nigeria (Benin, Abuja and Lagos), discovered need for government support in creation of legislation and policy framework. The finding confirms Nigeria's minimal government support for green building despite high demand for it by users in commercial buildings (Oladokun & Shiyanbola, 2021).

In comparing climatic conditions in Kenya with those of countries in the temperate/desert regions or those of South Africa and Nigeria, it is clear that it is not in the extremes. Yet, the South African government supports and provides policies to enable adoption of green in buildings. The government of Kenya supports green building too and this is confirmed by its ratification of related international environmental protocols. Such protocols include the Kyoto Protocol, 1997 on Sustainable Development Goals 6, 7, 11 and 13; Sustainable Building Climate Initiatives (SBCI, 2012) and African Union Agenda 2063 (AUA, 2015). At the national level, support for green building is directly provided for in Vision 2030 objective No.8 (GoK, 2007); 2010 Constitution Article 10(2d), 42, 43(1) and Kenya's Big-Four Agenda under the Affordable Housing tenet (EOI, 2018). The government has also partnered with organizations such as Kenya Green Building Society (KGBS), Climate Change Action (a UNEP initiative), the Board of Registration of Architects, and the Interior Design Association of Kenya to promote green building. Regrettably, even with such efforts, issues on green building are excluded from the

National Building Regulations Code (NBRC, 2014). Probably because they are often considered as issues, too complex to identify when compared to hazards like fire. Yet, they are liability concerns too.

Nevertheless, a few projects based on green concept exist in Kenya despite the challenges faced in its adoption. The numbers of green projects are set to increase, especially now that the government committed to greening 75% of its existing public buildings (Otieno, 2018). In addition, some private organizations have begun promoting adoption of green building by offering discounted personal loans especially for green energy solutions. However, in a study by Chanyisa (2021), it was revealed that the loaning process also has challenges. Chinyisa asserts that in Kenya, access to green energy financing was challenged by the following: in-uniform borrowing requirements and repayment terms, higher interests, and too much documentation by local financial institutions. These challenges discouraged those seeking to adopt/invest in green energy such that they only sought assistance from credit facilities as a last resort. Park (2022) concurs with Chinyisa's finding in a study that examined the theory and practice of green energy entrepreneurship in sub-Saharan Africa. Banking institutions tended to shy away from lending to ventures they deemed unfamiliar/risky such as green building.

The Kenyan government supports green building and has even unveiled 'green bonds' by the National Treasury for sustainable-green investments. The government offers a 100% tax exception on interest income from bonds and securities to raise green building projects' financing (NTP, 2021). Further, the government has scrapped import duty and value-added tax on renewable energy and related green products for buildings (Otieno, 2018).

However, despite all efforts there is need for the government to strongly offer support for an increased adoption of green. FSD (2022) observes that much of financial support for green focuses on mitigation activities on climate change rather than adaptation. This therefore, creates a gap in financing adaptation activities, of which green building is one of them. Other efforts to support green by the Kenyan government has been in green/clean energy that is generation of electricity from wind power at Lake Turkana Wind Power Plant since 2019. The plant is Kenya's largest renewable energy project producing 310 MW from 365 turbines. This generation will reduce electricity costs by 7-10% and lessen power shortages by 12.5%. Other green energy projects include Ngong Wind and Garrisa Solar projects (Mizner, 2019). Unfortunately, Kenya's move to enable energy efficiency as embedded in sustainability protocols seems still far from being achieved. This is because the National Building Code - 2014 still needs to incorporate mandatory energy efficiency requirements. Thus, even the Big Four Agenda on providing affordable mass housing (500,000) may not achieve energy efficiency aspects that would enable low-cost living as envisioned in its initial affordability measures. Lastly, in support of green building adoption, Kenya's State Department of Housing formed a Memorandum of Understanding with county governments for Affordable Housing Projects. In that agreement, the developers who win bids for the housing projects would obtain free land for construction if their designs and construction activities are in line with EDGE-green building standards (Menes, 2020).

Many of the studies based on the developed nations (Fietkiewicz & Wolfgang, 2015; Coates, 2013; Morris, 2012) intimate immense support given by their government to promote the adoption of green building. This is unlike the situation in developing nations where literature (Otieno, 2017; Park, 2022) has it that more still needs to be done to show support for green building. Otherwise, there exists a gap/need for more outstanding sensitization and motivation by these governments and their counter parts in the private sectors. More needs to be envisioned in order to incentivize building professionals and developers to adopt green buildings and discourage the practice of non-green buildings. Despite all the support provided by governments in the promotion of green building, there still exist challenges to its uptake worldwide, as depicted by studies worldwide (Karji *et al.*, 2020; Khalfan *et al.*, 2015). This provided basis upon which this study examined the unique factors influencing green adoption among building professionals (interior designers) locally.

2.1.4 Green Building Concepts

Adopting green concepts remains a significant solution to reducing consequences of sick buildings and their negative impact on the environment. Green concepts are adopted in the design/construction/re-modelling phase of a building’s life-cycle. The adoption of green increase resource efficiency, curbs resource depletion, creates quality healthy environments (free of SBS) and reduces effects of climate change

(Oladukun & Shinyanbola, 2021; Aram *et al.*, 2019). The strategies for green in buildings are either passive or active and include: exterior shading devices, siting of deciduous vegetation, insulation to control interior heat and noise, cross-ventilation (Plate 2.2), daylighting, light-coloured interiors, atrium (Plate 2.0), windows/skylight (Plate 2.1 (Yan *et al.*, 2016; Alessia *et al.*, 2019), and controlled high-performance artificial lights (intelligent devices, sensors, and dimming controls). The concept green also include use of low reflecting surface materials, humidity controls, indoor pollutant mechanical flushing, air purification filters to prevent outdoor pollutants, air quality monitoring systems and prevention of interior pollution migration (David *et al*., 2018; Fisk, 2015; EEBA, 2018). The use of low-pollutant-emitting materials, energy-saving windows/door treatments, alternative/green energies and moisture-resistant paints are considered green (Yan *et al*., 2016; Kubba, 2012; Sotiris *et al.*, 2015; Feliman and Nelishman, 2018). Examples of strategies of green concepts that were adopted in buildings are as explained hereafter.

Plate 2.1 depicts a green concept, atrium on the ground floor of a building. The atrium opens up to the top of the building and enables natural lighting and ventilation within the building interiors.

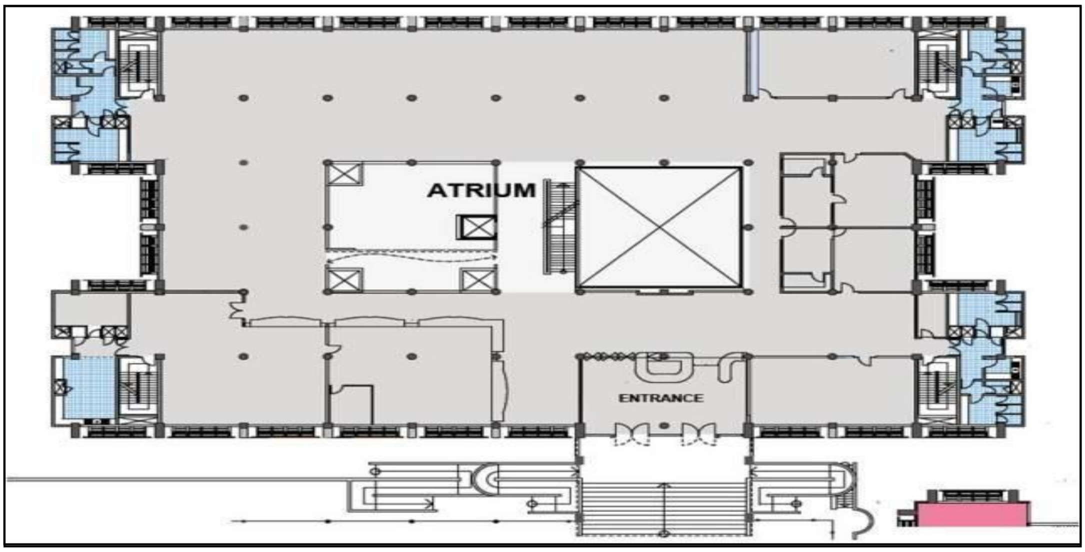


Plate 2.1: Atrium Adopted in the Plan of Resource Learning Center: Catholic University of Eastern Africa, Kenya *Source: http://buildesign.co.ke/the-lrc/*

Plate 2.2 has an illustration of a passive green concept known as a skylight window and an atrium. The concept uses no energy but allows for exploitation of natural day lighting to illuminate the interiors directly beneath the element as shown below.

Plate 2.2: Skylight window and an Atrium
Source: https://www.google.com/search?q=skylights+window&source=lnms&tbm=isched

Plate 2.3 illustrates interplay of passive green concepts that include natural ventilation and lighting. This enables conservation of energy and preservation of the natural environment while creating healthy interiors for its users as illustrated below.

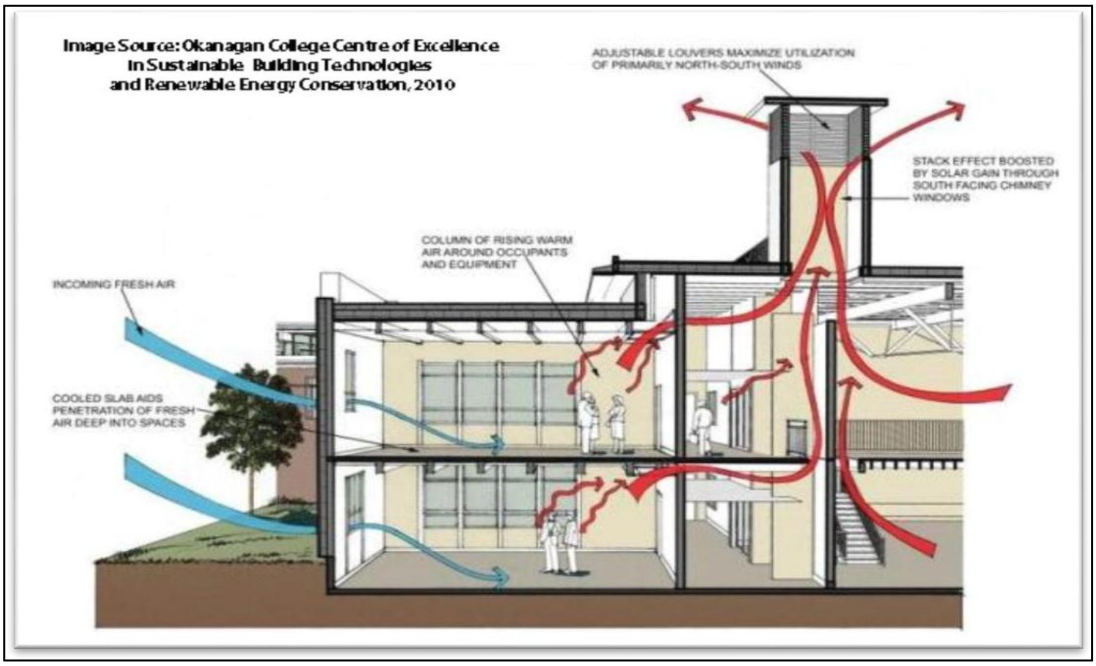


Plate 2.3: Cross Ventilation Aided by a Cooling Tower
Source:https://www.google.com/search?q=passive+technology+for+ventilation+cooling+tower

Plate 2.4 illustrates an interior designed to adopt both an atrium and elements of natural ventilation to enable cross ventilation (Mahdavinejad *et al*., 2014; Yan *et al*., 2016; Ambole, 2016). This saves energy and in the long term reduces the building's operation costs as well as creates a heathy interior environment for the well-being of the users. The dominant principle employed when designing the natural cross-ventilation system is air within the space gets warmer and rises out of the space via the openings. The warm air floats and finds its way out of the ventilation tower design with louvers at the top of the building. The cold air enters through the openings in the wall to replace the warm and the cycle of fresh air continues without mechanization that normally consumes a lot of energy (Hariri, 2016). The principle was illustrated in the diagram hereafter:

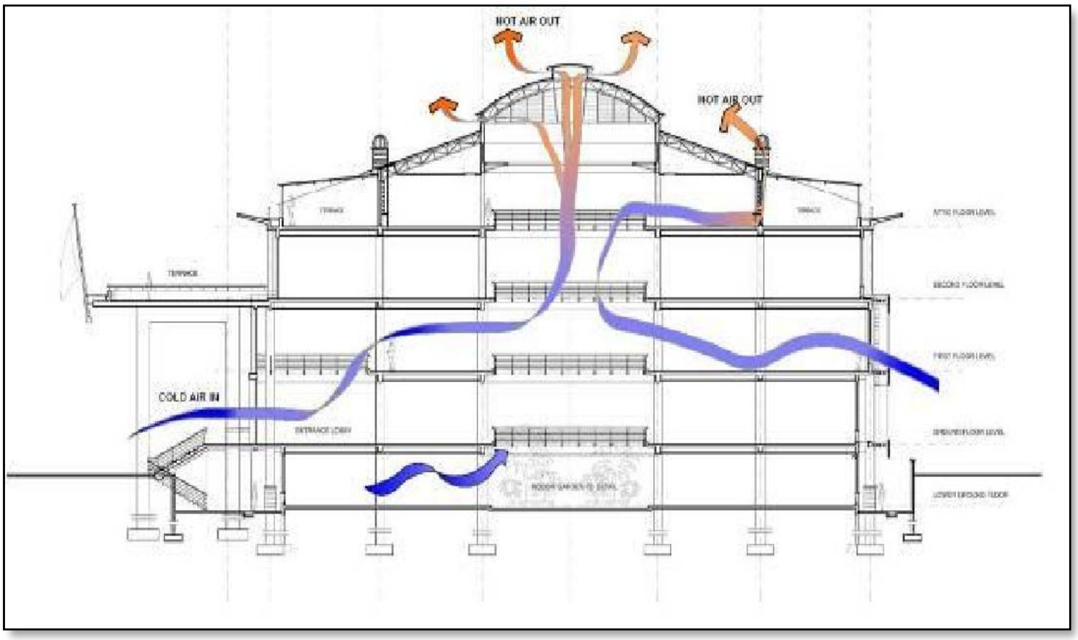


Plate 2.4: An Atrium and Cross Ventilation Strategy
The Resource Learning Center, Catholic University of Eastern Africa, Kenya
Source: http://buildesign.co.ke/the-lrc/

Other green strategies aimed at achieving water efficiency include use of efficient water fixtures and plumbing designs, leakage monitoring devices, sewage volume reduction (Plate 2.5), recycling/re-use of grey wastewater and rainwater harvesting as illustrated on Plate 2.6 (Mahdavinejad *et al*., 2014; Yan *et al*., 2016; Ambole, 2016).

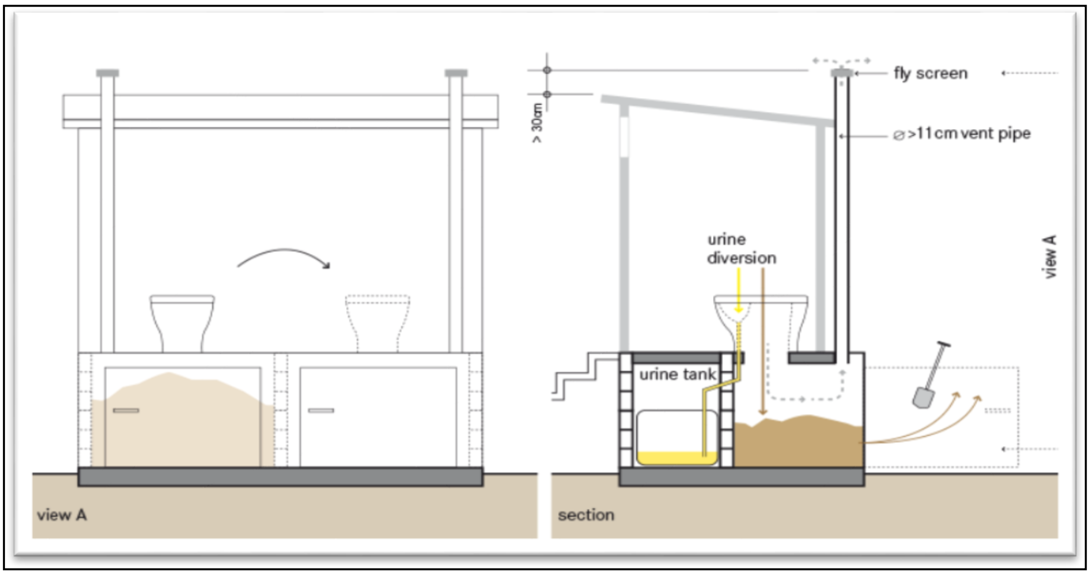


Plate 2.5: Urine Diverted Waterless Toilet
Source:https://upload.wikimedia.org/wikipedia/commons/3/3a/Schematic_of_the_Dehyd

Plate 2.6 illustrates simple design used in domestic rainwater harvesting that supplements domestic water consumption within the building as shown below:

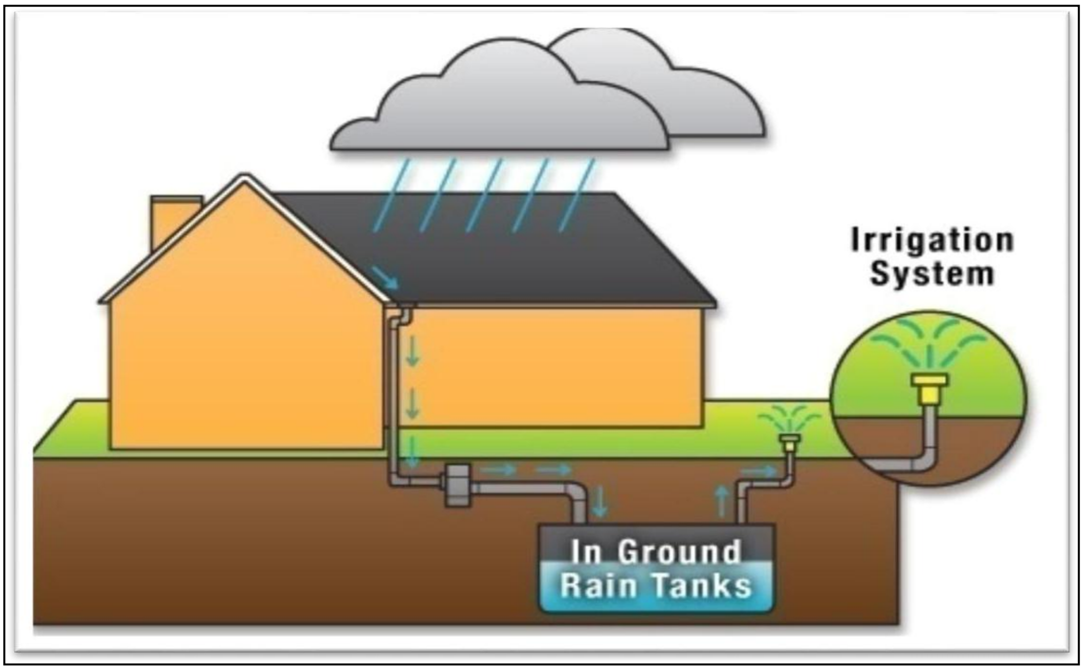


Plate 2.6: Rain Water Harvesting
Source: https://tunza.eco-generation.org/file/rain_water_harvesting_chart.jpg

In selecting materials, adopting green would be by use of products and finishes that are natural/live (Plate 2.6), recyclable, easily maintained, salvaged from waste (Plate 2.7), high performance, locally sourced, of industrial modules, standard sizes, low emission, and optimized life-cycle cost (Hussein *et al.*, 2017). Green concept within interiors also considers quality space performance such as good ergonomics, universal designs, bio-mimicry/organic architecture (Plate 2.8), functional technological change (design for flexibility), and biophilia. The key factors determining green strategies are basic sustainability principles of: reduce, renew, recycle, re-use, recover, delay, avoid and re-model as emphasized by Sadi *et al.* (2012).

Technological procedures involve using green rating tools such as LEED, Building Environmental Assessment Methods (BREAM), and Building Intelligent Modeling (Bacon, 2011; Kubba, 2012). Some images showing green strategies are as discussed in Plates 2.7 and 2.8 that follow:

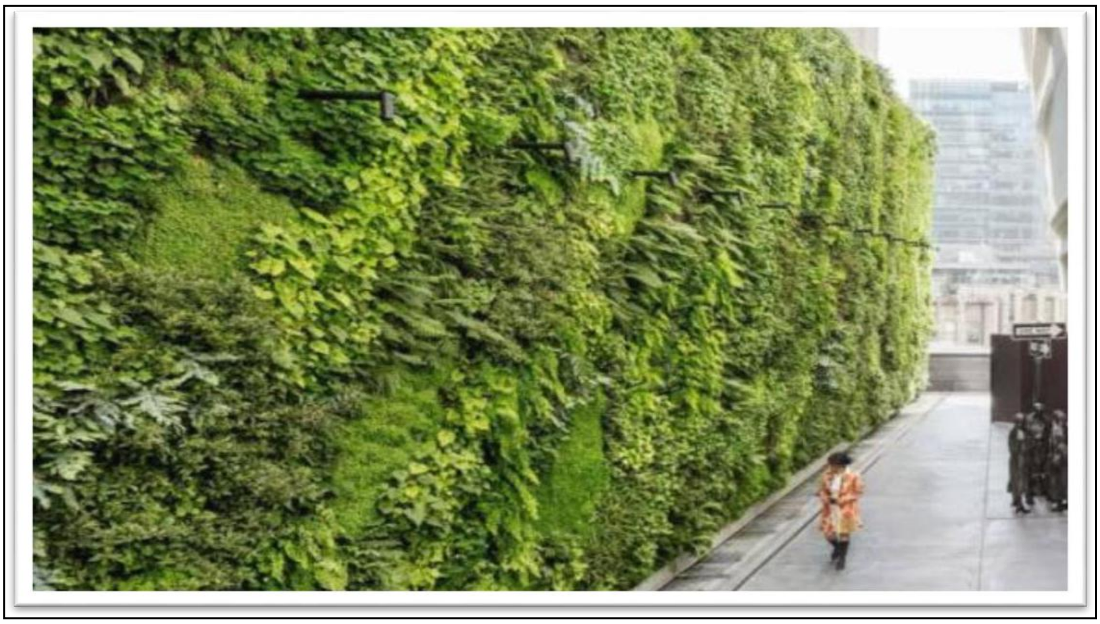


Plate 2.7: Natural Materials Live/ Processed (Green Wall in a Mall in Sydney, Australia) *Source: https://www.thefifthestate.com.au/columns/spinifex/turf-wars-13-reasons-*

The green concept of re-use was illustrated in the business that sells used materials as shown in Plate 2.8 that follows:

Plate 2.8: Materials Salvaged from Waste (An Urban Salvage Business)
Source: https://www.abc.net.au/news/2017-07-02/hobart-co-op-wants-builders-to-recycle-site-

Lastly, the other green concepts illustrated by Plate 2.9 are those of biophillia and biomimicry used to inform designs of the following buildings.

Plate 2.9: Biomimicry and Biophilic Architecture *Source: https://www.google.com/search?q=building%20biomimicry&tbm=isch&hl=en&sa=*

2.1.5 Comparing Green to Conventional Buildings

The interiors of a building are designed to follow either a conventional or a design in green concept. Usha *et al.* (2021) assert that traditional design approaches major on function and aesthetics to guide a conventional building design. In green buildings, however, environmental considerations are the main focus. Further, Achini *et al.* (2017) compared green buildings to conventional ones in Sri Lanka and found a significant impact of adopting the concepts on the life-cycle cost of buildings. The quantitative analysis used a net present value that exhibited that the construction cost of green buildings was about 28% higher than those of conventional. However, it is vital to note that operations, maintenance, and end-of-life cycle costs of green buildings are up to 41% lower than in conventional buildings. This advantage focuses on something other than the negatives of the initial high costs of adopting green. The initial high cost is an aspect of green that has discouraged building stakeholders from its adoption. After examining 160 office buildings in Germany and relativizing that adopting green concepts significantly paid- off, Christian and Jona's (2018) finding concurred with that of Achini *et al.* Christian and Jonas attributed the results to excellent environmental certifications that currently exists in Germany.

The construction of green interiors costs 37% more than that of conventional ones, although the overall operational and maintenance costs remains low. Therefore, adopting green results into 30% savings throughout a building’s life cycle . These are findings established by Achini and Thunuja (2018) in an Indian-based study, whose observations agreed with those of Alessia *et al*. (2019). In addition, an Italian-based comparative study indicates that green buildings attracted higher market values, sold faster (half the time) and had lower maintenance costs than the conventional ones. In Malaysia, there were better energy-saving practices in green buildings than in conventional office buildings (Nurul *et al*., 2015).Possibly because there exists a conscience linked to environmental preservation in the users. Surprisingly, findings show much satisfaction with the interior spaces by users in both categories of buildings, as no statistically significant difference was observed in the different categories sampled.

Jonsson (2019) used the Mann–Whitney (rank-sum) test to compare the perceptions on the overall satisfaction of users in green and conventional residential buildings

(Switzerland) concerning Indoor Environment Quality (IEQ). Also, findings showed that the initial construction costs of green buildings would be perceived as high but, over time, it payed back. This discovery concurred with those of Slabbert (2013) made in an inquiry based in South Africa. However, Habitat (2010) was of a different view in arguing that strategies for green concepts do not necessarily make interiors economical. They only serve to create a positive psychological and social experience that raises their market value. Ayalp (2013) and Mahdvinejad *et al.* (2014) continue to affirm that buildings that have adopted green concepts were efficient, produced less waste and experienced low tenant turnover during their life cycle. In comparing their energy performance to those of conventional office buildings in Kuala Lumpur, Malaysia, Suzzaini *et al.* (2017) concluded presence of a significant gap in their performance, with green being better.

Further, Taslima and Salina (2019) examined the financial performance of selected commercial banks that offered green financing in Bangladesh between 2012 and 2014. The study found that the banks are still far from fully meeting the green/sustainable policy requirements. However, they preserved the socio-cultural aspects of the policy and thus practiced sustainability to some extent.

Alec *et al.* (2012) analyzed the cost-effectiveness of the heat recovery ventilation technology inter-grated within Lincoln on the Lake (South Africa), against a direct-expansion ducted system of conventional practice. Using a life cycle cost analysis the study determined if the green option was better. The findings showed that green measures were more cost-effective over a period of 20 years when compared to that of a conventional building system. In Peng and Deng (2017) investigating the effects of conventional building on learners in China's education centres, findings showed that it lowered productivity and learning abilities of students. This was because conventional buildings host high levels of pollutants within that reduce learners' concentration rates. Aloyo *et al.* (2020) also concurs with Peng and Deng's with findings confirming that a schools' physical environment and the quality of its facilities enhance learning outcomes in secondary school learners. The discovery was established in a case study survey that involved 39 secondary schools in Nairobi (Kenya). Langat's (2016) survey in Nairobi involving 5-LEED-certified building interiors confirmed that users' productivity and satisfaction in green spaces achieved satisfaction and a production rate of 65%.

Generally, the researches reviewed, except for Habitat (2010), revealed that green buildings paid-off significantly when compared to conventional ones in the aspect of economics and the quality of environment created. The majority of variables in those researches were mainly those that interrogated the economic (Taslima & Salina, 2019; Achini *et al*., 2018) and social (Aloyo, 2020; Langat, 2016; Jonsson, 2014) aspects of sustainability in buildings. Therefore, the researches mainly ignored and under-represented the environmental aspect of sustainability Seemingly, many studies (Alec et al., 2012; Suzzaini *et al*., 2017) emphasized and examined buildings' element such as energy consumption but, ignored other indoor air quality elements (IAQ). Yet, all of the elements work in tandem and contribute to enhancing the quality of buildings' performance/ sustainability. Some researches compared the levels of green adopted in different building categories though many were internationally based therefore, confirming the need for studies that provide a local perspective to green adoption. The methodologies used in past researches were primarily quantitative, and so need for an integrative approach that included qualitative methods for comprehensive results.

Owing to the gaps mentioned, this study filled in the gaps. This was by providing comprehensive information focused on the environmental/green aspect of sustainability. Availed information compared and emphasized all the elements of IAQ in detail while, contrasting them in the different building categories.

2.2 Variables of Green Concept

Adopting green concepts into various design elements of building interiors increases their level of Interior Environmental Quality (IEQ). This subtopic discusses the adoption of green concepts under three integral design elements that constitute buildings interiors Indoor Air Quality (IAQ), water efficiency, green materials and technology. These three fundamental elements also constituted the variables of this study.

2.2.1 Indoor Air Quality (IAQ) Elements

The Indoor Air Quality elements comprises of provision for thermal comfort, lighting, acoustics, ventilation and ergonomics whose discussion immediately follows.

2.2.1.1 Thermal Comfort

Several attributes act as indicators for green in the provision of IAQ and all are energy consuming. They include aspects of acoustics, lighting, thermal comfort, and technical space performance (Yan *et al.*, 2016; LEED, 2019). The IAQ elements can be manipulated and improved in specific capacities using the concept of climate envelope over a scale beyond the cover of one building. The climate envelope encompasses many buildings within a city, an occurrence observed in some developed nations. Adopting this modern green concept was inspired by Richards Buckminster geodesic dome. The dome envelopes buildings in a span of up to 2 kilometres under transparent photonic membrane. Thus, lowering a city's climate temperatures by 5-10 degrees. Interestingly, residents/users of such envelopes are kept visually connected with the climate outside but thermally, acoustically, and pollution-wise insulated. Existing examples of such envelopes/domes include that of Eden Project (United Kingdom), Stadt-in-der-Arktis (Tokyo) and Cool Paris in France (Maomen, 2016).

Yaolin *et al.* (2021), inspired by the geodesic dome principle, presented a trio-optimization approach to enhance design solutions regarding the building shape and its envelope properties. The study considered their implications in providing thermal comfort, visual comfort, and energy consumption in buildings. Garba *et al.* (2015) further revealed that a building's energy costs usually constituted 25% of a building's total operating cost. However, employing climate-sensitive designs that integrate appropriate and avail green technologies can reduce heating and cooling energy needs by 60%. Deng *et al.* (2021), using questionnaires and a building energy simulation program, investigated the impact of air conditioner operation on the energy consumption/savings of a model building. The model had different types of thermal insulation for the exterior wall. The findings indicated that air conditioning operation behaviour was influenced by human thermal experience. In addition, under continuous energy usage mode, the exterior thermal insulation's heating and cooling effect was better than the interior thermal insulation.

In considering the perovskite-based building-integrated photovoltaic, a single box model of 4x4x3 m^3 illustrates a viable solution to a zero-energy residential building for the Wuhan urban area in China. Gong *et al.* (2020) further discovered that a high ratio of facades on tall buildings achieved a higher estimation of energy gains from the solar cells mounted on them than, those on rooftops. Compared to perovskite/silicon tandem solar cells, the perovskite single-junction solar cells boost the annual energy gains by more than 1.5 times on the facades. The latter is less angle-dependent, even if their efficiencies under vertical illumination are lower than the former's. Wang *et al.* (2022), to reduce energy consumption in Beijing (China) subway stations, conducted field studies designed and developed an autonomous control system for saving energy in Heat Ventilation and Air Conditioning Systems (HVACs). When energy consumption features and load signatures of the systems were investigated, the results showed reduced consumption in the range of 20% to 38% more than that of a conventional control strategy. These findings concurred with those of Zhou *et al.* (2020).

Enhanced thermal comfort improved users' work productivity and physical well-being if appropriate humidity levels were between 50% and 70% and temperatures were between 680^0 F to 740^0 F, as upheld by ASHRAE Standard 62.1-2016. Salah *et al.* (2020) confirmed this aspect by identifying that most important Architectural Building Design Parameters (ABDPs) was achieving thermal comfort while reducing building energy consumption. These findings were from a study based in an Australian educational lecture theatre of which variables were, cooling set-point temperatures and roof construction. The green concept lowered operative temperature by up to 14.2% and 20.0%, respectively. Salah *et al.* used Monte Carlo technique to sample 2000 simulations that were analyzed using Sensitivity and Uncertainty analysis to confirm those findings. Consequently, the findings imply that temperature reductions significantly shortened the thermal discomfort hours, thus reducing energy consumption by 43.7% and 41.0%, respectively.

Interestingly if given the deserved attention, these findings may enliven building designers to focus on ABDPs with a substantial impact on thermal comfort and energy consumption. On the other hand, Aiman *et al.'s* (2021) findings, compared differently. In that, the research was conducted to determine ABDPs that contribute most to making residential buildings more efficient in Jordan (Azraq), Middle East. The area is in a hot desert climate, and using Design Builder software for analysis, Aiman found essential ABDPs as window-to-wall ratio, type of shading, ground floor building, the natural rate of ventilation, glazing, and flat roof structure as the primary influence of thermal comfort, unlike findings in Salah *et al.* (2020).

Mechanical and passive systems can be used separately and in combination to provide thermal comfort. Maomen (2016) advocates combining the two systems to reduce interior temperatures by 80%. Maomen observes that mechanical methods involve heating, ventilation, and air conditioning (HVAC) systems while passive systems engage vernacular evaporative cooling techniques, which are inspired by ancient Egyptian architecture. They include the integration of water ponds in courtyards, use of porous water pots, clay jars, water chutes in wind-catchers, roof ponds and burlap bags. Generally, Mateus *et al.* (2017) found nothing new/unique with the vernacular green concepts that Maomen advices on and that their adoption already dominated traditional buildings in hot, humid climates. This was especially in areas such as North Africa, Southern Portugal, and Middle East countries. Thus, there was need for stressing adoption of passive green concepts not only in traditional but also modern buildings.

There is an emerging trend of inefficient building designs in Sub-Saharan Africa. A trend that Ndichu (2017) avers that modern building design in Nairobi situated in tropical climates unwittingly imitates those of North European and North American regions, designed for cold and temperate climates. These designs are of concern since they take no thought of differences in climate and rely heavily on energy to provide indoor comfort (i.e. cooling, heating & lighting). These were findings of a Nairobi based study exploring ways of enhancing thermal performance in View Park Towers. The results showed that sun-shading devices were minor parameters in providing thermal comfort, unlike Window-to-Wall Ratio (WWR), glazing, and wall thickness. These results contradicted those of Kiamba (2016) obtained in a study aimed at exploring ways of improving the thermal comfort and performance of office buildings in the warm, humid city of Mombasa. Kiamba's discovery from a parametric study showed external shading was the most effective green strategy since it reduced solar heat gain via glazing. Nicole *et al.* (2020) added that inefficient designs coupled with inadequate materials, minimal adoption of passive building principles and energy-conscious performance had led to an increase in energy waste.

International Renewable Energy Agency equally confirmed the above observation. The agency reported that there had been a steady increase in energy consumption for cooling buildings in Africa (WGBC, 2017). For instance, buildings alone consume 56% of electricity generated in Kenya. The consumption is more than that of the transport and industry sectors together (EEBA, 2018). Therefore, advocating for use of alternative/clean energy in buildings would be a crucial green strategy in reducing consumption that has steadily been increasing. The World Bank reports popularization of green energy and that by 2017, 30% of Kenya's initially off-grid households had acquired a solar product (Otieno, 2018). Even with the increased adoption of green energy, designers in Kenya need to recognize and intentionally work to achieve energy efficiency in both conventional and green buildings.

More paramount was that building designers should understand appropriate green concepts compatible with their climatic areas. This is because adoption of green concepts is specific to dynamics operating in a region. Khaemba and Mutusune (2014) identified that achieving energy efficiency using daylighting/alternative energies (solar, geothermal, wind) was Kenya's most popular green strategy. This was established in a survey that involved 347 conveniently sampled architects and quantity surveyors. The discovery concurred with those of Slabbert's (2013) that were based in a developed nation. Although Khaemba and Mutusune provided some insight into building designers' perceptions, the approach would have increased validity if the methodology had incorporated observation of building.

Most of the researches reviewed featured the technical aspects of energy consumption and green designs in providing thermal comfort. The studies were carried out in areas extreme climate conditions, either very hot or cold, which were unlike local conditions in Kenya that are usually average. The methodologies of these studies (Gong *et al.,* 2020; Deng *et al.,* 2021; Salah *et al.,* 2020) employed an experimental and a scientific approach that majorly included simulations of building aspects and not actual observations of the building elements. Although Ndichu (2017) was Nairobi based, it provided information on the adoption of green concepts crucial in enhancing buildings' thermal performance, it needed to provide information on the extent of green adoption before the enhancement. Thus, the current study remedied the gaps by using a survey that involved observing existing buildings and information recorded on a checklist. This study was also based in Nairobi (Kenya), an area with moderate tropical climatic conditions. In addition, a much larger sample population was engaged in the study than was involved in past studies. This approach enabled the gathering of unique, comprehensive, and diverse information.

2.2.1.2 Lighting

Maomen (2016) reports that integrating natural/daylighting and adequate lighting in building designs enhances the quality of interiors and supports users' physical and psychological well-being. Using daylighting is more advisable, although where it is insufficient; augmenting it with artificial lighting is advised. Maomen continues that daylighting offers benefits by providing healthy interiors, comfortable room temperatures, and illumination levels. This results in ease of task performance, thus increasing productivity and aesthetics of spaces by enhancing perception of spaciousness (EEBA, 2018). Daylighting, therefore, enhances/aids provision of energy efficiency and also reduces emissions of atmospheric pollutants. Angelaki (2021) assessed daylighting techniques through dynamic energy simulation with hybrid and natural lighting systems optimized along with the role of shading devices. The European and Greek building stock focusing on residential buildings were of interest. A virtual south-facing building model in Thessaloniki was developed, emulating the residential buildings with external solar shading devices. In comparing the simulation results, findings show that the highest energy reduction was recorded when the sensor was positioned in the middle of the building area. Of the two different commonly used external shading devices, overhangs showed better performance than blinds. Although overhangs are not popular shading devices due to their construction costs, bulkiness, and expertise needed, when compared to blinds.

Natalia *et al.* (2020) suggested Energy-Plus as a viable analytical tool to aid in designing decisions that enable rapid calculation of multi-criteria analysis (wall reflectance, window size, position, visible transmittance of glazing, and room width). In addition to validation for daylight harvesting capabilities of building designs, findings showed that Energy-plus categorized solutions satisfactorily with errors within a 20% margin. Thus Energy-plus was effective and suitable for aiding the search for low-complexity facade design solutions. Hegazy (2021) introduced an approach of creating Perceptual Light Maps (PLMs) to visualize day lighting perception in architectural spaces. The study examined Kimberll Art Museum in Japan. The method was validated using building users' perceptions.

The users were divided into two groups with a sample population of thirty-six subjects and recordings made on a 5-point Likert scale. The findings showed that perceptions in reality and those compared to PLMs generated a significant positive correlation. The implication was that Perceptual Light Maps enabled the evaluation of daylighting perception in the same manner as in real space and inspired efficient lighting designs.

Oladukun and Shinyanbola (2021) found that most users of commercial buildings in Nigeria (Lagos State) demanded for green energy features when compared to other IAQ elements. The outcome was primarily because of the erratic nature of the power supply in the country. The authors recommended need for a government intervention in increasing adoption of locally manufactured green concepts. They are to be incorporated in commercial buildings and subsidized for use in the Lagos construction industry. Thus, it was vital to create the right environment by enhancing related policy. Further, adequate daylighting was highly advisable and to achieve it, Maomen’s (2016) in an Egypt based study, recommended a Window-to-Wall Ratio (WWR) of between 30-50%. Wan (2021) further added that daylighting is a factor of the local climate and is influenced by the surroundings of a building, its orientation and location. Failures in designs of buildings should be minimized by avoiding: poor class orientation, double-loaded buildings with single-sided windows, small glazing area, low window placement, low light reflectance and inappropriate glazing material.

However, the results of a study done in Kenya by Nicole *et al.* (2020) and Green-Mark (2019) recommend a WWR of above 40%. This allowed for ample daylighting within interiors and reduced demand for energy and artificial lighting, especially for countries situated in tropical climate. Yan *et al.* (2016) further reiterated the need for: user-friendly lighting control systems, glare control, outdoor views, efficient artificial lighting and use of renewable energy as vital in creating quality interior environments. Butera *et al.*, (2020), in examining selected buildings in East Africa, concluded that to reduce heat gain in buildings in the region, it was crucial to design narrow floor plans that adopt water features in interiors. Such designs maximizes daylighting, cross-ventilation and passive cooling for indoor comfort while at the same time reducing energy needs by up to 30%.

On reviewing past literature, much information on lighting was from international studies based in developed economies. In such nations, green building is already streamlined in their construction policies unlike in developing ones where it is still in its infancy.

2.2.1.3 Ventilation

The use of natural ventilation as a green concept serves as an alternative to the mechanical air-conditioning system. The concept has been effectively employed in high-rise office buildings in Western countries. Erdem *et al.* (2019) explored the possibility of using natural ventilation in school buildings with case studies carried on the Queens Building (De Montfort University) and the Liberty Tower (Meiji University). The research involved simulation for an ecological dormitory building in China. They concluded that single-side ventilation and cross-ventilation had a 40% enhancement for quality in cooling and ventilation in school buildings. This applied to all buildings used for different purposes, as long as the height and depth of the spaces were appropriately designed. In addition, solar walls and solar chimneys should be adopted to enhance natural ventilation quality based on the principle of stack effect. These recommendations agree with findings of Maomen's (2016) carried out in the Red Sea area of Egypt on natural ventilation. Maomen emphasized that combining the two concepts (fenestration & atrium) including ducted and aperture openings for cross ventilation achieved better results. The combination saves up to 38% of energy needs.

The concept on natural ventilation also reduces and effectively protects building users from airborne disease transmission. This was proven by Sowoo *et al.* (2021) in a in Korea-based study that analyzed the natural ventilation performance of a school building. Sowoo *et al.* used a Tracer gas decay method with Coronavirus 2 (SARS-CoV-2) with infection risk assessed using the Wells-Riley equation. The results showed that the infection probability was less than 1% in all cases when a mask was worn, and more than 15% of the windows were open with cross-ventilation. However, with single-sided ventilation, if the exposure time was less than one hour, the infection probability was kept at less than 1% if a mask was worn. Therefore, combining natural and concepts on mechanical ventilation offered better quality air standards. Yuzhen *et al.* (2022), in a study aimed at systemic review of hybrid system controls for mixed-mode building, used a meta-analysis of controls, case studies, platforms, and building performance involving buildings across 15 climate zones. Notable from the studies reviewed was that majority of the case studies were simulation-based. Thus, experimental in approach with results providing some limitation in terms of informing the interior design field. This prompted the need for the current study to perform actual evaluation through observations of the imagined interactions between the IAQ elements.

Natural Ventilation and lighting are vital for quick healing and recovery in the hospital wards. Adebayo *et al.* (2022) revealed this in a research involving Ota Ogun State of Nigeria hospital wards. Additionally, findings indicate that fatigue, diseases, insomnia, drunkenness, suicide, and other psychiatric disorders are exacerbated by lack of sufficient natural lighting. Natural lighting minimizes patient suffering and increases patient satisfaction by raising oxygen and reducing systolic blood pressure. Full-spectrum light protects against viral and bacterial growth that causes illnesses while improving physical working ability, comfort, and spatial ergonomics.

Adopting bio-digesters as a green concept of reducing waste and producing green energy for cooking is yet to be made a popular strategy in East Africa. Harry *et al.'s* (2018) study highlights a situation where 27% of bio-digesters constructed between 2009-2013 in order to harvest biogas, laid unused. It was until year 2016 when Africa Biogas Partnership Programme raised a campaign through its call centres in Kenya, Uganda, and Tanzania to revive the use of these biogas plants.

Saleh and Saied (2017), in a Cairo-based longitudinal study, identified passive vernacular green concepts adopted in historic buildings, including extensive use of thick stones to provide thermal mass for insulation, light-coloured wall materials, wind-shafts for ventilation, large windows, atrium, corridor bends, water features and courtyards. There is great potential in adopting passive design concepts to enhance thermal comfort in residential and commercial buildings, even in tropical, hot, and arid climates. Projongsan (2014) further adds to the list of the passive green concepts: wing walls, double-skin façade, living walls while Al-Saffar (2018) identifies bio-philia and bio-mimicry. These authors argue that traditional passive features are local and original in concept and can provide original ideas, local identity, and style to building designs that otherwise ideas from the West had dominated. Notable was that the studies did not inform on levels or the dynamics of adopting the passive green concept their sample size (1) was too small to achieve adequate sample saturation, that is crucial in validity for purposes of generalization.

Although the climate in Nairobi (Kenya) is not to the extremes as those in places where past researches were carried out, there were evidence of green passive techniques adopted thein buildings. However studies by Aloyo (2015) and Tobias *et al*. (2018) make a crucial observation. That in the past, adoption of passive ducted (natural) ventilation systems had mixed success. The low adoption was due to lack of detailed and specific knowledge which made it difficult for policymakers and stakeholders to adopt and create clear Indoor Air Quality (IAQ) standards for them. Nevertheless, in another survey by the International Facility Managers Association, high tenant retention rates in buildings were attributed to adoption of green concepts that provided thermal comfort and ventilation. Aloyo (2015) further added that building occupants identified quality ventilation of interiors as paramount to their stay. Therefore, maintaining carbon monoxide levels in buildings at below 1000 parts per million was paramount. Installing gauge monitors was then crucial to the detection and reduction of carbon-dioxide excesses.

2.2.1.4 Acoustics

Standards and design guidelines show that the ideal classroom acoustic conditions of 35 dB ambient and 0.7s reverberation time are required for a suitable environment for teaching, learning, and other activities. Johnson (2019) observed this after examining the relationship between users and neighbourly noise levels in a Canada based survey among 1084 adults living in 2-green and conventionally designed buildings. Results showed that acoustic quality based on neighbourly noise determined the level of satisfaction expressed by the occupants. Most noise levels measured were between 27.7 and 75.3 dB, with higher levels recorded in living rooms than in bedrooms. The acoustic quality of the apartments depended on location and design of the building. Thus, greening of façades, designs of balconies, type of construction materials, and finishes influenced quality of acoustics within interiors (Dimitrijevic, Zivkovic, Dobrnjac, 2017). Other studies by Frontczak and Wargocki (2011), Lee and Guerin (2009) and Radwan and Issa (2017) based in the USA and Canada among interior designers and three Manitoba schools, respectively, confirmed low considerations for acoustics when greening buildings. Studies by Coralie and Chrisna (2021) in South Africa surveyed five urban schools using case studies in a province. The aim of the study was to establish the primary source of noise in schools. Findings showed that outdoor noise levels exposed to traffic were 63.3 dB, and indoor noise level in the classroom was 58 dB. The levels were significantly higher than the noise level requirement. The conclusion was that South African urban noise levels in schools needed lowering to enable healthier class interior environments.

Interestingly, Simone *et al.* (2019) uncovered a unique perspective on acoustics and natural ventilation, and pointed out that indoor-outdoor connection enabled by ventilation openings is, so far, a limiting factor in interiors. Use of natural ventilation can conflict with other ventilation needs because of the intrusion of noise from external environment. Thus, naturally ventilated buildings fail to meet acoustic standards and rating protocols.

From a survey to establish levels of users' comfort in 5-green certified buildings in Nairobi (Kenya), Langat (2016) found that the slightest consideration was made to provide acoustics as a means of greening interiors. In addition, the perceived job productivity was at 65% in those interiors. Aloyo (2015) in a survey involving 13 schools in Nairobi confirmed an existing relationship between a school's physical environment and their academic achievement. In that the former affected the latter, implying that the quality of school buildings (acoustics, type of lighting and interior painting) positively affected students' academic achievement in Kenya. Past studies had highlighted the effect of building acoustics on users' comfort and psychological well-being. However, they did not reveal any details or extent to which it was adopted to achieve green in buildings. These gaps inspired the current study to use a different approach (observation) to establish and compare levels of green concepts (acoustics) adopted in different building categories.

2.2.1.5 Ergonomics

Considerations for good ergonomics within buildings enhance quality of interior environment. This makes interiors healthy and improves the well-being of users. Soujanya *et al.* (2020) stressed the importance of ergonomics upon discovering that, musculoskeletal disorder among ophthalmologists in India was relatively high. The intensity of disorder cases was significant enough to cause productivity loss as shown in 75% of the 377 participants that were surveyed. Owing to the discovery, Soujanya *et al.* recommended raising awareness on ergonomics among both building designers and doctors to avert the modern epidemic. Rozlina *et al.* (2013) adds that ergonomics as a design principle fosters quality human interactions, productivity, hygiene, and safety within interior environments. This was found in a study was carried out among 108 practitioners in manufacturing companies in Malaysia. The study was to determine the importance of ergonomics in a workplace. Hence, good ergonomics increases job productivity, health, safety and comfort of building users.

Edna, Danjuma, and James (2021), anchoring their study on the ergonomic theory of production and design, used a quasi-experimental design to determine the relative performance of office workers with ergonomically fitted furniture and space. The study was based in Nigeria's tertiary institutions. The findings conclude that there was increased work output among workspaces with good ergonomics. Thus, recommendations were that institutions should have well-furnished office spaces with appropriate technological devices and furniture arrangements for a higher job output.

Another finding reiterating those mentioned above were those of Mushobozia and Younghong (2019) analyzing the effects of lighting quality on the working efficiency of workers in Tanzania. The evaluation was carried out in four representative offices of the administration building at Mbeya University of Science and Technology. Most occupants were unsatisfied with the lighting quality, adversely affecting their work efficiency and well-being. This is because illuminance and its uniformity levels were below the recommended values of the Chartered Institution of Building Services Engineers. This reiterates the fact that productivity and work efficiency are dependent on good space lighting. Lastly, Kiprotich (2016) has observed that comfort and satisfaction heighten productivity of the users depending on their perceptions of office ergonomics. These research findings were results of examining the extent of perceived occupants' satisfaction with various elements of interior spaces versus productivity in four LEED - Certified buildings in Nairobi County.

In reviewing the past studies, it was evident that there were disparities in the methodologies used. This is despite their findings being similar though there exist a difference in their cultural and climatic settings as in Mushobozia and Younghong (2019) and Kiprotich (2016). Such occurrence challenges the credibility of either the results or effectiveness of the methods used. This prompted the need for this study that was based locally and, anchored on observations and not on a psychological link to ergonomics.

2.2.2 Provision for Water Efficiency

Population increase in cities and urban areas in developing countries is on the rise, thus escalating the demand for water and sanitation (UN DESA, 2019). Africa's water scarcity has worsened with time due to Climate Change. Unfortunately, Kenya was listed among those countries with water deficiency and low replenishment rates (Mutai & Ochola, 2014; IPCC, 2014). The high water consumption rates contribute to its growing commercial, industrial, and domestic demand due to the rising urban population and industrialization. Zuraini *et al.* (2019) confirm this in a research carried out in 13 states of Malaysia investigating the impact of economic indicators and climate change on water demand. The findings showed that total consumption per capita, agriculture, and population density positively impact water demand. Climate change is a sign of a pending increased demand for water resources especially during dry spells.

Water sources are also diminishing due to pollution resulting from chemical emissions, poor sanitation cultures and effluence, as indicated by Jing *et al.'s* (2019) study in China. The findings showed that chemical oxygen demand and ammonia nitrogen emissions were critical pollutants that required monitoring in China's water pollution management. Domestic and industrial wastewater sanitation was considered the next world problem, as there was a 40% drop in clean water sources worldwide. Hence, clean water sources may not be available by 2050 due to contamination, as revealed in a United Nations General Assembly dubbed the ‘Water Action Decade’ of 22nd March 2018.

Sewers and sewage treatment systems will only be practical in the present, especially in poor third-world countries. Peal *et al.* (2014) agrees adding that sewage systems are expensive to install, operate and maintain, especially in dense urban settings where the impact of poor sanitation is highest. Further, Kaza *et al.* (2018) indicates that residents in urban centres generate over two billion tons of waste yearly. In urban centres, economic growth normally reflects increased affluence among the resident population. That implies that the rising population can now afford a lifestyle of excesses, represented by the huge amounts of waste being produced annually. In Kenya, the anticipated Vision 2030's major housing developments will worsen the sanitation/pollution crisis by increasing the discharge of effluent. In addition, Heragu *et al.* (2017) especially noted that solid waste management remained a critical concern and a major challenge in the main cities of Kenya (Nairobi, Mombasa) due to weak institutional structures, capacity and enforcement of regulatory frameworks. Solid waste management is not only a problem in Kenya but worldwide too, as indicated by Wang *et al*. (2020) in China, Ghani (2022) in Malaysia, and Misgnnaw (2022) in Ethiopia. The observation was affirmed by KESHP 2016-2030, indicating that Kenya's sewerage cover was currently estimated at 12% with a low operation of 16% of design capacity because of poor maintenance.

The poor maintenance had resulted in untreated effluent being discharged into clean water sources risking the health of half of the population that ends in death (58000 persons die annually and by 2015 associated mortality rate was at 19.3%). IHME (2015) confirms that Kenya’s poor sanitation and hygiene situation was linked to 75% of the country's disease burden. WHO (2022) mirrors the same finding indicating that 829,000 people in poor and middle-income economies die annually. This is due to inadequate water and sanitation practices and this represented 60% of the diarrhea-related deaths. In addition, by 2020, 45% of the household waste-water generated globally was being discharged without safe treatment.

Similar challenges plague Nairobi City County water supply and sanitation and they include scarcity, low quality and inconsistent supply of the resource. In addition, water sources are threatened by human activities, such that even during rainy seasons, users contend with water rationing (Otieno, 2018). Fortunately, the government recognizes existence of these problems and has since urged the adoption of green concepts to provide for efficiency in water use. The government further entrenched the concept green in the Water Act of 2002(Cap 372) that regulates use, management, conservation, and control of water resources. Green is also entrenched in Kenya's Vision 2030 goals. For instance, the government's support for rainwater harvesting (green concept) came from the realization that supplying piped household water from a centralized place was unrealistic. This was due to the vast energy/resources needed to maintain the system (Joshua *et al.* 2012). Unfortunately, rain harvesting is still unexploited yet, adequate rainfall of 365.6 billion m^3 that takes place annually is sufficient for all the country's water needs (Otieno, 2018). Owing to the deplorable water situation occurring in most poor and middle economies, adopting green concepts in provision for water efficiency is advisable. Efforts should then be made to reduce, recycle or reuse water around built environments in order to conserve this natural resource. Some green concepts adopted to provide for water efficiency include use of: efficient appliances, fixtures and fittings (sensor-taps), green plumbing, leakage monitoring devices, sewage waste volume reduction through installations such as: bi-flush, waterless toilets, bio-digesters (recycling/reuse of wastewater), usage monitoring (meters), and rainwater harvesting (Yan *et al.*, 2016).

2.2.2.1 Green Concepts for Water Efficiency

Adreza *et al.* (2020) assessed water consumption as impacted by coronavirus spread and prevention actions in Joinville, Brazil. The findings showed a drop in water use in the commercial, industrial, and public buildings and an increase in consumption within residential buildings. Increased water consumption was more in apartment buildings than in stand-alone houses. The conclusion was that the water supply was resilient in the pandemic situation. Sometimes, drinking water chemical quality can change after water enters a green building plumbing system. Maryam *et al.* (2020) indicated this in a study that sought to understand seasonal and spatial water quality differences in a highly net-zero energy building. Using more than 2.4 million online plumbing records, Maryam *et al.* concluded that there were changes in organic PH and carbon levels in the quality of water in those buildings.

Unfortunately, even with the benefits linked to adopting green in buildings water system, there are related problems. Tiong *et al.* (2022) recounts the spread of opportunistic pathogens in a LEED-certified plumbing system of the school's building. During minimal use of water (summer) and through typical high consumption times (autumn), the copper-plumbed building containing water-saving devices was tested in three sampling events. The tests detected a high presence of the pathogens *Legionella spp.* followed by *Mycobacterium spp*. in all the water samples throughout the plumbing system. The presence of pathogens stresses that even in sustainably built systems; care has to be taken in monitoring the quality of water stored within. Therefore, quality maintenance exercises for water resources are also considered as part of the green practice.

Consequently, green innovations such as sewer-free faecal-sludge management systems, onsite domestic recycling, and reuse of grey waters are slowly being adopted to solve sanitation problems in the world (Chapman, 2014). This green practice has ensured water efficiency, sanitation, and conservation of primary resources by reducing, delaying and constraining water consumption rates. In the State of Arizona USA, Chapman alludes that domestic wastewater is usually recycled and put up for sale. The state government also incentivises owners with onsite reclamation systems to promote recycling (Ginette 2016). In study by Caixia *et al.* (2020) based in China based among Xi'an residents it was discovered that, the public's attitude and acceptance of reclaimed sewage water determined the success of the water reclamation project. The study shows that the public's low intention to use recycled water was the biggest hindrance to the concept's popularisation among residents.

In reviewing studies that were based in Taiwan, Cheng and Kawamura (2023) established that, adopting green concepts in the management of water and sanitation through plumbing design provided efficiency and reduced consumption by 37% per cent. Similar findings showed that up to 33% savings on water bills were also recorded by Wahyudi (2020) in a study done on Menara Towers (Indonesia), on green plumbing concepts. A study based in United Kingdom and Mexico, comparing consumption rates of 1320 buildings belonging to green and conventional building categories was carried out by Elizondo and Loft-House (2010). The research concluded that washrooms alone accounted for 60% of water consumption in residential buildings and the rate increased by 30% with conventional plumbing design as also confirmed by Fabio, Anacleto, and Riccardo (2015). Further, in Melbourne(Australia), 40,000 homes were using recycled water which was metered and delivered separately rather than portable water for toilet flushing, washing cars, and watering outdoor landscapes (OECD, 2011). Therefore, recycled water was an essential green concept that could be used for addressing looming water shortages across countries and especially in developing nations.

Furthermore, with the outbreak of the COVID-19 pandemic, there was increased consumption and disposal of water for heightened hygiene and public sanitation standards. The consumption put pressure on household tap water use and building demands. Thus, efficient use of freshwater resources through design and adoption of water-saving concepts for management became important than before (Wong *et al*., 2021). Adopting green strategies for saving clean water in buildings could motivate rational use of the resource during the initial stages of planning the design of a building. Caleb *et al.* (2018) confirms the motivation by observing that providing discounts that match tank size for rainwater harvesting encouraged the installation of larger tanks to ensure water security in Australia and Kenya. This was found using an E-Rain, a combined performance analysis of rainwater harvest systems with cost analysis for economic evaluation. The study further indicated that installing smaller tanks was economically a poor choice. Moamen (2016) study on El-Gouna City, Red Sea district (Egypt), examined sale of wastewater from tourist centres. The recycled water was mainly bought for use in irrigating green urban spaces and re-recreational areas such as golf fields. The idea confirms that recycling wastewater was not just a green strategy but, one with a potential economic dimension. The business idea is especially recommendable for water-scarce and poorly sanitised regions of Africa.

Sikhulisa (2013), in a South Africa based study, found that fulfilling 50%-70% of water demand in high-density commercial building areas was accomplished using reclaimed grey-waters. The reclaimed water was used mainly for toilet flushing and irrigation of plants. The article added that 80% of users above 21 years of age accepted the use of reclaimed water, while the older population preferred its use in irrigation since it meant coming less in contact with it. Oteng's (2018) reiterates similar outcomes in a research based in the same country. Further, Ambole *et al.* (2016), in a South African-based study, points out that it was essential to engage in green concepts that are socially acceptable. This was especially for waste management and reduction in order to achieve successful implementation in the informal settlements. This finding exhibited when users of the pour-flush toilet in the Enkanini settlement cited water poured as expensive and waiting a while, then emptying the toilet's waste went against their Xhosa cultural norms. The lack of regulations on grey-water reuse had also hampered the comprehensive implementation of green strategies by Municipalities in South Africa, yet 30% of financial savings were realised by those who adopted them (Ilemobade *et al.*, 2012).

Popular green concepts for providing water efficiency in China and South Africa were identified by Cheng *et al.* (2016) and Sikhulisa (2013). They included: waterless toilets-foam flush, dual flush, pressure assist, gravity flush, oil/highly efficient urinals, low-flow shower heads, aerated, sensor automated taps and faucets, Aqua-connect-sink with toilet, water monitoring devices and showers that recycled used water. The green concepts include varieties that are cheap to install and maintain with money-back assurance within a short time. Rain harvesting was the least popular green concept adopted in South Africa's commercial buildings in the Stellenbosch area, with only a 10% installation rate (Slabbert, 2013). The findings were of a survey carried out among nine architectural firms. These results were attributed to expert's minimal knowledge on green and scarcity of related products. Slabbert gave an awkward revelation of South Africa, especially now that it is among the developed nations that should leading by example on green adoption. Further, Ahmed *et al.* (2017) recommends that provision for water efficiency should be enabled before and during a building's construction and not only during the occupation since, buildings consume lots of embodied water during onsite and offsite processes, as was established in the survey based in Cairo of 15 construction sites.

Further, Fawaz (2013), Khaemba and Mutusune (2014), and Were (2015), in surveying perceptions of construction managers among other building professionals in Kenya, identified providing water efficiency as perceived second in importance to energy efficiency. This observation was mainly motivated by intentions to save on costs. Nyaanga *et al.* (2018) and Mbui *et al*. (2016) highlighted other green strategies aimed at reducing waste from toilets while at the same time enhance sanitation and provide green energy. These studies examined production of green energy by creating charcoal briquettes from human waste in Nakuru Water and Sanitation Services Company. Using charcoal briquettes attracts interesting and mixed perceptions from users, and primarily when used in food preparation, e.g. roasting.

Notable in all the studies reviewed was that focus was on different green concepts used in provision for water efficiency in buildings. Although few studies were based locally and indicated the extent to which green was adopted in provision for water efficiency, only in Slabbert (2013), was the rate of adoption indicated. This gap prompted the current study, in which, using the same method of surveying commercial buildings in Nairobi, established their rate of green adoption for water efficiency. Nonetheless, the previous researches detailed adoption of specific green concepts though did not compare the rate of adoption in different building categories. The detailed information gathered from the current research was critical for benchmarking purposes, informing awareness campaigns, marketing and policy-making on green building in Kenya.

2.2.3 Green Materials and Technology

Green materials used in designing and sculpturing interiors of green buildings, play a significant role in creating quality spaces and finishes. Similarly, management and disposal of waste materials from the built interiors is also as important and needs to be addressed. This is because waste affects landfill capacity, soil, and water pollution, including sanitary conditions. Jiajia *et al.* (2021), in examining nine cities in China, confirmed that renovation waste from buildings grew from 0.16 million metric tons in 1999 to 2.6 Mt in 2018, with 95% of it being disposed off directly in landfills. According to the recommendations of the study, enhancing recycling rates and use of prefabricated materials aids in tackling the waste disposal problem. Thus, reducing the full impacts of waste dumped from building materials. There should exist considerations for using green materials that include those with: ease of maintenance, durable floor materials, environmentally friendly materials (those salvaged from waste, recyclable, localised, and natural-live), low emitting materials, advance material use plan, standardised materials and off industrial modules materials.

2.2.3.1 Green Design Materials

Cinzia *et al.* (2020) recommends use of traditional building materials for buildings in tropical regions for it is advantageous. The advantage stems from the fact that the materials are: locally sourced, cheap with low installation labour, ample in supply, climate tolerant, need no expertise in installation/repair and are less impactful on the environment. Graziano *et al.* (2020) adds that recycling/upcycling should be an integral part of interior material management, as in the case of the project previsouly undertaken in Guinea-Bissau. In the project, down-skis (750,000) disposed of yearly by France, German, and Italy were recycled and used as structural components in construction of temporary architecture. The temporary shelter was used for emergencies and had a 7-15 years life span when covered with a tri-dimensional cell panel. In another instance, the down-skis were used to make the Children's Nutritional Center in Farim and the refugee camp of Sanioniogo, Burkina Faso.

In a survey by Hayles' (2015) that involved 30 retail stores in Sydney (Australia), an understanding emerged of that which composed choices for green interior materials in that building industry. The understanding of material choices was based on the industry's demand and supply of green materials. The results showed that the frequency, with which interior designers made selection of green materials, was in actual practice, limited. Although many green materials were available in the marketplace, they needed to be made more readily identifiable among the many other materials. In addition, only 10% of the material suppliers informed their clients of the availability of green products. The research confirmed the difficulty involved in locating data on sources for green building materials. Yet, accessibility to such vital information plays a critical role in increasing adoption of green.

On the contrary, Wang *et al.* (2021) observed that South Korea employed a Green Standard for Energy Environmental Design where materials selection accounted for 11% of the evaluation criteria. Nevertheless, different organisations managed data for each of their green material resulting in inefficiency, heightened costs, and significant environmental impacts associated with material and resource selection. In solving the problem, Wang *et al.* designed a green materials integrated platform that hosted and compared 12,636 data points on green building across South Korea's industries. Case studies were performed on buildings to discover the economic efficiency and environmental performance enabled by GIP. The survey revealed a 17% and 10% improvement on the buildings respective efficiency. Also evident was that the awareness levels of stakeholders on green materials and their availability was vital in increasing their adoption.

Vernacular architecture is associated with numerous advantages in green building. However, Koffi, Kissi, and Danku (2020) pointed out that Ghana did not appreciate adopting vernacular materials to increase green building. This was a discovered in a survey that examined perceptions of 54 building professionals on use of vernacular materials. Using descriptive and inferential statistics, the preferred vernacular/green materials were identified as timber, bamboo, laterite, sun-dried brick walling/adobe, and rammed earth (*Atakpame* walling). Further, Were (2015) agrees with Koffi *et al.* discovery and argues that the reason are vernacular materials minimal popular among building experts was because they failed to appreciate them as green materials. Thus, the expert’s negative attitude contributed much to their low adoption of the green materials. Were (2015) confirming the observation was by an investigation that examined the challenges impending adoption of green among building experts in Nairobi. Interestingly, Were found that 92% of the building experts were awaren of green materials however, only 8% confessed to having adopted them in their projects. Were studies seems biased as it mainly focused on investigating green adoption in the siting and construction phases of a building. Also, on gathering information on perceptions of the building experts on adoption of green, the study excluded did not examine interior designers. Yet, interior designers too are counted among building experts in Kenya. Moreover, green levels in relation to the interiors of buildings and especially in the occupation phase, was not examined by Were’s study.

Further, Oni *et al.* (2020), on investigating natural materials that would enhance concrete abilities, discovered that adding cassava starch to concrete mixtures highly improved its resistance to attack by aggressive chemicals. Cassava starch is a valuable additive to concrete used in constructing structures existing in marine environments, water treatment plants, and jetties. In such salty environments, structures are predisposed to attack by harsh chemicals thus, may fail to perform satisfactorily. On the same note, Ashish *et al.* (2020) showed that marble mud powder was an alternative to natural sand and acted like composite cement. On examining its strength of compression using parameters such as time, the composition of binder, and vanadium ratio, results showed that the strength of composite cement at 28 days was higher in intensity than at seven days. Despite the invention and innovation achieved in green building materials, Komolafe *et al.* (2016) observed that the extent of green adoption within commercial buildings in Africa still needed improvement. The confirmation came from the survey carried out by Komolafe *et al.* to establish extent of green integration in 2 (two) office buildings. Although the sample population involved was too small, results availed an index weighting depicting the extent of green adopted in the building. The level green adopted was found to fall below a mean rating (MR) of 2.5 on a five-point Likert scale.

Surprisingly, green strategies linked to material use and conservation was the most adopted concept, recording a mean rating of 2.62 according to Komolafe *et al.* The concepts related to building owner/user education were the least adopted, with mean rating of 1.895. Since the study was based on a developing economy in Africa, the methodology used seemed suitable to inform a study that was based locally. Therefore, this current research borrowed a lot from Komolafe *et al.* (2016) but instead was based in Kenya and with a sample size much bigger than that of previous research. Komolafe *et al.* involved a sample size too small (2) to enable a population saturation required to provide detailed data necessary for comparisons between building categories and, for increased validity in results.

In Kenya, no official quality standards are imposed on sustainable green materials. Although the Kenya Bureau of Standards discussed the issue with Kenya Green Building Association, solid conclusions still need to be reached (EEBA, 2018; Green-Mark, 2020). The review of past research confirmed that much of the information on green technology focused on the nature and accessibility of materials but, failed to provide details/comparisons on the level/extent of its adoption in building interiors, except for Komolafe *et al.* (2016). Thus, the need for this study that was not only informed by Komolafe *et al.'s* methodology but, examined more aspects of green element in buildings locally (Kenya).

2.2.3.2 Green Design and Technology

There are sustainability-green assessment tools available in the market suited for different climatic regions. Assessment to determine levels of green in both new and existing buildings takes into consideration the climatic and social-cultural dynamics. Harsimran and Pushplata (2019), explored similarities and differences existing between urban assessment tools, outlined the widely used ones to include: Leadership in Energy and Environmental Design (LEED-USA), British Building Research Establishment Environmental Assessment Method (BREEAM), CASBEE (Japanesse), SB-Tool and Green Globes, Australian Building Greenhouse Rating (ABGR), the Green Home Evaluation Manual (GHEM), the Chinese Three Star, Indian Green Building Council (IGBC), and Green Rating for Integrated Habitat Assessment (GRIHA) for Large Developments in India. In using qualitative content analysis (QCA) to examine 105 articles, the study identified various themes/topics associated with aspects of sustainability. Findings show that many tools emphasised infrastructure and resource management while ignoring culture, business, and innovation. Also discovered were that the tools could not address the complex relationships between the different categories of these aspects, yet they do influence each other.

In developing critical assessment criteria for a green tool to aid in selection of building materials in United Kingdom's building industry, Akadiri and Olamayie (2012) conducted an online survey of 490 architects and designers to capture their perceptions. Using the factor analysis (FA) method, the perceptions revealed three areas considered necessary for materials selection by building professionals and include aesthetics, maintainability, and energy savings. The results agreed with those of Mahdavinejad *et al.* (2014) that examined the effectiveness of LEED-standard tool in gauging design features. Using a sample of 10 green buildings across Middle East countries, the study recorded that green standard tools were practical when programming construction activities rather than guiding the design process. Mahdavinejad *et al.* also indicated that LEED standards were best suited for programming construction activities since it achieves 50% effectiveness. Yet, when used for designing interiors, it realises only 30% effectiveness. The study then recommended that a green-design tool with designer attributes should be developed to guide design process to avoid the chances of greenwashing.

Greenwashing occurs when building interiors appear green but are not in reality (Freitas *et al.,* 2020; Lippert, 2016). Yan *et al.* (2016) alludes that greenwashing occurs especially when a proper tool for assessing performance of building interiors of s is lacking. The study acknowledges that tools available in the market for determining green levels are primarily suitable for building structures (frames) and, not interiors (core/envelope). Therefore, to bridge the gap, Yan *et al.* proposed a tool that was designed specifically for assessing the interiors of buildings in China. Yan *et al.* identified attributes considered indicators for gauging green levels in building interiors. The study enlists three main items important in determining levels of green within interior envelopes: IAQ elements, water efficiency, and materials and technology. Further, green could then be measured at three levels: lack of green (conventional), pseudo-green (partial green) and c. green (almost green). In the current study, the attributes/design of the tool used to ascertain green levels in commercial buildings were heavily borrowed from the Yan *et al.* (2016) study. A few modifications were then made as informed by the Kenya GreenMark-2020 tool to suit its local context (Kenya).

Several countries confirm the pivotal role played by green building assessment tools and, as a result, have developed suitable ones for their environments. However, despite the awareness levels on the role of green tools, Jubril and Obafemi (2019) show that Nigeria still requires a significant building assessment tool, despite its high demand for housing. Jubril and Obafemi's study used LEED green building tool as a reference to inform the development of a tool suitable for Nigeria. The study suggests inclusion of the following rating categories in determining green levels: material/waste control, water efficiency, indoor environmental quality, energy efficiency, sustainable site and innovation in design. Incorporating these aspects into Nigeria's building code would ensure improved levels of sustainability in buildings.

Further, it was essential to understand the vulnerability of developing countries to climate change and address them in the most effective ways/channels possible. Gibberd (2019) investigated the existing South African Sustainable Building Assessment Tool to ascertain its adequacy in addressing climate change in South

Africa. The study pointed out that although the assessment tool provided a robust framework for addressing sustainability, it needed to address climate change resilience comprehensively. Thus, Gibberd recommended that the South African assessment tool and other similar tools be improved to address climate change better. In reviewing the past studies, the observation is that both developed and developing countries are utilising assessment/green rating tools.

Mekonnen *et al.* (2023) suggested the triple bottom approach's unique use to develop a green assessment tool for Ethiopia. Ethiopia's building sector is plagued with complicated ecological and socio-economic issues. The green tool was designed based on a consensus reached by 93 building experts and information gathered from 10 widely used tools. Based on an analytic hierarchy process technique applied to select assessment categories, priority aspects denoting green were identified as materials (18.66%), sustainable sites and ecology (16.92%), energy efficiency (16.78%), indoor environmental quality (12.60%), economic aspects (10.41%), management (10.30%), water efficiency (8.06%), location and transportation (6.27%). In all the studies reviewed, the management aspect appeared for the first time in the green assessment tool tailored for Ethiopia. The management aspect was unique though it raised questions on a methodology that can successfully assess it so that it is not just a redundant item in the checklist.

Nicole *et al.* (2020) advises that technology suitable for designing green buildings for East Africa's warm climate should assess and predict energy efficiency models for existing and new buildings. Such technology includes Energy Plus and BEST-energy. These accurately estimates energy needs and at the same time, allowed for selection of desired architectural features. They consider a building's thermal response based on the effects of its shading devices, natural ventilation, sizing, HVAC system so as to predict an efficient energy model in the design phase.

In an investigation by Mosse *et al.* (2020) involving 175 building professionals in Nairobi on adoption of BIM and its influence on Engineering Contract Management (ECM) revealed that the adoption rate of the Building Intelligence Model (BIM) technology was at 56.6%. In addition, a shallow understanding of its capabilities acted as a barrier to its full implementation. Also, using BIM improved the time, cost, quality, collaboration, and return on an investment. By using the BIM technology, engineering contract management became more effortless. Kanyaura and Obino (2015) espouse that adoption of the green technology would have been higher in Kenya but, due to insufficient expert knowledge about the technologies, a lack of suitable legislative framework, and awareness of green concept, uptake was still low. In conclusion, Oguntona *et al.* (2021), after analysing 156 Scopus database articles, observed that though few, significant contributions to green building research in Africa were mainly from Egypt, South Africa, Nigeria, Algeria, Ghana, and Morocco; Kenya, Mauritius, Ethiopia, and Cameroon needed to increase their contribution to the subject.

Majority of the past research informed on various tools available for measuring green, but mainly in 3 major areas: siting, design, and construction phases of a building's life cycle. Minimal research was carried on the occupancy phase (interior envelope) and so this study contributed by filling the gap in providing related information. The information was gathered using Yan *et al.* tool recommended in 2016. However, the tool was modified to suit Kenya's local context when determining the extent of green adoption within interiors.

2.3 Stakeholders' Awareness of Green Building

The literature review was carried out on two categories of building stakeholders found to be of concern to the study were interior designers and building users. The information gathered was to confirm their level of awareness on green buildings. The sample population was mainly composed of Interior designers since they were the prominent experts directly involved in deciding and prescribing materials/products that are integrated within interiors. Therefore, their awareness of green building was vital in shedding light on factors influencing their adoption of the concept locally (Kenya). On the other hand, building users provided first-hand information about their experiences in occupying the sampled buildings' interiors. Lastly, a literature review discussing factors perceived to affect the adoption of green concepts among interior designers worldwide ensued.

2.3.1 Awareness of Green Building by Interior Designers

Several studies observed that the current practice of sustainable-green building was yet, to reach its targeted goals (Chan *et al.*, 2018; Nduka & Ogusami, 2015). Thus, to increase its adoption, especially in the interior design, it was essential that identification of critical factors affecting interior design experts be investigated. The identification was critical because many existing studies identified factors affecting building experts only in developed nations, while few discussed those in developing countries (Darko *et al.,* 2018; Leontev, 2021). Nevertheless, there were differences in factors influencing the adoption of green building in different countries due to: climatic conditions of an area, dynamics in socio-economics and time/period (Tafazzoli *et al.,* 2019). Therefore, identifying and understanding critical factors influencing the adoption of green locally (Kenya) was essential in bridging the knowledge gap and informing policy-making and motivational strategies for an increased uptake.

A number of past studies identified increasing awareness on green building among building experts (interior designers) as one of the most significant factors in promoting positive attitude towards it (Umar *et al.,* 2021; Bugwon *et al.,* 2016; Ipsen, 2021). These studies argued that the main setback to green concept adoption is the level of its stakeholder awareness. Nevertheless, envisioning high stakeholder awareness would translate to a more credible green building support (Komalofe *et al.*, 2016). The growth of green support would be because building stakeholders took upon themselves a social responsibility to educate the public on its benefits, and so increase its demand. However, there are times when interior designers adopted green not to satisfy their moral obligation to protect the environment but as a means to market their products. Templeton (2011) indicated that such a move would be because it was a popular tag in marketing building products. Therefore, the adoption of green in such a scenario then appeals to and serves to satisfy the client's environmental concerns.

A major concern is arising among stakeholders on familiarity with green building practices. Nduka and Ogusami (2015) reinforce the concern by observing that building experts' familiarity with green practices relies on their knowledge and experience, which in turn provides them with confidence to adopt it. The expectation is that as one acquires knowledge and gains experience in green building, their confidence to practice it increases. Hence, during designing of an interior, concepts on green would come naturally to the interior designer and become part of their practice. Ezzaddin *et al.* (2023) add that acquiring confidence can be a significant challenge in a new practice like green building since materials and technologies are constantly changing.

Umar *et al.* (2021); Marsh, Brent and Cock (2021) pointed out that creating awareness of green building referred to the ultimate deliberate model and motivational exercise, which would assist building stakeholders in understanding the importance and desired goals of the concept. Nour and Husain (2019) further opine that raising awareness of green building is achieved better through public institutions, non-governmental organisations, and more so, educational institutions. This action is authentic in Palestine, where Nour and Husain discovered that binding government legislation and laws on green buildings would alleviate obstacles to its awareness and increase adoption on a long-term basis. Therefore, creating a constant awareness of greening buildings may be the right attitude required for the 21st century. Minami (2018) added that awareness would drive the sustainability agenda and hasten the attainment of the expected paradigm shift in thinking from conventional to green buildings.

The awareness of building experts on green concepts, which marks their knowledge, skill, and experience, is vital in determining designers' attitudes toward its adoption (Kootin & Bangdome, 2013). The level of Interior designers' awareness of the green concept influences their chances of frequently adopting it in their building project, thus ensuring increased uptake. Rimalini *et al.* (2022) and Hankinson and Breytenbach (2012) further established that awareness of green building also influenced the availability and demand for green products, materials, and technologies. The level of an interior designer’s awareness of green concepts enables them time for research and cultivate a positive attitude in their clients. Exploring the status of the public's attention, changing trends, and perceptions of green buildings may provide an important direction in greening of buildings.

Kang and Guerrin (2009a), in a U.S.A-based survey involving 300 interior designers, revealed their high awareness and value placed upon green building. However, the frequency of green adoption in elements of Indoor Air Quality (IAQ) was low, with almost none adopted in the selection of materials. Sotiris *et al.* (2015), in a research based in the United Kingdom, opined that building experts mostly adopted green concepts in the residential sector to deescalate greenhouse gas emissions and pollution. Khaleel (2013), in a Gaza-based study, discovered that the greening of IAQ elements of commercial malls was low, and so was the level of designers' awareness of green building. Khaleel further revealed that although the designers' attitude towards the green concept was positive, they seldom adopted it in their projects. Noticeable was that Khaleels' method of determining interior environmental quality in the sampled malls was by analysing the chemical and mechanical properties of the spaces. The approach mainly favoured and enabled a mechanical engineering perspective to the information gathered but failed to inform an interior design one. However, interior design is a field synonymous with visual details. Al-Sanad *et. al.* (2011), in a Kuwait survey of construction industry stakeholders, showed that awareness and acceptability levels of the concept of green in the building were moderately good.

Nduka and Ogunsanmi (2015) and Waniko (2014), in Nigeria based survey to determine the awareness levels of building experts on green concepts, indicated a high rate of over 60%. Most of the experts confessed to have acquired awareness through personal research. On the contrary, Bungwon *et al.* (2016) studies recorded low levels of awareness on green among building experts in Nigeria. Probably the difference in findings could be attributed to the methodology and period of research. Umar *et al.* (2021) survey on levels of green building awareness among 129 construction professionals discovered that it was high (68%). The results almost match those of Nduka and Ogunsanmi (2015) in addition to Waniko (2014) which indicated high levels of awareness on green concepts among building experts. Most of the building experts were holders of Master's degrees. The primary source of the building expert’s information on green building was television and websites (at 23% each) and not their colleagues. Their perception of green building was that it was (27%) environmentally friendly and energy efficient (20%). Another finding implied was that building professionals rarely spread publicity on green strategies among their clients.

Umar *et al.* (2021) concluded that there existed low levels of awareness and knowledge of green building materials among architects in Nigeria. The low awareness was confirmed by an evaluation of levels that used a purposive sample of 18 registered architects. Umar *et al.* then recommended updating building by-laws to make it compulsory for architects to learn about green building materials to frequently adopt in their designs. Were *et al.* (2015), in a Kenyan based survey, determined levels of green awareness among building experts, and revealed it to be high. The levels were high since awareness of green was a factor least identified as a challenge to the practice. In all the past studies reviewed, the awareness levels of building experts' on green concepts was high, except in Gaza as shown by Khaleel (2013). Many studies needed an elaborate method of determining awareness levels for building experts like in Nduka and Ogunsanmi (2015); Joshua, Opoku and Rita (2022). The current study borrowed from the study when determining awareness levels on green building among interior designers in Kenya.

2.3.2 Awareness of Green by Building Designers

In many developing countries, sustainable/green construction has not received adequate awareness; it is missing in green building design and education policies even in the wake and attempts to overcome barriers to green adoption. Pham *et al.* (2020) analysed managerial perceptions of Vietnam's main barriers to green adoption. The respondents, answers to objectives identified four main barriers to greenthat included incompetent project managers, limited access to green materials and technologies, resistance to change towards sustainability and need for government incentives towards green practice. Further, Kang and Guerrin's (2009) survey examined interior designers' awareness and attitudes towards green in the USA. The study showed that awareness considerably affected their frequency of green adoption and the importance they attached to it. Although there was no significant relationship between interior designers' demographic characteristics and importance attached to green, project size predicted the frequency and level to which green was adopted. Such that huge-sized projects attracted greater green inclusion as its big budget would disguise perceived high costs that generally discouraged clients. A significant relationship also existed between the area of interior design specialisation and the frequency of green adoption. For instance, interior design projects in childcare, hospitals, and educational facilities attracted greater integration of green strategies.

On the other hand, a survey by Karji *et al.* (2020) in USA involved 135 construction managers to identify barriers to sustainable construction. The results showed that green adoption depended on the period/time, region, and social culture of the place/group. Ranking of the main factors identified influences on green adoption as: pre-construction constraints as the amount of paperwork involved, education, reluctance to change, managerial constraints, clients; legislative constraints (lack of legislation), financial and planning constraints (cost of maintaining green systems), issue of timelines for green projects typically takes longer. Noticeably, the two studies were based in similar geographic settings though the results obtained differed. Probably because of the difference in period and the population sample of building experts involved, which needed clarification in a similar study.

A survey by Akadiri and Fadiya (2013) based in the United Kingdom espouses that government legislation positively influenced and was the most significant determinant of green adoption. Other influencing factors perceived were top management's commitment to adopt green and the perceptions of construction stakeholders. Zahir *et. al.* (2014) engaged in a Malaysian based survey of 2500 architects to determine their awareness and level of acceptance of green roof systems. The findings revealed that many local architects still needed convincing of the benefits provided by green roofs. The factors identified as influencing their adoption of the green-roof system were lack of policies on green roofs, government's legislation on building by-Laws, client constraints (difficulty in accepting the idea), newness of green technology, high costs with limited supply, lack of expertise/knowledge on installation and maintenance, leakages, short roof life span, increases loading of a building structure, concerns over unknown risks, lack of advocacy among local architects and lack of demand for green in the construction industry.

Khalfan *et al.* (2015), in an Australian-based survey among construction contractors in Victoria, captured their awareness of the environmental, social, and economic benefits of green building. The results indicated that 60% of the respondents had positive perceptions of aspects in green building. The main barriers to green adoption included: client's demands, costs of construction materials/technologies, availability of green materials, financial incentives to clients and contractors, government legislation, and environmental awareness in the industry. These findings concurred with those of Hankinson and Breytenbach's (2012) survey on perceptions of interior designers and Architects in South Africa's Kwa Zulu Natal area. The findings by Hankinson and Breytenbach identified a need for educating building experts on green concepts, as this was the greatest hindrance to its adoption. This was because education is considered as the primary channel for informing and influencing building designers' understanding and attitudes towards adoption of green.

Interior Designers' attitude does affect their behaviour and likelihood of practising green building if they possess relevant knowledge and skills (Ipsen *et al.,* 2021). Other common influencing factors akin to green adoption were cost, availability of green products and materials, rating tools, and client's willingness. Further, Hankinson and Breytenbach recommended availing incentives to increase adoption. The incentives should be as suggested by the respondent’s/stakeholders such as education on green concepts, inclusion of green in national regulation policies, campaigns to raise awareness and knowledge of green products/materials, and lastly increasing client involvement.

Evidence shows significant gender disparity in the social and economic growth, consumption patterns, aspirations, access, use of knowledge, attitude towards environmental issues; use and access to control of environmental resources, and in management of the environment (GJP, 2015). There exists a gender difference in environmental perspectives among urban design professionals thus imprinting on the adoption rate and development of green/sustainable concepts in the building industry. Females placed great importance on green aspects even though they felt that their possibility to influence its adoption was relatively low. On the other hand their male counterpart felt an outstanding possibility to influence green issues although they attached low importance to its adoption when compared to the females. Genarally, the participants believed that they possessed influence on the environment and so attached high importance to green issues. This was established in an international architectural competition dabbed 'A New City Centre for Kiruna', Sweden (Wallhagen *et al.,* 2018).

Further, demographics (gender & age) were also factors considered to influence adoption of green in product sales as given by Steven (2010). The author opines that females were more likely to adopt green products than males. The study shows that females tend to be more concerned about preserving the environment than males. In addition studies, such as those of Faridah and Afham (2018) together with that of Roslin *et al.* (2018), agrees with similar findings in Wallhagen *et al.* and Steven's. The findings from Faridah and Afham's were results from a Malaysian based survey of 200 respondents (customers). The survey investigated the effect of demographics on purchase intentions of green products for personal care in Melaka. The results confirmed a significant influence of demographics on people's intentions to purchase green products. In addition, the demographics (gender, age, level of education) only influenced those intentions that were linked to buying personal care products. Therefore, it was vital to consider gender differences when promoting adoption of green building. The logic being that gender influenced pro-environmental behaviour among interior designers. Therefore, both genders have different potentials and roles in the growth of green building. This gender aspect could be an untapped dynamic that can provide an economic, social and environmental contribution to the development of green building.

Simpeh and Smallwood (2016), in a South African based survey on barriers perceived to challenge the adoption of green, demonstrated that reluctance and resistance to change from traditional building materials to green ones was the most significant setback to the practice. Building experts in South Africa preferred using materials such as brick and mortar that daunted the use of any other substitute. In turn, this trend has in turn caused building stakeholders to refrain from demanding green building solutions. The lack of incentives to promote green buildings, inadequate cost data, and inadequate information regarding the financial benefits and opportunities offered were also significant factors hindering the adoption of green..

Further, Chan *et al.* (2018), using a 26-item questionnaire on 43 building experts with green building experience, investigated the critical barriers to green adoption in Ghana. The results identified 20 critical barriers with those ranking as top three being high costs of green building technologies, lack of government incentives, and lack of financing schemes. When these critical barriers were compared to those of developed nations (USA, Canada and Australia), the analysis established that those affecting Ghana were different and varied from those of developed countries. However, the high costs of green technologies remained a top barrier in all the countries. Also, noted was that Chan *et al.* study method was comprehensive as it further summarised the 20 critical factors into 5 (five) underlying groups of barriers that were government-related, human-related, knowledge/information-related, market-related/cost and risk-related barriers. The government-related barriers emerged first therefore emphasizing the role of governments in positively influencing green growth. Still in Ghana, a study by Kwasi *et al.* (2020) points out that although Ghana's National Urban Policy and Action Plan provides sufficient scope and a diverse mix of initiatives to promote urban sustainability, its success was potentially undermined by factors such as threats to inclusivity, social sustainability, lack of a poverty reduction strategy and lack of environmental performance targets.

Time too was echoed as a crucial factor affecting the adoption and delivery of green buildings. This was revealed in a studies based in Nigeria and the USA, according to Usman, Kamau & Mireri (2014) and Ali *et al.* (2020), respectively. Further, Bungwon *et al.* (2016) listed more hindrances to the adoption and awareness of green in Nigeria as lack of technologies for green practices, laxity of professional bodies in raising awareness of green innovations among members, the need for more expertise and interest from building industry stakeholders. Minami's (2018) survey of 127 building experts in Rwanda for factors perceived to hinder the adoption of green, posted similar results to those previously mentioned in studies such as Chan *et al.*, (2018); Bungwon *et al.,* (2016). Minami (2018) further summarised Rwanda's main barriers to green adoption as lack of: enforcement for green building policies, education, stakeholder empowerment, and incentives from the government. Currently, the country's level of green building adoption stands at 17.9% and still on the rise. This growth can be attributed to establishment of government policies in support of it. Interestingly, education featured as a major influencing factor for the first time in a study based in a developing nation. Otherwise, it mainly featured in those carried out in developed nations (Tafazzoli *et al.*, 2019; Akadiri & Fadiyah, 2013).

Momanyi's (2019) survey gathered information on perceptions of 110 building professionals on factors influencing their adoption of green in Nairobi malls. Findings showed that financial factors such as economic benefits beyond capital costs and payback period were the main influencers to adoption rates. This was in addition to other factors already mentioned previously in studies conducted in Ghana and Nigeria (Akinsipe, Oluleye and Aigbavboa, 2019). Another survey by Were *et al.* (2015) based in Kenya involved 94 construction experts (Architects, Quantity Surveyors, Property Managers & Engineers) to identify critical challenges facing them in the adoption of green. Lack of green building policies, enforcement and incentives from the government were listed as the most significant challenges. These findings contradicted those of Otieno (2018) indicating that despite the government's incentives to promote green adoption, there still existed challenges to it such as poor levels of awareness, inadequate financial incentives, unsuitable limited credit and financing mechanisms.

In yet another survey based in Kenya, Madukani (2020) involved 234 respondents in identifying factors influencing environmental sustainability of real estate in Nairobi County. The results identified the cost of acquiring green equipment and techcnolgy as a major influence. This factor was mentioned by 60% of the respondents aware of green majorly (65%) through television media. Among the respondents, only 10% expressed a willingness to adopt green building. Finally, a study by Ddiba *et al.* (2020) to enhance cross-sector collaboration, identified factors impeding green adoption in sanitation and waste in Naivasha. The outcome of the study showed that public leadership was a factor that would co-develop visionary strategies for green adoption with non-governmental organisations.

Notably, many of the studies reviewed were based internationally, with very few ones based locally (Momanyi, 2019; Were *et al.*, 2015; Madukani, 2020). The existing studies did not provide information concerning awareness levels on green building among interior designers as a sample population of building experts. However, the studies involved respondents from all the other groups of building experts. Yet, awareness of green building varied from one professional’s group to another depending on their dynamics of socialization/ prevailing culture and climate. The gap prompted this research to conduct a similar study but investigate awareness levels on green building among interior designers in Kenya. Therefore, Chan et al. (2019); Taffazoli’s (2019) that were researched in Ghana and USA, respectively informed much of the design of this study. The current study thus, struck a balance in availing information on green awareness between developed and developing nations..

Also, past studies employed ranking as the primary method of analysing and identifying critical factors affecting the adoption of green. Such a method is limited and curtails the amount of information harvested from data as was illustrated in Were (2015) and Madukani (2020) studies. The change in method of analysis was important to make adequate conclusions and generalisations from the information obtained. The gaps mentioned above catalysed the need for this study that engaged a different methodology to analyse and identify critical known as factor grouping. This study had its data collected locally (Kenya). The results obtained are aimed at informing formulation of policies in Kenya to overcome barriers to green adoption. This is especially important, in developing nations such as Kenya where green building is relatively a new idea to building e industry. The findings will also be used to create valuable reference to aid international/local organisations and practitioners interested in promoting green building in Kenya.

2.3.3 Awareness of Green by Building Users

The building users are the immediate consumers of interior spaces and not only so, but the correct stakeholders to give feedback on experiences of the spaces. However, they could also act as a market force to demand for more green buildings. Therefore, Waniko (2014) argues that raising users' awareness of the benefits of green buildings is crucial for increasing the adoption of green. Further, Nduka and Ogunsanmi (2015) recommends creating of public awareness on green building to be done by governments and made a priority among stakeholders. Baird (2015), in a study based in the Kingdom of Saudi Arabia, points out that a considerable percentage of users needed to gain awareness of green buildings. This observation was concluded from a survey involving users and designers of 60 commercial buildings in temperate regions regarding their perception of green concepts. Also, Baird found that green rating tools needed more provisions for recording users' feedback on their expectations, experiences and perceptions of buildings. Therefore, the best way to gauge a building's performance was by analysing and gauging the opinions of its users. The reason being, users are the ones who regularly experience the interiors of buildings. Thus, have the proper judgment on the quality of an interior space. In addition, the current rating tools were only suitable for rating new buildings, and so emphasizing the technical performance such aspects as energy, water efficiency and not the social. Yet, all the aspects are important in determining green levels in a building's performance.

Jonson (2019), in a Sweden-based study carried out in Stockholm, documented users' perception on their levels of satisfaction with the acoustic quality in both green and conventional buildings. The results showed that, users aged 21 years and above, rated the acoustic quality as high and were delighted with their interior spaces. In addition, results showed that satisfaction with acoustic quality, decreased with the perceived frequency of experiencing noise. Maschke and Niemann (2007), in a study carried out in 8 European countries, evaluated annoyance induced by noise. The findings showed that noise emanating from traffic was the dominant source of annoyance in those buildings, followed by noise from neighbours. The study pointed out that noise-related stress affected the nervous system and led to inadequate neuro-endocrine reactions, responsible for poor sleeping patterns, hence, resulting in diseases and a decline in users' health.

Xiaojun and Wei (2019) confirmed Maschke and Niemann's (2007) results by their study based in China. This was done by surveying information from posts related to green buildings on the Sina Weibo users' web platform. The findings revealed that the attention of users towards green buildings had improved significantly with a change in the government's policy However, the users' attitude towards vertical greening of buildings for purposes of thermal insulation remained negative and at 46.32%. The observation occurred mainly because of worries about the number of snakes and mosquitoes in the vertical greenery. Surprisingly, the usually perceived high cost of green construction was not a reason for the negative attitude.

Findings by Samarasinghe (2012), showed that building or purchasing a green home depended on owners' awareness of green strategies, linked health benefits, value attached to the environment, social-economic constrain and users' habits. The discovery was from a survey bases in Sri Lanka, to establish awareness of green building among 200 respondents in homes. Similar findings were ecorded by Maranatha (2017) in Malaysia based studies. Further, Wimala *et al.* (2016) surveyed 75 building users, and employed both descriptive and inferential analysis to provide information on conventional and green buildings in Indonesia (Jakarta & Bandung). The findings identifying barriers to green adoption from the users perception were burdensome implementation (59%), lack of supportive atmospheres (47%), resistance to change (36%), inadequate knowledge and information (34%), negligence (31%), high cost of green options (30%), insufficient supervision (21%), lack of awareness (18%), low availability of green products in the market (12%) and lack of building management participation (10%). Notable is that ranking was done with no magnitude ascribed to any of the barriers to inform ranking order/criticality of the factors.

Komolafe and Oyewole (2018) investigated awareness levels among 352 office users in 176 properties in Lagos, Nigeria. Using descriptive analysis (measures of the relative perception index) findings show that only 23.6% of the users were aware of green building. In addition, the predominant medium of awareness was the television. The results implied that most users were not aware of green buildings and those that were, perceived them as an environmental concept that costs more to build and operate. On the contrary, Sharni's (2014) South Africa-based longitudinal (6 months) study that used a mixed-method approach established that green buildings did not necessarily produce significantly better environmental or psychological well-being. Neither did green buildings increase job satisfaction or perceived higher in quality by users. These findings were also confirmed by Sergio *et al.'s* (2019) study that explored the experiences and perceptions of users in green buildings, in addition to their perceived organisational outcomes. Equally, findings by Armitage, Murgan, and Kato's (2011) survey of 351 users and 31 building managers on perceptions of green building created an understanding of what works in green buildings. Similarly, results of Sergio *et al.* (2019) demonstrated in a discrepancy that users perceived more credible benefits of a green workplace. Langat (2015) in a survey carried out in Nairobi, established users' perceptions and satisfaction with indoor air quality elements (IAQ) in 5-LEED-Certified buildings. The findings showed that thermal, lighting, acoustics, and hygiene/maintenance quality significantly impacted users' productivity. In contrast, furniture and workspace layout had no significance on the other IAQ elements, but on acoustic quality only. These findings were also reiterated in studies by Andersen (2019) and Lu *et al.* (2019), carried out in Switzerland and China, respectively.

From past studies, it was apparent that majority of them neither focused on users' awareness nor, their experiences within green buildings. The existing studies mainly examined post-occupancy experiences inferred by measuring comfort and productivity. Notably, a significant portion of the reviews captured the perceptions of building users, especially those of residential buildings and small commercial buildings (Komolafe & Oyewole, 2018). Available literature was broadly internationally based, implying that information depicting local (Kenya) situation on awareness of green among building users was minimal/scarcely documented. Therefore, this study remedied the gaps mentioned above, by examining and documenting on users' awareness and perceptions of green building within interiors of commercial buildings in Nairobi (Kenya).

2.4 Adoption of Green Content in Interior Design Training

The integration of sustainability/green content in the training of building experts such as interior designers is entrenched in the United Nations Sustainable Develop Goal number four (universal access to education). The goal acknowledges education's role in promoting sustainable development that involves green building, sustainable behaviours, and circular economy (SDGs, 2015). The genesis of sustainability in interior design education is also rooted in international efforts such as the United Nations resolution on the Decade of Education for Sustainable Development and the Stockholm Conference in 1972. The two recognize the role played by higher education in the protection of environment (Wals, 2014). Hence, this section systematically presents existing information on integration of sustainability/green content into the training interior designers as building experts at the undergraduate level, in the university. The topics in design training relating to green building, sustainable development, circular economies, greening, and etcetera are discussed extensively in the section that follows.

2.4.1 Levels of Green Content in Interior Design Curricula

As earlier discussed in section 2.4 of this document, one of the critical factors that stood out as challenging to the adoption of green concept was lack of its education/training. Thus, designers were devoid of knowledge, technical skills and confidence to design and implement green building. This gap was as confirmed by many of the studies based in the USA, India, South Africa, and Kenya, respectively (Karji *et al*., 2020; Taffazoli, 2019; Nevzorova & Kutcherov, 2019; Hankinson & Breytenbach, 2012; Were, 2015). In addition, Templeton (2011) opined that green concept was either not studied or comprehensively covered at tertiary institutions, for it was considered a specialized field. Further, Malik *et al.* (2019), in a study based in Pakistani, concurred with Templeton (2011) by pointing out that lack of awareness and education on sustainability among information technology students impacted their competence to adopt green. Malik *et al*. confirmed this after investigating on the awareness levels of green among 159 higher education students in public universities in Pakistan. The study aimed at establishing the depth of green inclusion in the curriculum for information technology students. The findings revealed that 71% of the students were yet, to be made aware of sustainability/green issues while, 12% just had an idea of it. Evident was that the information technology curriculum needed to cover the topic of sustainability sufficiently. This would develop student competence in adopting sustainability/green concepts across all curricula and not only in information technology or interior design disciplines.

Akinshipe and Aigbavboa (2018) call for the need to train designers to build green to align themselves with professional requirements, that is, sustainable development skills and other emerging industry practices. With the building industry constantly evolving, the academic curricula should ensure that the industry's requirements are met. This is by including emerging issues or trends such as green building to curb on climate change that is a current significant problem. Owing to the training gap that was noted, several studies recommended the importance of including green into the training content of building experts (Malik *et. al.* 2019; Sangster, 2016; Olweny, 2018). Training on green would enable its adoption by building experts and thus increase the number of green building in future. There were various recommendations from past on the need to conduct researches to avail the much need information on integration of green building in designers training/education. Such research would act as a benchmark for creating suitable approaches to integrating green into the training of building designers. Training approaches on green building would be tailored to suit different countries given that dynamics surrounding green building varies with socio-culture and climate. Such an inquiry, sought to identify and detail the training needs and areas that require integration of green content.

In China, Guo and Zhang's (2021) observed that integrating green in the training of building design professionals enhanced their employment rate and increased student satisfaction. Therefore, this study aimed at causing an improvement in the employment situation among the environmental design students if at all by informing and emphasising the importance of including green content in education and training. Further, Guo and Zhang study was supported by Rasha (2017) indicating that, educating interior designers on green building equips them with knowledge, skill and a positive attitude towards the environment. Ispen (2021) also confirmed that training significantly increased interior designers' adoption of green concepts when compared to other mitigation measures. After all, the construction industry fully expects higher education institutions to train and produce professionals that are confident in and can deliver on green projects (Akinshipe and Aigbavboa, 2018). The expectation being that Interior designers skilled in green will confidently provide innovative solutions to reduce climate change and challenges related to sick building. Further, in examining factors influencing green adoption among interior designers in South Africa, Hankinson and Breytenbach, (2012) concluded that educating on green building concepts, enacting national regulations and policies, and increasing options of green materials and technology while, improving client awareness of green issues were primarily the factors that increased its adoption. Other studies by Rabigh and Ibrahim (2015), Khaleel (2013), Darko and Chan (2017) were among those that concurred with the findings and made similar observations.

Ebaid (2022), in exploring accounting students' perceptions on integration of sustainable development issues in their education in Saudi Arabia, engaged a survey instrument of a questionnaire. The study revealed that although most students had learned about the concept green from the media, they perceived it to be important although their understanding of it was not as good. This was because issues on sustainability/green needed to be integration into accounting education at the university. This provides a clear indication to the universities to begin integrating green content in the training of different professionals. A survey by Sammalisto and Lindhqvist (2008) established levels of green content in Sweden's institutions of higher education offering architecture, interior design, and engineering. The study found that the level of green integrated in the content of design professional's training was low. In a Malaysia based survey by Kuper (2009) involving 100 architectural students of Temple University, it was revealed that awareness/knowledge on green roofs lacked in half of the respondents. The students confessed to have never heard of or seen a green roof.

In a case study, Rania (2015) aimed at integrating sustainability issues in interior design curriculum for Jubail University College. The study recommended inclusion of green content at all levels of training and in different courses. Rania advocated that theoretical courses should provide background on sustainable design while discussing implementation of its principles. In contrast, studio courses should then provide a platform to implement the green concepts learnt in class projects. The resulting courses should be composed and mapped based on LEED-certification points akin to sustainability. These points include the integrative process, sustainable sites, location and transportation, water efficiency, energy and atmosphere, materials and resources, interior environmental quality and innovation. These points would ensure that all the areas of green building are taught by being given the same priority and attention that they deserve.

Obrecht *et al.* (2022), established levels of green content integrated in Slovenia's university training by analyzing 1051 programmes of Bachelors, Master of Science and PhD. The findings revealed that the highest share of study programmes with green integration in its content were average in level. They included programmes of 3 subjects that explored 392 study programmes. Sustainability/green in the training Content was mainly represented by integration of environmental topics that touched on preserving ecology and greening but, were rarely on circular economy and its social aspects. Notably, fundamental differences existed between specific programmes and fields. This implied that not all students were uniformly educated on green issues therefore; few qualified to handle future sustainability challenges. Especially notable was that, programmes for Masters Students ended up with the best choice to provide insight on sustainability/environmental topics needed by future environmental experts.

A study by Rasha's (2017), based in Egypt, investigated existing levels of green content in interior design curricula for its universities. Rasha found that there was need for integration of green content in the curricula and, those that taught it did so out of a personal initiative. In addition, the faculty had acquired knowledge on sustainability/green building through personal research. Thus, faculty were self-taught on green via: internet (55%), scientific papers (34%), conferences (8%) and by supervision of postgraduate thesis on sustainable design. In addition, majority (67%) of the faculty were opposed to teaching of the green concept in 'stand- alone' courses. They instead advised that the content be spread throughout a curriculum since students normally viewed stand-alone courses as optional and not a requirement. A holistic approach was preferable because having different courses allowed for multiple aspects to be taught instead of presenting all information in one course that is introduced at the beginning of training.

Rasha further recommended that specific sustainability topics should be taught throughout the design programme. To add on, there were some obstacles that were identified in the teaching of green content and included the need for more awareness, minimal academic staff training and time for training, already saturated training programmes with little room for additional content, existing courses needing assistance in embedding of green due to prevailing content and purpose. Hence, there existed need to create a model and define pedagogical skills to aid integration of green content in programmes for interior design training. In answer to this need, a model was developed by this study that took into consideration the various obstacles earlier identified by the reviews. The model was designed to deliver an efficient, yet effective way of integrating green content and teaching it. Therefore, increase confidence in practicing green by in future interior designers (building experts). The model is discussed in depth in Chapter Six of this study.

In a South Africa-based investigation, Akinshipe and Aigbavboa (2018) highlighted that the extent to which the education curricula on construction incorporated green content was shallow and vague. The curricula needed to have covered fundamental elements of sustainable development or, provided a method of achieving it in practice. A project by United Nations Environment for Promoting Energy Efficiency in East Africa’s buildings held training workshops using high-quality education materials. This project expected that such a move would translate into high levels of green adoption among building stakeholders. Unfortunately, it was discovered that the anticipated high rates of adoption did not materialize. This was because the workshop involvements were only helpful as a sensitization exercise on green building but, the periods were too short to create adequate capacity and confidence for independent adoption. Neither did, offering after-training technical assistance create internal capacity and independence but, encouraged follow-up requests for review of plans and drawings instead (EEBA, 2018). Therefore, the transfer of skills in green design was not usually immediate and so time is needed to develop confidence in adopting green concepts in design practice; which can only be provided for by training institutions.

The training programmes in institutions of higher learning should enable platforms and opportunities to engage in green design through active hand-holding. This perspective was reinforced by the Machakos Declaration of 2016 on Mainstreaming Sustainable Building Design in Curricula of Higher Learning and Practice in East Africa. The timely declaration was endorsed by 13 universities across the East African region, with institutions in Kenya represented by University of Nairobi, The Jomo Kenyatta University of Technology, Kenyatta University and Technical University of Kenya (Olweny, 2021). The declaration creates a chance for tertiary institutions to review and integrate green content into the training of their building designers. Unfortunately, the extent to which the review has been implemented remained largely unknown especially in the interior design and construction fields.

There needs to be more inclusion of green content in the training of architects at the undergraduate level in East Africa. This was a recommendation by Olweny (2018) from a Uganda based survey that evaluated architectural training in programmes across East African universities. In conclusion, Olweny had it that architectural programmes lacked courses with content on green and the link between these courses and climate change was vague. Although Olweny acknowledged that lecture-based courses touched on climate, comfort and building material performance, it however doubted the success of pedagogy used in delivering these courses in studio/practicals. This was because, understanding green architectural solutions would have been conveyed clearer using a different teaching approach; a perspective also held by Assali (2017). Olweny's doubt on success of the pedagogy used stemmed from the fact that the supposed green courses were either support- or lecture-based and hence, had no link with studio training. Further findings exhibited that even course instructors needed to be more conversant with the philosophy of green design.

Therefore, instructors rarely taught green concepts in building. Nonetheless, Uganda had so far shown a positive transformation of architecture by intentionally integrating green content into the education of architects.

Evident also is that, leadership was vital in transforming design/architectural education to embrace sustainability (Marco *et al.*, 2020). The observation was a confirmation of findings by Olweny's (2021) examining new architectural curriculum enforced by Uganda Martyrs University. The curriculum, in support, purposely integrated green content at a greater extent in its training programmes. The successful implementation of the curriculum was attributed to faculty/staff dedication, commitment, and stamina, noting the resistance that had to be overcome at several levels.

Ambole's (2011) survey of perceptions of design students from the University of Nairobi and Maseno University on integrating green content in their training shows it needed to be more. The results showed that most (51%) of the students expressed minimal encounter with or lack of green content during their training. The finding confirmed EEBA's (2018) concerns about building training that identifies a need for more confidence in adopting green concepts as a major among these professionals. Ambole cited ill-equipment and lack of green content during training in design as the main reason for students needing more confidence to adopt green concepts in providing design solutions. The Association of African Universities (2012) Report further confirmed the need to integrate green into university education in Africa. This was because it was reported that only engineering as a design discourse had directly integrated green content in their curricula although at low (8%) levels.

Were (2015) further reiterates that even though most of the building professionals in Kenya were conversant with the green concept, there was need for its training locally. This is because most of those building experts that were conversant with green design had not been trained locally but abroad. Ndegwa's (2018) summed up the preceding findings by concluding that 83% of all public universities in Kenya offered environmental/sustainability-related courses. This finding was as a result of a survey that analyzed 70 of the university courses considered as green related and offered in Kenya’s public universities. This contrasted largely with the 12% of private universities that offered the same. This implied that only few private universities had attempted to integrate sustainability issues into their training process.

The low integration of green content in the training at university was evident from past studies. Hence, there is need for deliberate alignment between curricula and sustainable development goals at international and national levels. Ndegwa (2018) therefore, concludes that to achieve international and national goals that Kenya ratified on sustainable development, it would be paramount to withdraw course contents that were redundant and integrate new ones. The new courses would be in relation to environmental/green content, development of climate resilience in education, training, campus operations, and increase in student engagement. Individually and jointly, literacy on sustainable construction, its adoption and evaluation usually had an above-average impact on compliance in a construction industry. This was reported in Kamau (2019) study that was based in Kenya and which primarily focused on interior design segment of the industry in Nairobi City County. Kamau pinpoints the importance of literacy for increased uptake of green/sustainability issues and compliance among interior designers. Unfortunately, in this study, the operationalization of key concepts was vague and in addition, failed to detail the integration of green in the training aspect of interior designers.

Notable from past studies was the need to appraise the contents of building experts' (interior designers) curricula at the undergraduate level. The need for appraising curricula was necessary to address current green trends in the industry while, aligning the discipline's focus to institutional, national and global goals. The move is key to achieving an increased adoption of green concepts and engenders an environmentally conscious generation. Also, worth noting was that past studies examined the integration of green in the training of all other professions including building, except in that of interior design (Kang & Guerrin, 2009; Leddy, 2013; Rasha, 2017). Even fewer were those studies that specifically investigated green integration in the training (curricula) of interior design locally (Kenya) except for Mukhwana (2016); Ambole (2014).

Moreover, most studies determined the level at which green content was integrated by surveying perceptions of design instructors, students and professionals while, mainly ignoring the curricula except for a few like Olweny (2017). Most of the studies were international based in countries that had an economic, climatic, and cultural setting different from that of Kenya. Hence, those studies outcomes may not be generalizable and thus, would only be valuable in informing other studies but not the local decision-making process (Rasha, 2017; Rania, 2015). Lastly, most of the past studies failed to provide details on the levels of green content that was integrated in various curricula that were investigated. Yet, such details would have highlighted the problematic areas in the training of building designers. This move would have enabled the creation of appropriate methods and solutions for integrating green content into training curriculato promote increased adoption.

However, this study endeavored to remedy the gaps mentioned above by examining interior design curricula used in Kenya's public universities. This was a different method as opposed to that of interviewing design students and course lecturers on integration of green, a method that featured most in past studies. Examining curricula as a sample population was an appropriate method as it enabled identification of the training gaps in interior design programmes and established levels of green integration in the content of university training of interior design at undergraduate level in Kenya. The findings of this study were then used to inform development of a model-framework that was proposed for guiding integration of green content in interior design training programmes.

2.4.2 Pedagogies in Delivering Green Content

To achieve a country's goals on building sustainably, teaching methods in delivering green content matters a lot during the training of building experts. Ndegwa (2018) continues to aver that sustainability should not only be part of a university's culture but an enhancement to an institution's brand and marketability of its students. Therefore, appropriate pedagogies in teaching of green content may require adjusting of curricula and calling for its inclusion in related policies while, building the capacities of educators and trainers.

Past studies demonstrated different ways in which green content was integrated and taught to building experts. For instance, Sangster (2016) inquired into the teaching of energy and water efficiency programmes in schools across Canada, the USA, the UK, and Japan and discovered that green issues were integrated early in the education of individuals. Gürel (2010) was in accord with Sangster in echoing that, ideally, content on green needed to be integrated in every aspect of a curriculum. This would enhance the development of green habits that ensures sustainable lifestyles in the future. This is because of the belief that education would create a generation of building experts that were more aware of green issues.

Also, Sangster (2016) revealed that learning outcomes were better when students were given significant control over green programs and put in charge of running them. On the contrary, Celadon (2017) opined that the results were better if tutors were allowed to elect topics on green and teach, as they deemed appropriate. Tutors are also to coordinate different student learning activities and be fully in charge. Collaboration in teaching was deemed essential when delivering theory and studio courses. However, the teaching of the green content must be as outlined in the course training guides.

Ma and Jin (2022) in a study done in China among 25 Ningbo-Tech University students found out that, a practical interdisciplinary approach to green content integration and teaching in engineering, was most appropriate. Such an approach would develop design students' diversity of knowledge and complex problem-solving capacities. For instance, according to Ma and Jin’s ,students s were taught urban water environment engineering theories and then, encouraged to work in groups to complete a landscaping design project for river ecological restoration. The findings substantiated the importance of outdoor education and project-based teaching. The results provided new insights for educators into integration and delivery of green content in disciplines of design such as engineering.

Further, insights by Celadon (2020) in coinciding with those of Ma and Jin (2022), suggested that interior design curricula be audited and, revised regularly to include current facets of green building. The revision was to enable students to acquire systematized knowledge, appropriate abilities and skills on green building to create spaces with a high environmental performance. The modifications stemmed from a practical curriculum realized in teaching interior design at the Academy of Fine Arts in Krakow (Finland). Celadon also recommended inclusion of core courses in the curricula that are linked to environmentally/sustainable interior design. Such courses should offer comprehensive theoretical knowledge on the multi-dimensional aspects of sustainability, professional design tools, evaluation systems and an interdisciplinary approach to environmental design. Workshops/seminars that are led by green building consultants and professionals practicing green interior design should be offered frequently as the norm. Efforts should include an integrative approach to delivering design classes as a supportive project-based learning technique. An integrative approach will develop students' ability to accomplish sustainable design strategies for resource efficiency, waste management, optimization of quality indoor environment, and pro-environmental education. In outlining the benefits of conducting integrative design in teaching, Celadon proved that it would develop technically and formally innovative interior designers. The method allowed interior design students to establish a connection between theoretical knowledge and practical adoption of green concepts, as advocated for by Olweny (2017).

Besides, Ramirez (2012) posits that, like in the USA, UK, Australia, and South Africa, green issues should be integrated early into design training and carried through to postgraduate level. The survey by Ramirez involved 221 university undergraduate training guides, websites, and tutors of Industrial design in the countries prior mentioned. The findings showed that concepts on green design were taught more effectively using the approach of group work. Similarly, the discovery the discovery by Ramirez was in agreement with those of Gaulmyn and Dupre (2019) where individual student's work was less credible and more impressive than group work. Gaulmyn and Dupre arrived at that conclusion after an evaluation that used a new sustainable performance simulation tool named Easy Approach for Sustainable and Environmental Design (EASED) among architectural students for creation of innovative sustainable design. In addition, teaching through active collaboration with building industry stakeholders would address the challenges of green integration in interior design training, thus, heightening student motivation in non-studio courses. This was by Afacan (2013) after a 15-week evaluation of the "IAED 342 Sustainable Design for Interiors" course involving 98 third-year interior architecture students from Bilkent University (Turkey). It was established that active industry collaboration positively influenced students' awareness and understanding of green concepts. Industry collaboration also increased students' ability to confidently integrate green content in Studio design projects, answering the need for more confidence in adopting green, a concern earlier mentioned by EEBA (2018). Afacan argued that active collaboration with industry stakeholders improved students' academic outcomes as opposed to conventional methods of teaching that is, performing theoretical exercises.

Teaching green content through an approach of 'build-to-learn' is a more effective pedagogical practice and reveals positive learning outcomes. The observation made by Konkel (2014) avers that, the 'build-to-learn' approach reinforces experiential learning in architectural and engineering education. This discovery was from an online survey involving 40 interior design educators. The survey also included associated learning outcomes of 11 students in a construction materials and methods course. The findings highlighted four stages in using the approach to achieve effective results that include representational modelling to understand 3D-dimensionality, construction assembling and materiality, joinery and connectivity, and experience in real-scale construction. Much of the exercises done by the students should purely involve the practical aspect and touch as an experience of different materials is key in developing their perceptions on green design.

Interestingly, Pakravan *et al.* (2022) points that since there was a decline in the stock of agricultural land, pedagogies advocating for interior space designs that enable the cultivation of food to be integrated during design and training. This notion, though contemporary, would enhance residential urban agriculture in a futuristic vision to improve food security in a way that not only would building interiors provide landscapes but, also provide a platform where fresh local food can be cultivated, processed, and distributed. Urban agriculture is new concept but has the potential of inviting a lot of interest from various stakeholders in the future.

Generally, as exhibited by the reviewed studies, it was acknowledged that few on the topic were locally based and especially in developing nations, except for Olweny (2017) done in Uganda. The method mainly used in past studies was that of scrutinizing existing pedagogies through interviewing (survey) of design course instructors in various learning institutions. None of the studies analyzed the contents of the different existing curricula, to confirm the varied and recommended teaching methods. However, by gathering information from the instructors, students, and class design projects, examining curricula yielded more comprehensive results that are free from biases. This was as advised by Hakinson and Breytenbach (2012) after observing that there is inconsistency in what designers confess and that which they do in reality. The current study, therefore, remedied the identified gaps by involving a total population of the existing interior design curricula and employed document analysis in the methodology.

2.5 Green Integration in Interior Design Training

Owing to the discussions in the previous section, it is important to integrate green in interior design and other building experts' training. On the other hand, the architectural design instructors also need to teach and should therefore be more conversant with the concept of green, even though just a few had a positive attitude towards it. This address a concern raised by Olweny (2017) that pointed existence of a difficulty in integrating green content into the training curricula/programmes of interior design for teaching/learning process. The process of green integration is therefore, discussed in the following section 2.6

2.5.1 Integrating Green in Interior Design Programme

Acquiring knowledge and skills on green building enables interior design students to develop confidence in adopting the concepts in designing of spaces. There existed a need to avail a simple method of integrating green content into design training without disrupting the already busy and full design programmes. Vallet *et al.* (2014) acknowledged that educating designers on green was the most significant mitigation measure to increase its adoption. Thus, Vallet *et al,* stresses knowledge acquisition as mandatory and should be integrated at all levels of interior design training. This meant that topics on green be spread from beginnings of interior design training to its ending. That style of integration coincides with a sustainability-philosophical model that McDonough and Braungart (2002a) termed 'Cradle to Grave'. In that, apart from emphasizing the need to do more with less (Frank-Lloyd Wright), the philosophical model advocates for continuity. Continuity involves interrogating and improving aspects of a product/process (for example stages in design training/learning, buildings) to make it green throughout its life cycle. In this case, integration of green principles such as re-use, reduce and recycle form an integral part of design training. According to the philosophical model, the resulting design product must have multiple uses, either as biological or technical parts circulating in closed-loop cycles without down-cycling.

Victor Papanek envisioned sustainability through social inclusion in the 1970s with a focus on designs being light-weight and space saving (foldable, inflatable and stackable). Francis Kere articulates the green philosophy in the modern twenty first century from an African architectural perspective. Therefore, combining local sustainable materials in response to extreme weather conditions and low economic standards to provide solutions. In Kenya sustainable philosophy proponents are Musau Kimeu with a stress on environmental aspect that focuses on providing right thermal comfort for building interiors with energy conservation at the helm of it. The reginal and local relevance of green building is a growing philosophy and finds it relevance in architectural schools.

McDonough and Braungart (2002) assert that it is cardinal to consider the triple bottom line when engaging the sustainability philosophy in designing products. Considerations are therefore, made to strike a balance between the traditional sustainability goals relating to economic, social or environmental aspects. The authors emphasize that designs of new products should refocus on development to enable creation of safe and quality items. The products should enhance well-being of nature and culture while generating economic value. However, it is not possible to achieve all the three aspects of sustainability in one go. Therefore, in the case of a building, the focus of its design should then be on only one aspect of sustainability at any given time. For instance, the focus would either be on the environmental, social, or economic aspect Morone (2020) suggests that the linear strategy of 'cradle to grave' is applied to increase the efficiency aspect of green building but, it was found to be inadequate. Therefore, designers should be taught to uphold a closed-loop system that denotes a new paradigm shift, which enables effective use of resources. This new strategy is known as the 'cradle to cradle' approach, where there is no waste, and everything acts as a resource for some product, hence attainment of a circular economy as envisioned by Diaz-Granados (2021). Designs of products that strive to achieve a circular economy are of a worthy characteristic that ought to be ingrained in interior design training programme.

Entrenching a consultative approach that involve industry stakeholders such as vendors, contractors, developers, facility managers, and interior designers in the training programme enhances learning and confidence to adopt green concept (Celadon, 2019). Design for Sustainability (DfS, 2009) concurs with Celadon by averring that in including the industry stakeholders, students benefit from a consolidated variety of information and experience that would not have otherwise been gained in a purely class environment. Pleevoets and Cleemoel (2013) further emphasize that interior design training should stress the aspect of longevity, and so, in technical life enable: repair, replacement, and material reclamation. However, that aspect of longevity fails to augur well with the call to enhance the economic aspect of sustainability. Pleevoets and Cleemoel continue that when training on resource efficiency, emphasis should be on teaching designs that accommodate future needs for space change. The teaching should inspire preservation, restoration, reconstruction, adaptive re-use, and re-modelling of interior spaces. Interior designers be thus, trained to arrange interior design elements to achieve multi-functionality and flexibility of spaces. The suggestion agrees with that of Celadon (2019), adding that during training, designers be taught methods to manipulate interior components (shell, services, space plan, floors and suspended ceilings) to be of different life spans. The components should be liberated from each other to enable intervention and replacement. Ndichu (2017) added that considerations for the rate of change be made primary in organizing design elements within interiors. The idea of longevity would not only result in the prolonged use of a green element but, make it economical to do re-troffits.

The integration of green in design training also demands considerations for aesthetic identity. This leads to acquiring formal integrity that allows designs inspired by local and natural concepts. Earlier proponents of green design, such as Frank Lloyd Wright, believed that architectural designs should blend with their natural environment. If not, then be inspired by nature as in the practice of biomimicry (Celadyn, 2017; Predrag, 2019). Adopting biomimicry would curb the recent trend in African countries where without much contemplation, architectural designs aped those of buildings in temperate climatic regions. Many glass-covered facades accelerate heat gain within interiors, and with already heightened tropical temperatures, the comfort of the spaces are compromised. Moreover, design training should include assessing aspects of interior environmental evaluation, where the impact of one’s designs on users is measured in addition to their satisfaction. Such evaluation trains designers to predict the quality of their designs in advance in terms of: waste management, harmful emission of chemical substances and interior Environmental Quality parameters to adjust them beforehand (Wilkison *et al.*, 2006; Winchip, 2007). Evaluation minimizes the chances of poorly designed buildings and reduces maintenance costs since both can be projected in advance before a building is constructed or allowed to be operational.

Modelling interior designers on the art of sourcing green materials and especially from sustainably managed production sources is paramount (ECOS, 2019). Designers should be equipped with skills and knowledge to design, manufacture or source from green materials creatively. Akidiri *et al.* (2012) agree with ECOS adding that, it is mandatory for stakeholders such as manufacturers to provide information on green products' specifications that include: green characteristics, ability in crime prevention, resistance to natural disasters and fire for quick human adoption. Akidiri *et al.* stress that for successful design outcomes, decisions are mainly influenced by designers' knowledge of green, available skills on the green in the market, green materials and technologies, opportunities and incentives. Therefore, local processing of green building solutions should be lauded over imports, even in regards to skills acquisition. Sule *et al.* (2015) opines that in integrating green in training, technical issues are usually lauded over the socio-cultural aspects. Efforts should, be thus, intentional to include the socio-cultural aspect. When possible, considerations should be made to adopt an approach of a green global teamwork project. This would then be guided by the LEED-green building system as a framework and vernacular architecture. Since in designing products, precedents ought to be created, that is coupled with a collaborative experience.

2.5.2 Models Aiding Integration of Green Content in Related Disciplines

Models that exist to aid the integration of green content in design discourses are discussed in the section that follows. Figure 2.1 illustrates several topics on green that were integrated to revamp and design curriculum in the USA. The model was for the field of engineering and being a design discourse, it should inform the process of integrating green in interior design training.

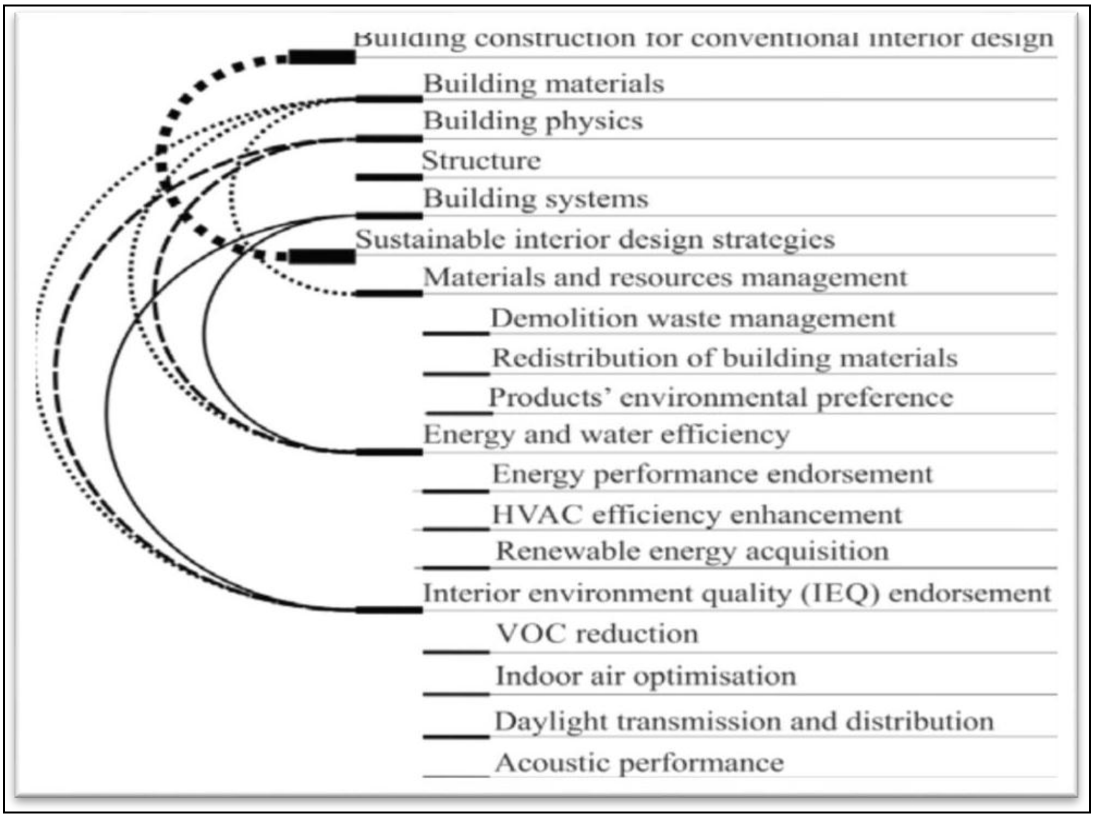


Figure 2.1: Juxtaposition of Sustainable Design Content
Source: Celadyn (2019)

The topics were categorized into: building materials, building physics/technology, building structure and building systems customarily examined in engineering. In comparing the topics in engineering training to those in interior design, building systems and technology were absent. Yet, the two topics were essential in order to achieve a wholesome training for all building designers. Therefore, there is need to include them in future programmes.

In training interior designers on green, Celadyn (2019), emphasized in Figure 2.1, teaching of three significant topics: materials and resource management, water efficiency and Interior Environmental Quality (IEQ). The three sub-topics listed in the figure, identify the major topics that should be integrated in interior design training. Unfortunately, the content represented in the model (Figure 2.1). The limitation is in the sense that several knowledge areas were excluded and needed to be addressed. For example, green materials and passive technologies, the social aspect that ensures creating quality environments and engaging users. More so, areas relating to water efficiency were mentioned but not addressed in the model.

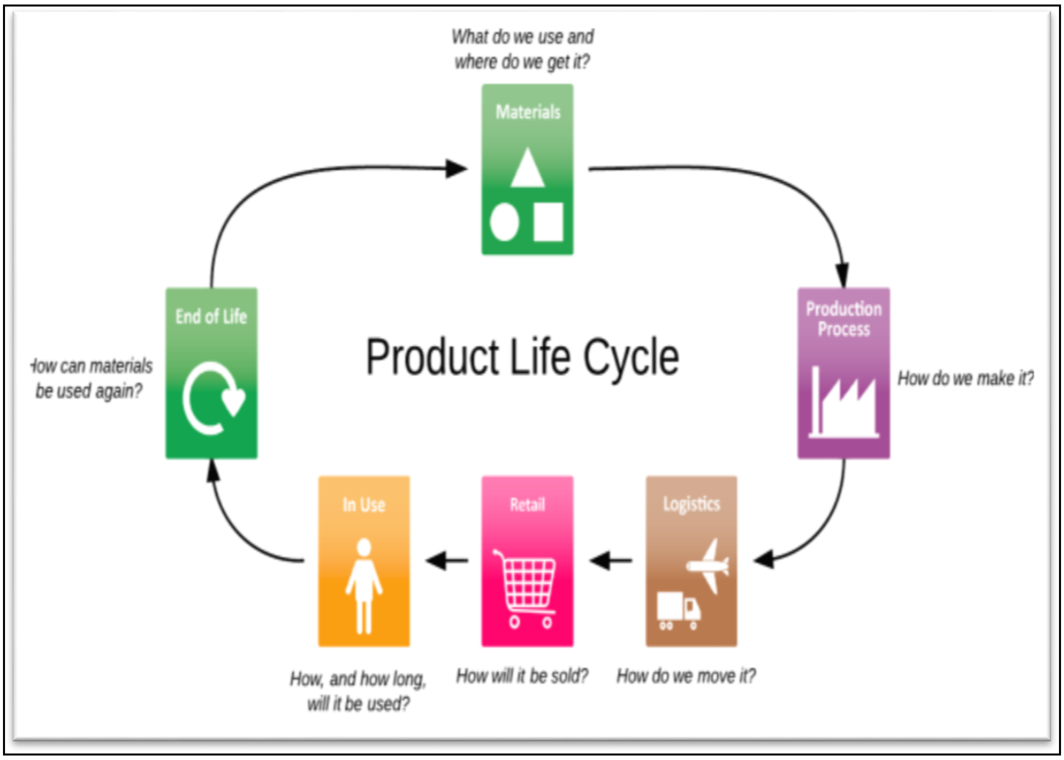


Figure 2.2: Eco-design Product Life Cycle
Source: Murray (2013)

As shown in Figure 2.2, the model by Murray (2013) illustrates the integration of specific topics on green materials and their production processes, especially in product design. Unfortunately, these topics only address materials and processes, excluding energy and water efficiency. However, they are pertinent topical areas in enhancing sustainability in areas of interior design. The model embraces the loop principle reiterated by McDonough and Braungart (2002) and modified by Morone (2020) to refer to 'cradle to cradle' not 'cradle to grave'. The looping in the model gives it superiority over the Celadyn (2019) model in Figure 2.1. Celadyn's model seems inferior since it leaves out many current features of green in terms of looping, as it portrays the linear 'cradle to grave' aspect. The 'cradle to grave model' does not embrace green principles of longevity, reusability, culture appropriateness and many more.

Additionally, a superior model would combine the strengths of the existing models and create a hybrid model that integrates all areas of green including the biomimicry and biophilia aspects. A sample of such hybrid model formed the end result of this study and is discussed in Chapter Six.

Another model proposed by Perpignan *et al.* (2020) to guide the integration of green content in curricula for undergraduate engineering in France, outlined six significant levels to be embedded. The levels include ethics, complex thinking, collaboration, critical thinking, systematic thinking and agility. Further Perpignan *et al.* opines that green integration should be done during acquisition of technical and disciplinary skills to ensure they are eco-design specific. Eco-designed implied that issues on economic, social and transversal aspects of sustainability were integrated. That involved a proposed process referred to as a skill cross-over matrix. Subsequently, the matrix will evolve towards guidelines combining specific knowledge of green design skills and cross-disciplinary competencies. Perigan *et al.* later surveyed academic staff to identify green-related knowledge/competencies targeted during their teaching. The findings showed that faculty mainly taught cleaner production, waste management or pollution prevention. The implication was that none taught on the economic and social aspects of sustainable design.

Pezesheki *et al.* (2013) proposed four major dimensions considered in modelling a green content curriculum, especially in higher education for engineers. The dimensions included: in-core science, facilitative strategies for instance, tool development; canonical eco-design philosophy, that is decision-making processes, conceptual knowledge and paradigms shift. The dimensions were either a replica of what other authors had previously mentioned or a development of ideas already existing in sustainability discussions.

Vallet *et al.* (2014) further proposed a sustainability-training model for civil engineers, with a framework listing six main areas dimensioned into multiple levels. The areas include choice and management of criteria, modelling of life cycles, management of the eco-design process, levels of calling into question, evaluating the impacts of products, and services on the environment (life cycle assessments), an insight also shared by Wurst *et al.* (2023) and Leornadi *et al.* (2022). The studies echoed findings that involved green products which students ought to learn and methods of carrying out impact assessments during project designing. Lastly, integrating industrial and civil stakeholders in teaching designers on sustainability is vital. These stakeholders are vital since they bridge the missing connection between industry and practical reality necessary during design learning processes.

Further, Berceric-Gerber *et al.* (2014) in a USA based survey identified the best method that upcoming construction professionals could use to meet the present needs of the building industry. In addition to technical, personal, and green building, other skills required include possession of cooperative skills for good teamwork, attaining deep understanding of critical professional subjects (social, environmental and economic), comprehension and application in basic engineering technology and computer systems. Notable, was that, when all the skills were applied, the expectation was that designers will confidently provide innovative sustainable product solutions relevant to challenges of climate change. Important too was that, social skills were deemed necessary in order to practice green building successfully.

Remarkable from the reviewed studies especially those represented by models in figures 2.1. and 2.2., were research gaps worth addressing. The studies mostly stressed green designing from the perspective 'cradle to grave' process of a building/ product instead of 'cradle to cradle' loop of life cycle. The loop aspect was more developed and resonates well with present times of green building practice. In addition, many models needed to detail the procedures, and topics on green to be integrated in addition to pedagogical methods adequate to achieving the desired training goals. Furthermore, the models primarily addressed design disciplines like engineering/construction management, with fewer specific to interior design. Existing models addressing interior design were not extensive in that, they only presented processes and methods to achieve sustainability/green. However, they needed to provide a holistic education approach to integrating and teaching green in design training.

In addition, information on past studies mainly focused on siting and construction phases, leaving out design and occupation. Therefore, existing models to aid integration should be informed and guided more by industry and research approaches to green building rather than, simply educating/training. Many of the models were based on studies done internationally and hence, need for one based locally. That could adequately inform decision making.

Although the available literature provided eco-design processes, frameworks, methods and tools to inform integration process, they failed to consider the need for a progressive education to green building. Particularly, integrating green principles and processes into existing interior design training programmes fully proved difficult. This was because individual educational institutions, typically design their curricula with no existing system to ensure uniformity in green integration (Akinshipe & Aigbavboa, 2018). Thus, in addressing the gaps, this study developed a suitable and comprehensive model-framework to aid integration of green in to the content of university training at undergraduate level in interior design specifically for Kenya.

The proposed model-framework provides a simple but convenient way of adequately integrating green content into existing curricula/training guides especially for interior design. The model-framework achieves the integration process with minimal resources and changes on training programmes. The framework is viewed as an important step towards the increase of green adoption. Thus, with a goal of lowering cases of sick building syndrome, environmental degradation and climate change resulting from building impact.

2.5.3 Sustainable-Green in Kenya's Housing Policies

Although Kenya's housing policies do not directly address sustainability/green in buildings, they make provisions for it. The provision is achieved through several existing legislations and building-environment-related policies. Some of these policies include Agenda 2030 on Sustainable Development Goals (SDGs) and African Agenda 2063. At the national level, green building requirements are entrenched in Kenya's national policies, laws and action plans in: Green Environment SIP-2015-2030 National Environmental Policy of 2012, National Housing Policy-2004, the Occupation Safety and Health Act (OSHA) 2007, Big Four Agenda on Affordable Housing, National Climate Change Act 2018-2019 and Vision 2030(SDG no.7).

These protocols were created to guide and ensure increased adoption of green concept in buildings. The National Housing Policy, 2004 in agenda f (revised in 2016), obliges to enhance the development of innovative building designs and cost-efficient traditional architecture; built from locally available and affordable materials (GoK, Sessional Paper No.3). The broad vision of Big Four Agenda on Affordable Housing encapsulates the use of innovative technology and materials (Kenya's

Affordable Housing, 2018). The 2010 Kenyan Constitution Article 10 (2d) emphasizes the need for sustainable development while, Article 42 indicates the right to a healthy and clean environment. Article 42 spontaneously creates room for the sustainable exploitation of natural resources and provision of quality interior environments. Lastly, Article 43(1) directs the government to provide citizens with adequate housing and reasonable sanitation standards. Again, this reiterates the need for a healthy, clean interior and exterior housing environment.

To realize the above rights, the following Bills exist to that effect and they include: the Built Environment Bill 2012 that led to birthing of the Building Authority of Kenya(the body creates and controls housing standards and certification); National Building Regulations 2014; National Building Maintenance Policy 2015, National Environment Policy 2013 which lays a framework for managing natural resources; National Construction Authority 2011; Kenya's Vision 2030 aimed at housing citizens in decent, sustainable and secure environments by reducing pollution; Energy Act 2019 aimed at increasing national energy efficiency by implementing performance standards for lighting and industrial products; Water Act 2002 providing for managing water resources and sanitation; and Energy-Solar Water Heating Regulations 2012 whose implementation was targeted for 2017 but lacks reinforcement to date.

The other related policies include those of Environmental Management and Coordination Act 2015, that of National Environmental Management Authority that is aimed at auditing the environmental impact assessment of buildings (NEMA, 2012); The Green Economy Strategy and Implementation Plan 2016-2030 (GESISP) to promote green design, construction and maintenance of buildings; The National Climate Change Act 2016; National Climate Change Framework Policy 2016; and Kenya's National Climate Change Action Plan, 2018-2022 which directs the development, management, and regulation of mechanisms to improve climate change resilience and low carbon development in Kenya. The Kenya Building Research Council, has included in its key result areas strategic plan for 2017/18–2021/22, sustainable-green building. The plan features Sustainable-green issues in terms of creating focus on research and coordination of a green building as an agenda for the country (EEBA, 2018).

Despite various policies and statutory provisions, Sangori *et al.* (2020) argues that most existing building regulatory frameworks are outdated. Also,77.4 percentage of the building experts in Kenya do not support increased green building. The outdated regulatory framework for Kenya still relies on the 1968 building code derived from (British standards. The attempts to revise it and replace it with Euro-codes is yet, to be achieved there are challenges to its approval. For instance, the revised National Building Regulations (2009) needed an Act of Parliament to anchor it as the Built Environment and Housing Bill for Kenya. To date, the bill is still awaiting approval.

Recently, a proposal for National Building Code 2020 was made. The proposal finally acknowledged the use of locally available building materials, for example mangrove timber and coral stones, which had been banned in the National Building Code 2014. The proposed code included guidelines on natural cooling, lighting and ventilation thus, prompting for efficiency by use of green energy. The code allows for adoption of renewable/green energy in line with the Energy Act 2019. Also, the code promotes rainwater harvesting and proper storm water handling (Koigi, 2019). Unfortunately, the proposed code still bans re-use of construction materials, a stand similar to that of the current building code 2014 (Section 33). Upholding the ban could be to ensure standardisation and safety of building materials with the aim of controlling quality.

2.6 Theoretical and Conceptual Framework

Among theories that guided this study were theory of Sustainability as indicated in the Brundtland Report (1987) and, the Practice Theory as espoused by Pierre Bourdieu (1992) with improvements from Giddens Antony, Theodore Schatzki and Andrew Reckwitz (2002).

2.6.1 Sustainability Theory

The concept of "Sustainability", as described in Brundtland Report of 1987, is the capacity to maintain/provide required natural resources over an extended period. The emphasis of Sustainability is on resource efficiency and environmental conservation. The concept of Sustainability focuses on the well-being of human and their surroundings (WCED, 1987). The theory comprises three key pillars: Economic, Social and Environmental. Sustainability theory acknowledges a relationship between human activities and their environment. Bryan (2005) further advances the theory by adding that, there were limits to growth that is classified as having inner and outer limits. Therefore, human activities need to consider more of the outer limit, which represents the ecological environment. Hence, decisions that enable ecological integrity should be prioritized over those that satisfy human interests (Bardi, 2011).

Harrington (2016) argues that sustaining everything, everywhere and forever, is impossible. Therefore, trying to achieve all three pillars of sustainability at a go is unattainable unless in a transitioning process. This is because sustainability systems are dynamic, and there is no endpoint to efforts in reaching them. Harrington concluded that in different regions and materials, there exist different states of lesser or greater sustainability. The weakness of this theory is in assuming that all environmental changes are connected to human activities. However, some changes occur without human participation and are by far beyond their control. The also theory fails to detail the kind of human activities and category of human-beings linked to particular environmental changes. In addition, some aspects prompting the destructive human actions should be provided for in the theory.

Nevertheless, the Sustainability Theory provided a framework within which the scope of this study was bound and explained, that is, the focus was on the environmental aspect and specifically the interiors of buildings. The theory provided a variable ‘green’ (dependent), which was measured and used to guide on topics that were reviewed in determining the extent of its adopted in buildings and in the training of interior design. Introducing the Practice Theory in this study was aimed at augmenting those areas where Sustainability theory exhibited weaknesses or failed to address the expected issues. Inclusion of the Practice Theory therefore, strengthened and guided this study better.

2.6.2 The Practice Theory

The Practice theory was initially outlined by Pierre Bourdieu (1972) and developed further by Theodore Schatzki (1996) and Andrew Reckwitz (2002). Bourdieu explains human actions in terms of practices, described as routinized or learnt behaviour. Human actions consist of inter-connected structures that influence practice, and they include mental and bodily activities, meanings (symbolic meanings, ideas and expectations), competencies (skills, knowledge, experiences) and materials (physical things and technologies). The theory considers agents as those individuals who carry out practices as influenced by set structures, that is, experts (Bourdieu, 2020). Agents/experts in a practice act as affected by norms grounded on specific emotional and motivational expectations (*doxa*), through interconnected structures (Reckwitz, 2002). Agents understand the expectations, materials for applying knowledge and, motivation in performing practices. Human actions are performed in fields (*habitus*) which are places and disciplines that play host as influenced by political, religious, and economic factors (Schatzki, 1996).

Although the Practice Theory does not indicate the directions or magnitude to which interconnected structures influence each other to enable adoption of green different levels, it explains major influences to the green practice. This study therefore, applied the Practice theory as a lens through which factors influencing interior designers (building experts' rate of adopting green adoption was examined. In addition, this theory provided the variables that were measured and used to guide the review of the study's literature on the second objective.

2.6.3 Conceptual Framework

According to the Sustainability Theory, achieving all three pillars of sustainability is impossible. Although the factors influencing interior designers' rate of green practice were examined from a perspective of the three pillars, this study only focused on the environmental pillar (building interiors) of sustainability. The factors influencing the rate of green adoption, here referred to as the 'practice', were grouped into three interconnected categories. They included: meanings, competencies and materials as referred to in the Practice Theory. These three represented the intervening variables of this study. The environmental pillar (green) represented the dependent variable, that was investigated to determine the extent to which green concept was adopted in commercial buildings. This therefore, formed the first objective of this study. The study's independent variables were represented by three elements that are usually involved in the designing of building interiors. They included Interior Air Quality (IAQ) elements, water efficiency and materials as previously indicated by Yan *et al.* (2016) and Mahdavenejad (2014).

Since, Sustainability Theory stated that attaining a complete state of sustainability is impossible, the more reason why this study's assessment of green was done to depict a in a progression of three different levels. The assessment of green level was captured on a 5-point Likert scale, divided and marked along the following progression: Conventional (lack of green), Pseudo-green (mid-green) and, green (almost complete) an approach informed by Mahdavenejad's (2014) study. The concepts derived from the two theories were as outlined in Figure 2.3. The graphical representation summarises the main tenets of the study captured in a conceptual framework that follows.

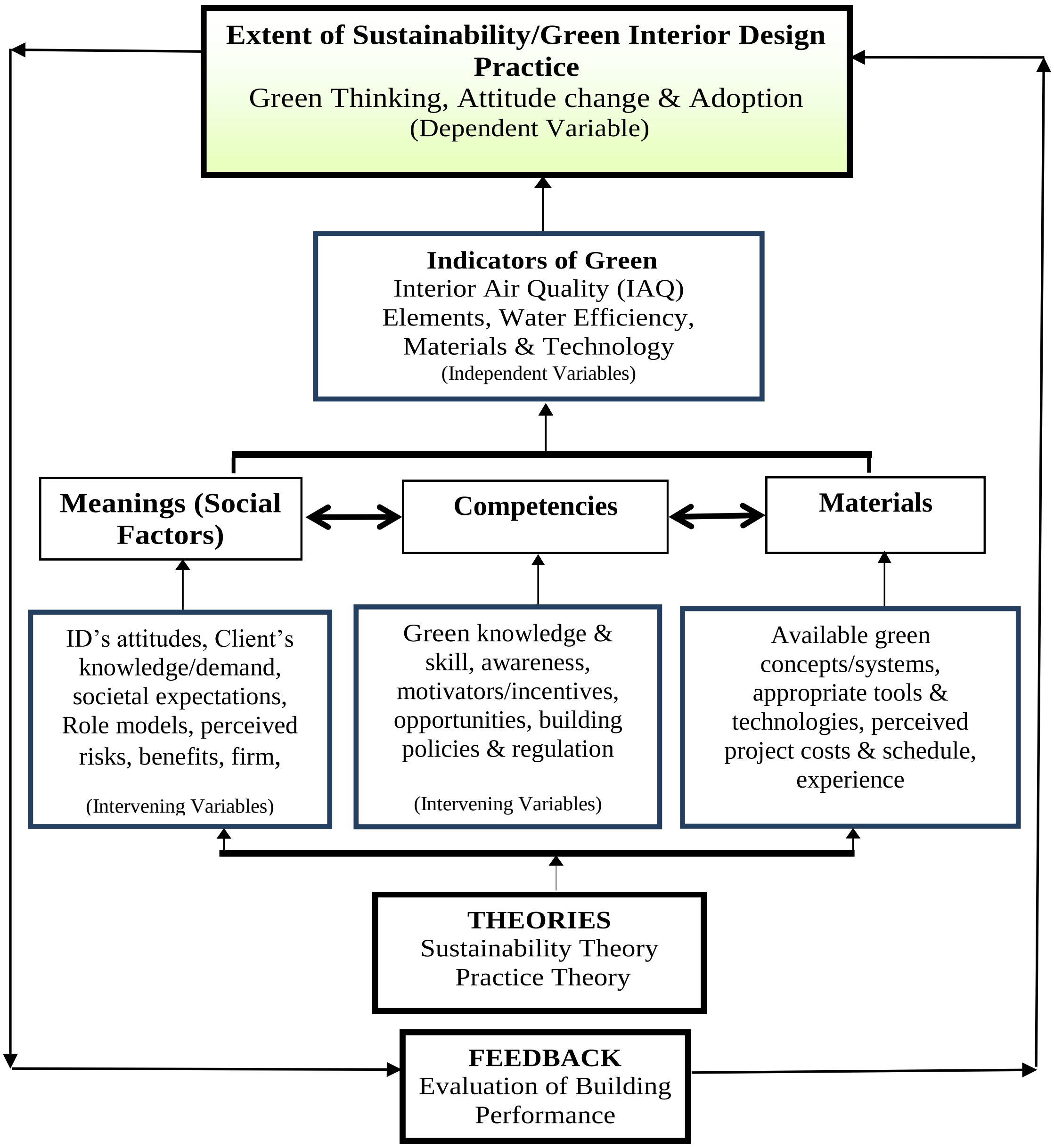


Figure 2.3 Conceptual Framework
Source: Researcher (2019)

Figure 2.3, which is the study's conceptual framework, outlines this study's concepts. According to the Practice Theory, 'agents' carrying out the green practice in this study was interior designers/experts. The goal of investigating these agents was to discover the critical factors that influenced their adoption of green concepts in Kenya and was represented by the study's objective 2 (two). Adopting green concepts in the building of interiors was considered as the 'practice' that was of interest to this study. In the Practice Theory, Bourdieu described a practice as consisting of learnt bodily and mental activities involving interconnected structures that influenced each other. According to the theory, these structures included meanings, competencies and materials. These 'structures' in the study formed the intervening variables affecting the adoption of green practices among interior designers (agents) in Kenya. The categories of variables that represented the three factors influencing green adoption included: meanings (expectations of interior designers, policies on the practice and availability of green concepts); competencies (acquisition of knowledge, skills, experience and role models on green building); and materials (green materials and technologies). These categories of factors that influenced the adoption of green by interior designers in Kenya formed the study's intervening variables.

An interconnection existed within the study variables, as shown by the flow on arrows between the intervening variables. The interconnection meant that, the categories of factors influenced each other too, before finally affecting the overall levels of green adopted/practised within building interiors. The intervening variables also influenced the levels of green content integrated in interior design curricula used in training. This also guided the investigations on the study's objective 3 (three) that determined the extent to which green content was integrated. The investigation was important a several studies had pointed to education and training on green building as a significant influence to its increased adoption (Olweny, 2018; Hankinson & Bretenbach, 2011). The arrows in Figure 2.3 indicated the interconnections between variables and the direction in which the influences flowed. All the activities and elements depicted in the flow chart contributed to the extent to which green was adopted within commercial buildings in Kenya.

Lastly, the green practices adopted in buildings operated within an ecological, social and economic environment/system. The environment is influenced by climate change, economics culture and politics as represented by the larger boundaries enclosing the whole concept, which is completed with a feedback process. The feedback process is embedded in the evaluation process that examined the performance of buildings (level of green adoption) as was achieved in the study's objective one. The first objective assessed levels of green adopted (interior space performance) within the interiors of the sampled commercial buildings.

2.6.4 Summary of Reviewed Literature and Theories

Evident from the reviewed literature was that topics on sustainability in building mainly focused on the environmental (Simpeh & Smallwood, 2018; Momanyi, 2020) and economic pillars (Alessia *et al.*, 2019; Kimani & Kiaritha, 2019) but, rarely on the social aspect. Seemingly, many studies (Alec et al., 2012; Suzzaini *et al.*, 2017) emphasized on the energy consumption elements in buildings while, ignoring other IAQ elements such as acoustics and ventilation. Significantly, few studies made a comparison to establish the different levels of green adopted in varied buildings categories. Those studies that made a comparison, engaged methods deemed inappropriate for gathering data that was highly valid. Most of the studies applied quantitative approaches that were weak in detailing data on the visual aspects of green building (Khaleel, 2014). Yet, the visual concepts in green building are best captured using qualitative approaches to research.

Also remarkable was that most studies needed to clearly state their research problems and define their variables. The past studies had ambiguous research statements that resulted in key concepts being vaguely operationalized. Therefore, it followed that the research designs and analysis procedures selected for the studies were inappropriate for obtaining the comprehensive data required (Khaleel, 2014; Mushobozia & Younghong, 2019; Langat, 2016). Majorly, existing studies also sampled populations mainly composed of certified green buildings and that of building experts only that included architects, engineers and building managers' not interior designers. Rarely were those studies comprised of populations such as conventional commercial buildings, interior designers or building users except in Nduka and Ogunsanmi (2015) and Komolafe and Oyewole (2018). Although findings from such studies were useful in informing similar future researches, they needed to detail the characteristics of the sampled buildings, awareness levels and perceptions of green especially by users, interior designers and in education (Langat, 2016).

Majority of existing studies could not identify the main factors that incentivize and motivate adoption of green among interior designers. Although many interior designers supported the concept green, fewer were keen on practicing it. The disconnect existing between interior designers' perceptions and their actual practice of green was thus, of interest to this study and so prompted to the need to identify critical factors affecting its adoption locally. Unlike majority of past studies that determined the criticality of factors using a ranking method, this study instead, used a method known as factor grouping (Were, 2015; Madukani, 2020). The choice of factor grouping was with the aim of mitigating the limits experienced in ranking as a method whereby, it curtails collection of adequate data that is required to make generalizations.

Further, documentation on green building were mainly based on developed nations (Fietkiewicz & Wolfgang, 2015; Sangster, 2016; Morris, 2012). Information on green building in developed nations was either undocumented or scarce. Therefore, this study in considering recommendations by Otieno (2017) and Park (2016) investigated and documented information on green building locally to fill the existing information gap especially on developing nations. Majority of past studies on building performance mainly featured the technical aspects of energy consumption and provision for thermal comfort as green concepts. The limited study on other concepts relating to green building resulted in insufficient information to guide decision making in the area. Thus, this study addressed the gap by comprehensively examining and documenting information on all the aspects entrenched in the categories of green concept. In addition, past studies focused on buildings situated in areas with extreme climatic conditions, that were, either very hot or cold. These climatic conditions were in contrast to that of Nairobi (Kenya) which is tropical and therefore average.

The methodology applied in many of these studies were experimental, involving simulations and not actual observations of existing buildings (Gong et al., 2020;

Deng *et al.,* 2021; Salah *et al.,* 2020; Ndichu, 2019). In remedying this gap, the current study engaged a survey that involved observations of buildings situated locally, with the resulting data, captured on a checklist. Most of the studies on green materials, mostly documented information focused on the nature and accessibility of the materials. Thus, the studies rarely detailed the extent to which green materials were adopted in buildings locally and worldwide except for Komolafe *et al.* (2016) that was based in Nigeria.

Further, most studies recommended the need for integration of green into the content of building experts' training at undergraduate level in university of developing countries. However, studies examining the integration of green content into university training were scarce, outdated and lacked a local perspective (Kang & Guerrin, 2009; Leddy, 2013; Rasha, 2012). These past studies also involved methods that only examined perceptions of either instructors, students or building experts but, rarely the curricula used in training with exception of Olweny (2018). Yet, approaching the subject by analyzing the training programmes yielded better and comprehensive results free of biases. This study, therefore, bridged the gap by analyzing the curricula documents guiding undergraduate training. This was aimed at establishing the extent to which green content was integrated in interior design training programmes at local public universities.

Notably, there lacked a precise and efficient method for guiding integration of green content into the training programmes (Akinshipe & Aigbavboa, 2018). In addition, evident was that individual educational institutions typically designed their training programmes without a standardized method. A standardized method would ensure uniformity when integrating green in the training programmes. In answer to the gaps mentioned, this study designed/proposed an appropriate model-framework to aid integration of green content into curricula for interior design training at undergraduate . This proposed model-framework provides a simple but convenient way of integrating green content into the training curricula with minimal disruption and resources, with considerations of he already busy programmes.

This study used two theories and they were Sustainability and Practice Theory. The Sustainability Theory addressed and informed the environmental aspect of this study while, the Practice Theory addressed and informed the act of 'adopting green into designs of building interiors. Hence, the two theories formed the lens through which this study was examined and directed.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter describes procedures used in data collection, analysis and interpretation. It comprises sub-sections outlining the research design, study area, target population, sampling procedures, data collection, analysis and results of a pilot study.

3.2 Research Design

This research assumed a Positivist and a Deductive theoretical paradigm in which knowledge exists as a tangible reality that is objective, observable in nature and measurable. Positivism focuses on identifying explanatory associations and relationships through quantitative methods such as surveys. The paradigm builds a hypothesis based on theory from literature and operationalizes variables to measure and manipulate them in order to identify patterns leading to the creation of social facts (Park, 2020). This aims at generating an explanatory association of cause and effect that determines societal behaviour. Positivist research detaches from subjective feelings and interpretations and claims to have no influence on the findings (Knappertsbusch *et al.,* 2023; Kivunja & Kuyuni, 2017). The causal explanations are made to enable prediction and control of the phenomena (green) in question leading to a proposal for social change for the better. Findings from a study are also used to provide solutions, strengthen or refine a theory (Babbie, 2020).

Likewise, according to this study, the phenomenon 'green' in buildings is a reality that is observable and measurable. Adopting green concepts is considered as the behavioural pattern of interest within the society of interior designers. The results of this study are to influence a desired change in behaviour characterized by increased adoption of green concepts in buildings. This study was deductive in nature since it was based on a universal view of the concept ‘green building’, as explained by two theories. Then the generalization was tested through observations and data collection (Azungah, 2018). With the assistance of variables attributed to the concept green building, operationalization was done to allow for measurements and manipulations of the mentioned phenomena. A hypothesis was then, formulated and tested to generate explanations for the existing relationships (Melissa, 2023; Gray, 2019).

The strategy of the research was that of a mixed-method approach. Here, qualitative and quantitative techniques were used in gathering and analyzing data through case studies. The method was advantageous since the two validated and compensated for each other's weaknesses. The qualitative techniques provided details while, the quantitative provided numerical data that allowed for statistical functions (Creswell, 2014; Gray, 2019). In addition, the mixed-method approach enabled detailed description of green in buildings by giving it a holistic view, for example by providing perceptions of interior designers and building users (Cohen *et al.*, 2015). Survey and Case study methods were later employed in collecting data. During the survey, the techniques that were used in collecting data for the first objective included observations with data recorded on a checklist. The second objective involved the use of an online questionnaire and an interview guide while, the third objective used a document analysis chart to collect data. This study involved the use of case studies carried out on building interiors, online questionnaires administered to interior designers and semi-structured interview guides for building users. In addition, document analysis of curricula was carried out in order to provide information for the third objective. The design of the study was cross-sectional in nature, whereby, data was obtained once from the sampled population (Gray, 2019).

The method of case studies was opted for since it enabled levels and concepts of green to be observed in their natural setting, that is, interiors of buildings, and in details thus, heightening validity. Using case studies also enabled individual, detailed and focused studies of each interior envelope, as was done in a UNEP-Singapore (2021) study. For just like human personalities, concepts of green building vary as influenced by different cultures and environments (Kubba, 2012). Therefore, involving case studies allowed for multiple perspectives by allowing for several techniques of survey and units of analysis to be incorporated into the study, that is, building interiors, interior designers, users and undergraduate Design curricula (Cohen *et al.*, 2015). In addition, this study’s design allowed for ease of cross-case analysis, which was anticipated between variables in the units of analysis, for example the comparison of green levels between interiors of green-certified and conventional buildings (Creswell, 2014; Babbie & Benaquisto, 2019).

3.3 The Physical Area of Study

The Nairobi City County (NCC) was selected as the area for the study since, it hosts the most significant number (5) of green-certified buildings in Kenya (USGBC, 2018; KGBS, 2017). Furthermore, Nairobi is Kenya's leading capital city with the highest number of commercial buildings (KNBS, 2017). The numbers are confirmed by the fact that in a year for instance 2019 alone, the number of approved building plans were 207,624.9 while, those built were 93,625.3, settling the large number of interiors created yearly (Economic Survey, 2022). Nairobi City County was also the most industrialized area in East Africa, with over 338 industries emitting gaseous and solid waste appearing as fog trapped in its western hills thus, a cause for interest (NCEO, 2015). Notably, Nairobi's pollution levels were at its worst in the region, that is, 70% above WHO's recommended standards of not exceeding annual average concentration of PM 2.5 (Kipruto, 2015), and so the need to investigate levels of green concepts adopted as an abatement measure for buildings

Characterizing Nairobi City County is a tropical upland climate marked by seasons of rain and dry spells, temperatures of 17°C-30°C (2°C above its surroundings). Nairobi sits 1795m above the sea level and is situated at 10'09'S 360 39'E, and 10 27'S 370 06'E, occupying 696 square kilometres (Ndichu, 2017). A difference in topography diversifies the climate within Nairobi such that Nairobi's higher side is cooler than the lower zones. The temperatures decrease by 0.60 C for every 100-metre rise in altitude. The decrease accounts for the cool micro-climate experienced in Kitusuru and Karura areas (KMD, 2023; Skogseid, 2017). The hot season is experienced between December and March, accompanied by persistent North-Easterly winds and at night, temperatures drop sharply. The long rainy season occurs between late March and May with cold seasons taking over from June to October. In November, a rainy season is punctuated by a few days of dry spells (Ndichu, 2017). Acknowledging climate characteristics was vital since it influence the level and type of green concepts adopted within buildings in the Nairobi area.

Currently, Nairobi's day population is at 3.2 million, with the residents' population projected at 4.2 million. These statistics confirm the large number of users that might be exposed to pollution risks and sick building syndrome due to low-quality interiors (Economic Survey, 2020).

Specific areas were selected for the study and they included Kitusuru-Gigiri, Muthaiga- Karura and Upper Hill, since they hosted 80% of the green LEED-certified buildings. The Nairobi Central Business District (NCBD) was also selected for the survey for it played hosts to all the conventional buildings that were targeted for the study. The Maps of Nairobi City County and the areas selected for study are annexed in Appendix 1.

3.4 Target Population

The study employed triangulation. According to Kothari (2019); Creswell and Creswell (2018), triangulation of data sources allows for varied information and increased validity. The study therefore, targeted a population comprising 4 (four) units of analysis: interiors of commercial buildings, interior designers, and building users as participants and interior design curricula/training guides for undergraduate level. This study opted to examine the interiors of commercial buildings for they naturally consumed much resource during their construction and occupation phases. Equally, they hosted vast numbers of users compared to residential buildings (Rana *et al.,* 2022). This implied that, in case a building was sick, a large number of users were likely to be at risk or affected. Thus, they would suffer related adverse health and productivity issues (McArthur & Powell, 2022; Fisk, 2015).

3.4.1 Interiors of Commercial Buildings

The study sampled and investigated several building interiors in order to achieve the study's first objective. Data was collected from the sampled interiors to ascertain the different concepts of green adopted within. The extent to which these green concepts were adopted in conventional and green-certified buildings was also established. The criteria used to identify and select the buildings were as follows: they must be located within Nairobi City County, built between the years 1900-2017, occupied and in use for commercial purposes. The reason for picking on the above period was because it marked the years within which the green philosophy emerged. 'Green' first emerged as an environmental concern in 1950's with the Suez Crisis (Hamilton, 2011). Thus, it was assumed that buildings constructed from then had some concepts of green that was worth studying. In addition, still around that period, green began featuring in the fields of arts and the built environment for the first time. In the works of art such as in ‘The Beginnings’ illustrated by Rachel Carson's, "The Silent Spring" and Henry Thoreau's ‘Walden, a Reflection upon simple living in Natural surrounding’ came some of the works marking appearance of the green concept (Coleman, 2002).

Samples of building generations whose interiors were examined comprised those of: Historic (possessed an attached historic connotation provided by National Museums of Kenya); Modern (conventionally built); and green (those built with considerations for the environment). More importantly, this study separately examined each building category to establish and compare the unique trends that emerged from each group. The reason being that since, the introduction of new technology, the field of interior design has embraced much of machines and foreign ideologies. Therefore, it was important to discover the concepts that buildings gained and simultaneously lost in design and originality (Ayalp, 2014). Therefore, examining the interiors of existing historic buildings revealed unique passive green concepts that would inspire future adoption in designs of future projects. Adopting passive concepts in green, would inspire designs of modern buildings and create healthier interior environments. Furthermore, data gathered from the historic building category would act as a reference point, documenting the historical development of green in Kenya.

3.4.2 Interior Designers

An investigation was carried out on a sample population of interior designers in order to answer to this study's objective number two (2). The investigation provided information on these stakeholders' perceptions of green building. The sample population of individual interior designers was selected based on the following criterion whereby, one ought to have been: an interior designer practicing in Kenya, a member of the Interior Design Association of Kenya (IDAK) and, in possession of a bachelor’s degree in Interior Design with a professional experience of at least three years. The professional association, IDAK, was purposively sampled since it is a body registered and recognized by the government to articulate interior design issues in Kenya. Therefore, as regarding to validity of data sources, the sample posed as an authentic population from which a local study could gather reliable data. The approach that was used to gather information for this study’s second objective was similar to that carried out by Chan *et al.* (2019) and Kamalofe and Oyewole (2018) in Ghana and Nigeria based researches, respectively. The selected sample of the Interior Designers provided data that was used in determine levels of awareness on green building and the critical factors influencing their adoption of it in Kenya.

3.4.3 Building Users

Another sample of population that was investigated to answer to objective 2 of this study comprised of building users. The objective sought to unearth the awareness levels and the perceptions of building users around the concept of green building. The criterion used to select a sample of building users involved choosing only those who spent at least eight hours working in the selected buildings. This was because they frequently interacted with the sampled interior spaces and so, it was pre-supposed that they could vividly recount details and experiences of working in the selected buildings. Obtaining data from these building users was essential since they mostly experienced severity of the sick building syndrome. The arrival to this observation was because, building users often spent extended hours (almost 90%) of their time indoors within possibly sick buildings. Thus, data gathered from the selected users provided valid and reliable perceptions that informed this study on green. Both genders (male & female) formed the sample of participants involved in the survey that captured users' perceptions of green building. Lastly, the users provided data that was used to determine their awareness levels of green building and the perceived quality of their building interiors.

3.4.4 Interior Design Curricula

The last sample population involved was to aid in achieving the third objective of the study and, comprised of Design curricula/training guides. These were documents used in guiding the training of interior design at the undergraduate level and were sourced from the universities in Kenya that offered interior design training. The data from the curricula enabled establishing of the extent to which content on green building was integrated into interior design training in Kenya. Determining the extent of green content integration was important because, Leddy (2013) and Ispen (2021) espoused that establishing levels of green content in the curricula was a more applicable way of determining whether green building was taught. This position was opposed to the approach of questioning tutors to establish if green building was taught in design training or not, a method that was earlier used by Mukhwana (2016).

The training guides contained data that allowed for identification of topics related to green in buildings. These topics were also considered in terms of variables, and their integration enabled determining levels of green content and the teaching methods used. This approach was informed by Olweny's (2018) study. Further, Heads or those in charge of Interior Design Curricula from various selected universities were also interviewed. The questions asked in the unstructured interview were centred on integration of green in the training of interior design and other related issues. The Heads/those in charge of curricula also assisted by elaborating on the unique aspects found in their training guides in order to corroborate facts on respective Universities.

Majorly, the study's primary data sources were obtained from building interiors, Interior Designers, and Users in addition to undergraduate Design curricula. The secondary data sources included those from library searches, building's websites, manager's records and drawing plans, University/Design department websites.

3.5 Sampling Techniques

The following section discusses the primary sampling techniques used in the study based on case study and survey techniques. Included in the discussions were sampling techniques of the different units of analysis that were involved in the research.

3.5.1 Sampling Interiors of Commercial Buildings

The first objective of this study required a sample of building population. Therefore, a sample frame was created from Nairobi's City Council's records of available plans, approved and built between the years 1900 and 2017. In the sampling frame, the buildings were categorized into conventional and green LEED-certified. The conventional category was further stratified along their construction periods. The stratification created categories referred to as Historical and Modern buildings. Each stratum had a 50-year generational interval.

In the category of conventional buildings, purposive sampling was used to select Historic Conventional Buildings (G1-HCB). These historic buildings were built between the years 1900 and 1950. Beginning of 1950, issues on sustainability started featuring with the Oil Shocks of 1973 evidently confirming the situation (Hamilton 2013). Engaging purposive sampling ensured that the buildings with a historic trait formed a representative sample (Babbie & Benaquisto, 2019). The other category comprising Modern Conventional Buildings (G2-MCB) were of those built between the years 1951 and 2000. Sampling was done using stratified random sampling technique with stratification based on a building's street location within Nairobi Central Business District (Gray, 2019). In addition, only buildings above 80 meters tall or with 20 or more floors were sampled for the study. Height considerations were important because huge buildings consumed more resources during construction and occupation phases. Thus, it was advisable to examine their level of green adoption, in order to determine their building performance (Eirik *et al.,* 2016; Kim, 2014). The last building category was that of Green LEED-Certified Buildings (G3-GCB), built after the year 2000. The mentioned period was after the sustainability/green philosophy was inaugurated at the 1992 Earth Summit in Rio de Janeiro. Therefore, green buildings began featuring a period after that. A whole population of buildings listed by the United States Green Building Council as LEED-Certified and those processing green certification were thus, purposively sampled for this study.

3.5.2 Sampling of Interior Designers, Users and Design Training Guides

The whole population of interior designers and Design Training guides/curricula were purposively sampled for the study. Purposive sampling technique was preferred because it allowed sampling to be done against a characteristic criterion in order to be representative (Gray, 2019). As for the building users, they were sampled using stratified random sampling with two strata resulting based on gender.

3.6 Sample Size

Determining of the sample sizes was based on a formulae or use of a whole population as was deemed appropriate.

3.6.1 Sample Size of interiors of Commercial Buildings

A total sample size of 17 buildings was examined for this study as shown in Table 3.1.

Table 3.1: Sample Size of Sampled Buildings
Source: Study Data

Strata/Category	Artifact/Building	Location/ Street	Year of Construction	Sample Size (N)	No. of Tenants	Sample Size (User)
G1/HCB	**Historic Conventional Buildings**			6		
	Kipande House	Kenyatta Avenue	1906		1	1
	Stanbic House	Kimathi Street	1920's		1	1
	Cameo building	Kenyatta Avenue	1907		16	1
	Old Mutual	Kimathi Street	1930's		70	4
	Pan African House	Kenyatta Avenue	1917		6	1
	Teleposta Towers	Kenyatta Avenue	1907		15	1
G2/MCB	**Modern Conventional Buildings**			6		
	Kenyatta International Convention Centre	Harambee Avenue	1974		13	1
	National Bank House	Harambee Avenue	1976		13	1
	Anniversary Towers	University Way/ Monrovia Street	1992		19	2

	Lonrho House	Standard Street	1990		20	2
	Cooperative House	Hailesalassie Avenue	1981		8	1
	Reinsurrance Plaza	Agakhan Walk, Taifa Road	1992		28	2
G3/GCB	**LEED-Certified Buildings**			5		
	Eaton Place	United Nations Crescent Nairobi, Kenya	2015		6	1
	Britam Towers	Delta Center Menegai, Road Nairobi	2017		8	1
	Kenya Commercial Bank Pension Building	Upper Hill	2015		4	1
	Garden City Retail Mall	Thika Road	2014		19	2
	Kenya Reinsurance Towers	Ragati Road Upper Hill	2017		8	1
	Sample size			17	255	24

Table 3.1, continued.

The category G1-HCB (Historic) had a sample size of N=6 which was a whole population and l00% of the sample frame. Creswell (2014) and Kothari (2019) recommend involving whole populations. This was in order to enhance validity, and especially for objects less than 100(N<100). The G2- MCB (Modern) category had a sample size of N=6 which was equal to 75% of the sampling frame. The sample size was the same, corresponding with that of G1-HCB for purposes of size homogeneity, asadvised in Gray (2014). Furthermore, a sample of six objects was the maximum size recommended for case studies (Oppenheim, 2014; Creswell, 2014; Babbie, 2020). This was because case studies involve much detailing during data collection. Thus, a bigger sample size would jeopardize the process and quality of results. The category G3/GCB (Green) had a sample size of N=5 representing a whole population which was 100% of the sample frame of green-certified buildings (Creswell, 2014). A corresponding number of 17 building managers of the buildings selected, guided the observation process. They enabled the process by allowing access, elaborating on issues related and providing necessary records detailing features of their buildings.

3.6.2 Sample Size of Building Users

The sample size for the building users was calculated using Neyman's proportional allocation formula (Taiwo & Lanre, 2018). The calculations resulted in a sample size of N=24. The sample size was then stratified along gender characteristics where, half of the sample represented females (12) while the other was male (12). The balance in size was maintained for purposes of maintaining homogeneity (Gray, 2014). The user respondents were between the ages 18 and 55 years. The sample size (N) was the sum of an estimate based on an equal proportional representation of users in each stratum that is, building. A total of 'N' sample size has to be studied for a sufficient representative sample, which had been decided through the standard technique shown in Figure 3.1. An example of actual calculations made based on the formulae is on parameters the Old Mutual Building and, the workings are as presented in Figure 3.2.

$$1. \quad n = \frac{z^2 p(1-p)}{d^2}$$

n= required sample size

z= confidence level at 95% (standard value of 1.96)

p= Level of users' knowledge on green buildings is not known, therefore 50% (0.5)

d = permitted error margin of error at 5% (0.05), if standard value is 95%

$$2. \; n_i = n\frac{N_i}{N}$$

$$N = n_1 + n_2 + n_3 + \cdots + n_h = \sum_{i=1}^{h} n_i$$

Figure 3.1: Formulae for obtaining Sample Size for Users
Source: Taiwo and Lanre (2018).

An example of calculations made for each sample size was as presented in Figure 3.2.

$$1. \; n = \frac{z^2 p(1-p)}{d^2}$$

$$= \frac{(0.95^2) \text{ x } 0.5\,(1-0.5)}{(1-0.05)^2}$$

$$= \frac{0.9025 \text{ x } (0.5 \text{ x } 0.5)}{0.05^2}$$

n = 90.25

For example

2. n_4 : sample size for users in Old Mutual building

$$n_i = n\frac{N_i}{N}$$

$$n_4 = 90.25\left(\frac{1}{24}\right) = 4$$

Number of building users $n_4 = 4$

Figure 3.2.: Calculation of Users Sample Size in Each Building
Source: Study Data

The resulting sample sizes obtained from the calculation of each building were as indicated in Table 3.1.

3.6.3 Sample Size of Interior Designers

The whole population of respondents (Interior Designers) had a sample size of N=69. This was as initially provided for by the Interior Design Association of Kenya's (IDAK) database for the year 2020. Thus, the study targeted the whole population of IDAK members in possession of at least a bachelor degree and above. An online questionnaire was then emailed to all the designers in the Association's database. A whole population was involved to compensate for the weakness of online surveys that normally has a low return rate of 50-70%. In addition, using whole populations allowed for high confidence levels of 95% and corresponding significance levels of 0.05 for the <100 units (Creswell, 2014).

3.6.4 Sample Size of Interior Design Curricula

A sample size of N=4 equated to 100% of the sample frame of interior design training guides/curricula was a whole population derived from the 4 universities that offered the course at an undergraduate level in Kenya. A corresponding number of 4 persons heading curricula in Art and Design Department were sought to elaborate on particular items in respective training guides. Information from these participants heading curricula in the 4 Art and Design Departments, acted to corroborate and explain features of the data collected. Examining all the curricula (whole populations) allowed confidence levels of 95% and corresponding significance levels of 0.05 for the <100 samples (Babbie & Benaquisto, 2020).

3.7 Data Collection Techniques and Instruments

This study obtained data from both primary and secondary sources. The process of collecting primary data employed the use of survey techniques such as observation, online questionnaire, structured interviews and document analysis. Primary data was unique in that it enabled obtaining of original data straight from the source (Knappertsbusch *et al.,* 2023).

3.7.1 Observation

Observation is a method of gathering data by scrutinizing the physical characteristics of phenomenon/behavior/events in their natural setting. The advantage of this method was that it enabled direct and on site observation of the green phenomenon under study. The observations were independent of the willingness/ability of the surrounding audience thus, minimized biases in data collected. The observation technique was used since it allowed for green concepts to be observed in their natural setting, that is, interiors of buildings. The technique was advantageous for it enabled the researcher to identify the adopted concepts of green, make choices and even react to issues that arose in the natural setting (Mulissa, 2022).

To enable observations, a tool in the form of a green-oriented checklist was developed. The green checklist was a modified tool from Yan *et al.* (2016), designed for evaluating green levels specifically within interiors of buildings. The items on the green-checklist tool were based on three variables that denoted green and were further detailed into measurable attributes. The study variables were as follows: IAQ elements (Interior Air Quality), provision for water efficiency, materials and technology. Although Yan *et al.*, (2016) did not provide a means of measuring these attributes; this study operationalized the concept by modifying the tool to provide values that denote green levels.

The modification was also inspired by ideas gleaned from Green Mark Kenya (2017), EEBA (2018) and Mahdavinejad *et al.* (2014) studies. The attributes and ideas on operationalizing the concept green, was guided and mapped based upon the LEED-green certification points. Mahdavinejad *et al.* (2014) study demonstrated the idea of measuring green at three levels that included: lack of green (conventional), pseudo-green (partial green) and green (almost green), and which was adopted in this study. The green-checklist tool was used to capture data on green concepts based on levels calibrated on a 5-point Likert scale, with the observable results recorded as weightings. The modified version of the green-checklist tool was unique as it incorporated all the ideas borrowed into one comprehensive instrument. The modified tool, green-oriented checklist, was then used to identify and determine the extent of green adoption in each of the building categories.

The modified tool referred to as the 'green-oriented checklist', was as captured in Appendix B of this study. The contents of the tool represented the three LEED-green variables, itemised on a 5-point Likert scale, and used to record the observations (Mahdavinejad *et al.*, 2014). To determine extent to which green concepts were adopted, ratings were placed on the green-oriented checklist and computed based on the physical observations from the interiors. The ratings ranged from 'lack of green' coded as 1 to 'full green' coded as 5. The green-checklist enabled a speedy analysis of data because of its predetermined content and, easy generation of numerical data for statistical computations (Kothari, 2019; Cohen *et al.*, 2015; Creswell, 2014). Information on the checklist was augmented with photography and recorded on a case study scheme as shown in Appendix C.

Pretesting of the instrument 'green-oriented checklist was done using 3 buildings and, the feedback obtained, used to guide adjustments in readiness for primary data collection. The observation technique was appropriate for data collection in such live situations. Besides, the technique acted as a reality check by confirming that which was present and therefore, validating the results. Since at times, interior designers' confessions on green adoptions may differ from their design actions; therefore, confirmation is important (Leddy 2013). At other times a sample characteristic might be ignored or missed out, but with observations, it could be noticed and included (Creswell, 2014; Gray, 2019).

3.7.2 Questionnaire

The questionnaire instrument comprised a list of items that were used to gather data from respondents about their attitudes, experiences, or opinions on green building. Questionnaire was preferred as it would reach more respondents, was less time consuming and cheaper to administer in terms of resources. The items were formulated to capture statistically valuable data from the study participants. The use of an online questionnaire was advantageous for it provided high data standardisation levels and results generalisation among populations. In addition, the results were real-time, and so data collection was cheaper, faster, honest, accurate and straightforward from the respondents (Babbie, 2020). Use of online questionnaire enabled the research to reach a more significant number of interior designers nationwide, heighten anonymity and curbed interviewer biases (Oppenheim, 2014; Kothari, 2014). Sample questionnaire (Appendix D) was administered to interior designers to gather data on awareness of green, criticality of factors influencing the rate of adoption and the extent of their involvement in the subject. The questionnaire had two parts: Section A (used to gather data on the demographic characteristics of respondents), and Section B (captured data on their awareness and factors influencing their rate of green adoption).The items were grouped under three variables given by the Practice Theory. The variables groupings included: Meanings, Competencies and Materials, while the factors measured were indicators attributed to the variables. An index value based on Mean Ranking (MR) was used to gauge the respondents' perceptions of critical factors that influenced their adoption of green.

The online questionnaire had 18 items, both open-ended and close-ended in nature. The items were developed from a comprehensive literature review and, especially those of Chan *et al.* (2018); Taffazzoli *et al.* (2020) and Ali *et al.* (2020). Prior to the survey, the instrument's appropriateness and rationality was assessed by two (2) experts, then subjected to Cronbach's reliability test and piloted by interviewing three (3) experienced interior designers. The testing was done to ensure that the questionnaire captured all factors relating to green adoption in Kenya and, was void of ambiguous words. Based on the feedback, the online instrument was finalised and emailed to the respondents.

The (respondents) were asked to respond within a time frame of one month. A reminder was made to the respondents every end of the week through telephone calls. Those participants who had not yet responded by then, were requested to do so. The respondents were asked to rate their level of green adoption based on past projects and, perceived criticality of factors influencing their uptake, on a 5-point Likert scale. The online survey achieved a response rate of 81%, which was above the rate of 50-70% advocated for by Creswell (2014).

3.7.3 Interview Guide

The interview guide used for the study comprised of a list of questions on topics that the interviewer covered during the interview. This guide served to gather data to inform on the green phenomenon; in this case, it was concerning users' awareness of green building. The interview guide had questions under three main topics: awareness, perceptions and interior quality and which were discussed with the building users (Gray, 2019). Using a 7-item structured interview guide with open-ended and closed-ended questions (Appendix E), data was gathered from building users who were tenants of the sampled buildings. The interview guide was sectioned into two: Section A captured the demographic details, while Section B was used to collect data on awareness and perceptions of users on green building. The topics were represented as variables that were calibrated on a 5-point Likert scale where: 1 represented 'much less'; 2-'somewhat less'; 3-'about the same'; 4-'somewhat more', and 5-'much more'. Next, users were asked to rank the variables measuring their perceptions on a five-point Likert scale so as to enable the study to arrive at a viable conclusion.

3.7.4 Document Analysis Chart

Lastly, an analysis of documents analysis was performed. This referred to analysis of written documents that contained information about the green phenomenon or the event under consideration in the social, public or digital world. A Document-Analysis Chart (Appendix F) was used to capture data from the interior design training guides in answer to the third objective. The chart was developed to facilitate and capture data by evaluating the electronic and physical curricula documents. Based on the information obtained, the chart was used to: interpret, gain meaning and understanding on the development and implementation of interior design curricula. Hence, the integration of green content in the training guides. Thus, the analysis chart was partitioned into a table whose rows were used to capture data on categories of course genres from four different university design-training guides. The course genres included foundational, skill development, environmental, technology-based and project -based.

3.8 Pilot Study

A pilot study was carried out before the main study to pretest the instruments (green-oriented checklist, online questionnaire for designers and users' interview guide).The purpose of piloting was to confirm the validity of the study content, establish the language relating to the targeted population, aid in planning and guiding the main study (Bowen, 2009). Thus, it averted any risks of failure in the main study by offering a prior understanding of the dynamics involved. The feedback from the pilot was then used to make adjustments and estimate timings for the investigations. For instance, the instruments were adjusted in accordance with the feedback, therefore improving their quality and reliability. Piloting confirmed the validity of the content under investigation since the respondents involved, understood and answered all the questions in the instruments.

3.8.1 Testing of Green-Oriented Checklist Instrument

The piloting of the instrument green-oriented checklist (Appendix B) was conducted using 3 (three) buildings, each from a different generalization/strata (Historic, Modern & Green). The numbers in Table 3.2 indicate green levels as represented by the study's Likert scale. An index factor denoted green levels for the different green variables and attributes. During the pilot, the buildings used were not among those investigated in the main study, though they had similar characteristics and were located in the same area. From the interviews, building managers requested that the names of their building remain anonymous for confidentiality. Therefore, codes were used instead of the buildings real names for purposes of reporting results of the pilot. Piloting confirmed the validity of the green-oriented checklist's by enabling correct capturing of the required information. The analysis of green levels was presented using a Mean Ranking index (MR) denoted by a green factor as shown in Table 3.2.

Table 3.2: Check List Summary of Green Levels in Building Categories
Source: Study Data

Variables	**HCB**	**MCB**	**LCB**	**Green Factor (MR)**
1. **IAQ Elements**				
a) Acoustics	1	1	1	0.6
b) Lighting	3	2	4	1.8
c) Thermal Comfort	4	2	4	2.0
d)Ventilation & Humidity Control	3	2	5	2.0
e)Technical Space performance	1	1	4	1.2
2. **Water Efficiency**	1	2	3	1.2
3. **Materials & Technology**	2	2	3	1.1

The analysis indicated a trend where green concepts were adopted mainly for providing thermal comfort (2) and ventilation (2), that is, Interior Air Quality. The slightest consideration for green was in selecting materials (1.1) and providing acoustics (0.6). This trend in the pilot was similar to that of the main study as indicated by the green factor in Table 3.2.

3.8.2 Reliability Testing of Questionnaire Instrument

Before the pilot study, reliability of the quantitative instrument (questionnaire) was tested. Using Cronbach's reliability test, the internal consistency of the variables studied, was calculated and presented as a coefficient of reliability, based on the variable measurement (Meaning, Competencies & Materials). The results were as presented in Table 3.3 as follows:

Table 3.3: Reliability of the Questionnaire Instrument
Source: Study Data

Factors Influencing Green Adoption by Interior Designers	Construct	No. of Items	Cronbach alpha	No. Of Items retained	Cronbach alpha	Conclusion
	Meaning factors	7	0.843	7	0.843	Reliable
	Competencies factors	4	0.732	4	0.732	Reliable
	Materials factors	6	0.746	6	0.745	Reliable

As indicated in Table 3.3, all the study variables dimensions had a reliability index of above 0.7 for all the items measured. The test achieved an alpha coefficient value of above 0.7, which was concluded as reliable. According to Bonnet and Wright (2014), those values considered as reliable should be at least 0.5. Therefore, the scale was reliable and going by results of the pilot study, it was deduced that the main study would be a success if implemented as planned.

3.9 Data Analysis Techniques

A mixed-method approach was used to analyse data where qualitative and quantitative techniques were blended. The approach yielded comprehensive and rich information thus, complementing results (Babbie & Benaquisto, 2010). Also in processing data, Statistical Computer Package for Social Science (SPSS) ver 21 was used. Specific techniques used to summarize data depended on the nature of each study objective. Details on analysis techniques for each objective are discussed in sections that follow.

3.9.1 Analysis Techniques to Determine Levels of Green Concept in Building

Descriptive techniques were used to analyze data for the first objective. This objective aimed at determining the extent to which green concepts were adopted within building interiors. Observations were recorded on a green-checklist and fed into a computer MS Excel worksheet. Figure 3.3 below shows the mathematical expression used.

a) Mean Rating was determined by:

$$TWV=\sum_{i=1)}^{5} PiVi$$

Where: TWV was the total weight value;

P_i -is the frequency of occurrence of each rating to a factor;

V_i -was the weight assigned to each factor.

MR to each attribute was arrived at by dividing TWV by summation of propertiesrated expressed as:

$$\text{Mean Rating } (MR) = \frac{TWV}{\sum_{i=1)}^{5} PiVi}$$

P and **TWV** were as previously

b) Green levels were then determined by the formula:

Y = μM + C where:

Y- Represents Green level for each interior,

μ- represents a constant generated by SPSS software,M- Represents average of IEQ elements

C – represents chance. Thus the equation reads

Green Level = **μ (IAQ + Water efficiency + Materials) + C**

Figure 3.3: Calculation Determining Green Levels in Building Interiors
Source: Komalofe and Oyewole (2016)

The data was then summarized using descriptive statistics based on the weightings of each attribute. This step resulted in frequencies and mean ratings. The ratings assumed weight values of between 5 and 1 to describe levels of green for each variable/attribute. The Mean Rating (MR) for each of the variables and attributes was then computed by dividing the summation of the weight value (TWV) by the number of properties rated (Oyewole, 2010). The resulting MR values represented green levels in this order: values in the range of 1 denoted lack of green, values range within 2 denoted slight/minimal green, 3 represented pseudo/average green, 4 denoted a large amount of green, and 5 denoted the total amount of green (Mahdavinejad, 2014). The MR, therefore, ranged between the values 5 and 1.

Then using cross tabulation, comparative analyses in the form of uni-variate, bi- variate and multivariate in nature were performed to summarize data on green levels for the three categories of buildings. Emerging patterns, similarities and differences were then identified for generalization purposes (Kothari, 2019). The green level for each building was determined by averaging Mean Rating (MR) values for the separate building categories.

3.9.2 Analysis Techniques To Identify Critical Factors Influencing Adoption of Green in Kenya

Immediately after data collection, coding was done and the emerging themes and topics noted. Content analysis was engaged in summarising data based on themes that arouse from the open-ended items in questionnaires and interview guides. Descriptive statistics was then used to summarise data that resulted. Also descriptive allowed mathematical functions to obtain means and frequencies (Gray, 2019). The content was analysed and compared along demographics such as gender, age, and education versus the analysis framework. The analysis was conducted to determine if demographics had any significance on awareness of green concepts, the rate of green adoption, and criticality of factors influencing adoption. Inferential statistics was then employed to make meaning of patterns that emerged, magnitudes and relationships between demographics and factors influencing adoption (Kathy, 2013).

The closed-ended questions were analysed and subjected to inferential statistics with influencing factors in the online questionnaire items, subjected to Cronbach's alpha reliability test before being administered. In assessing reliability, the test determined the average correlation or internal consistency among factors in the online questionnaire. The alpha coefficient values ranged between 0-1 and meant that the higher the value, the more reliant a scale was (Bonnet & Wright, 2014). Another method used in analysing the data was Mean Ranking (MR). Mean Ranking is a quantitative analysis method that ranked the criticality of factors by ascribing them relative importance. Several previous studies on green building employed the MR technique (Chan *et al.*, 2018; Karji *et al.,* 2020; Ali *et al.,* 2020) thus informing this study's choice.

Another step used agreement analysis to measure sampling adequacy and determine the appropriateness of Factor Analysis (FA), Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. The KMO represents the ratio of the squared correlation between the variables to the squared partial correlation between the variables (Chan *et al.*, 2018). The KMO value ranges from 0 to 1, with a value of more than 0.6 being acceptable (Jollife & Cadima, 2016). Since this study's data received an adequacy value of 0.753, it was therefore adequate for Principal Component Analysis (PCA) functions. For each component, a given value was calculated to determine the amount of variation in the data. Hence, performing Factor Analysis (FA) was appropriate for the data obtained and was used to identify the underlying grouped factors critical to this study (Pallant, 2011). Factor Analysis is a technique used to identify a relatively small number of factor groupings that can be used to represent relationships among sets of many interrelated variables. Factor analysis is used to re-group and reduce many factors to a smaller and more critical set by factor scores of responses (Li. *et al.* 2011).

3.9.3 Analysis Techniques to Determine Green Content in Interior Design Training

The data was analysed to establish the extent of green content integration as set out in this study's third objective. Using content analysis, data was obtained from interior design training guides and, recorded as themes on the document analysis chart. For instance, the data was analysed based on themes/topics that were identified in advance. The topics included nature/depth of the course topic on green building, year of academic study, depth of coverage and method of green content delivery. The course topics were mapped based on accreditation criteria for Bachelor's Academic Programme Content in Commission for University Education Standards Guideline for 2014. Descriptive statistics was then used to summarise and compare data between the four training guides. Results of analysis were presented as percentages/proportions/ratios in tables, graphs, pie charts and illustrations.

3.10 Validity and Reliability

The credibility of study findings was assured because of its triangulation of data: sources, collection techniques and varied units of analysis (Kothari, 2019; Creswell, 2014). Using Statistical Package for Social Sciences (ver 21), the online questionnaire scale with 17 items was subjected to a Cronbach's reliability test to ensure its internal consistency and thus, its validity. The items in the questionnaire achieved an alpha coefficient value of over 0.7. The value was within an acceptable level of consistency now that satisfactory levels are within 0.5-0.9 (Bonnet & Wright, 2014). Reliability was ensured as fieldwork was awarded ample time to capture detailed characteristics of the samples. In addition, the use of whole populations and pretesting of tools were all aimed at heightening validity and reliability (Creswell, 2014).

External validity was guaranteed as external and internal examiners assessed the study. Moreover, the study had undergone continuous shaping of its components throughout its formulation, by experts in the field. The continuous shaping was guided by expert criticism and peer reviews that further enhanced its validity and reliability (Kothari, 2014).

3.11 Ethical Considerations

Permission to access necessary information from the sample population was obtained from relevant bodies such as the Nairobi City Council Physical Planning Department, Building Managers, Interior Design Association of Kenya officials and the Heads of sampled Art and Design departments. The mentioned organisations were the primary custodians of approved plans, building documents and databases of Interior Designers.

Also, with consent from Kenyatta University's Ethics and Review Committee (Appendix I), the National Commission for Science, Technology and Innovation (Appendix J) further granted permission for this research.

In addition, voluntary participation in the study by Interior Design experts and building users was also encouraged. Confidentiality and anonymity was emphasised, as a cover letter explaining the research and its purpose was attached. For buildings, whose managers insisted on anonymity, especially during the pilot study, assurance of privacy was enabled by using codes instead of the actual names of the buildings.

3.12 Summary of the Chapter

This chapter has outlined in-depth, the methodology used to investigate the research problem summarized as to determine the extent of green adopted in buildings. The research design, methods, techniques, procedures and pilots involved testing of instruments, gathering and analysing of data been discussed. The study used case studies involving observations that were recorded on green checklists and case study schemes. During data collection, questionnaires, structured interview guides and document analysis charts were also used. The analysis of data involved using statistical computer packages and content analysis with results presented as tables, graphs, pie charts and pictures. The succeeding chapters present the study findings, analysis and interpretation of the primary data obtained.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents data and analysis in in three parts. Each part presents information ensuing from investigations made on each objective with analysis involved and results obtained. The presentation of information is in a sequenced order based on the study objectives. The first information concerns green strategies and their level of adoption within interiors of commercial buildings in Nairobi City County. Following these findings are those of the second objective identifying critical factors influencing interior designers' adoption of green concepts in Kenya. Lastly, information on integration of green concepts into the content of Kenya's interior design training at undergraduate level was presented. Generally, the extent of green adoption in Kenya's interior design training was enabled by information based on the study's three objectives.

4.2 The Extent of Green Adoption in Buildings

The aim of analyzing objective one was to reveal the strategies and extent to which green was adopted in the sampled commercial buildings. The analysis was carried out at 5 (five) levels, that involved analysis of indicators, attributes, and variables (for each building category). The resulting green values from the analysis enable comparisons of adoption levels between the different categories of buildings. The passive green concepts were also scrutinized and, a combined summary of green levels in the three building categories was done. Generally, the summary revealed the levels of green adopted within the commercial buildings. The combination of green levels as established in the indicators provided the extent of adoption in attributes and consequently green levels in variables. The levels of green in variables corresponded to values ranging between 5 (full green) and 1 (lack of green) as recorded on a checklist. The results of green levels for each building category were as presented in Tables 4.1, 4.2, and 4.3 indicated in Appendix F. Subsequently, Table 4.4 captures and summarizes combined data from the three Tables (4.1, 4.2, and 4.3). The green value denoted by different levels in the attributes calculated using a Mean Rating (MR) method and expressed as indices in the sections that follow.

4.2.1 Interior Air Quality (IAQ) Elements

The following Table 4.1 presents the Mean Rating indices for variables on IAQ elements. A detailed version of the results is in Table 4.1.1 (Appendix H). A comparison of the Mean Rating (MR) for the three different buildings categories are presented in Table 4.1 that follows:

Table 4.1: Green Levels in Attributes of Interior Air Quality Elements
Source: Study Data

Green Variable	**Green Attributes**	**Building Categories**			**Average**	**Rank**
		G1/HCB (Historic)	**G2/MCB (Modern)**	**G3/GCB (Green)**		
IAQ Elements	a) Acoustics	1.70	2.50	3.70	2.63	6
	b) Lighting	2.31	3.25	3.79	3.12	3
	c)Energy efficiency	2.97	3.32	3.81	3.37	1
	d) Thermal Comfort	3. 56	2.79	4.08	2.81	4
	e) Ventilation & Humidity	2.58	2.45	3.20	2.74	5
	f)Technical Space performance	1.60	4.42	3.65	3.22	2
Mean level		**2.45**	**3.12**	**3.71**	**2.98**	

The results on green levels in IAQ attributes presented in Table 4.1 shows that much consideration was given to greening for energy efficiency since it ranked first (MR 3.37) among the attributes of IAQ elements. Thus, it is at the level of pseudo-green given by its weighting index. Furthermore, HCB was the building category with little green (MR 2.97) and so lowest in adoption levels. Generally, considerations for alternative energy were low in all the building categories, with those of HCB lacking in green (MR 1.18).

The technical space performance ranked second (MR 3.22) and pseudo level in green adopted. In comparing the building categories, MCB had the highest (MR 4.42) thus, large amount of green adopted in technical space performance. HCB had the least (MR 1.60) adoption and so lacked in green levels.

The amount of green adopted in lighting ranked third with a mean rating of MR 3.12, denoting average/pseudo-green levels. The GCB had the highest (MR 3.79) pseudo-green levels in provision for lighting efficiency, while HCB had the lowest (MR 2.31) interpreted as little levels. Window Wall Ratio (WWR), an indicator for daylighting, achieved the highest (MR 3.47) pseudo green index weighting, with the GCB category being the highest (MR 3.79) average green and the MCB lowest (MR 3.25) and pseudo levels. Thus, the index pointed to large amounts of green adoption in lighting.

Provision for thermal comfort ranked fourth, with an MR index of 2.81, representing little of green adoption. In comparing the building categories, GCB had the highest (4.08) large amount of green adopted for provision or thermal comfort. Notably, the integration of passive evaporative methods was lowest in the MCB category (MR 2.2) little green, while HCB (MR 3.63) pseudo-green and GCB (MR 4.17) recorded large amounts of green.

Green levels adopted in ventilation and humidity control ranked fifth with an MR index of 2.74, denoting little amount. In comparing the building categories, GBC had the highest (MR 3.20) pseudo-green amount adopted in this attribute, followed by HCB (MR 2.58) little green, and the least was in MCB (2.45) little green levels. Considerations for green in provision for ventilation based on summary comparing results of the three building categories showed it lowest in HCB with an MR of 2.43 that denoted little green.

Acoustics ranked sixth with the least (MR 2.63) and little green adoption among the IAQ elements. Considering the values indicated were little amounts of green adopted in provision for acoustics. The category of GCB integrated the highest (MR 3.70) pseudo-green amount of green in provision for acoustics, while the HCB category had the lowest (MR 1.70) and lacking in green levels.

4.2.2 Water Efficiency

Table 4.2 presents Mean Rating indices that indicated the green levels adopted in provision for water efficiency in the different building categories. A detailed version of the results is shown in Table 4.1.2 (Appendix H).

Table 4.2: Green in Attributes Providing for Water Efficiency
Source: Study Data

Green Variable	Green Attributes	Building Category G1/HCB (Historic)	G2/MCB (Modern)	G3/GCB (Green)	Average	Rank
Water Efficiency	a) Efficient fixtures/fittings	1.01	2.00	3.03	2.01	4
	b) Sewage waste volume reduction	1.40	3.41	4.02	2.93	2
	c) Recycling/re-use of waste H_2O	1.25	1.83	3.41	2.13	3
	d) Usage monitoring	2.31	4.31	4.40	3.67	1
	e)Rain water harvest/storage	1.10	1.80	3.26	2.05	5
Mean levels		**1.41**	**2.67**	**3.62**	**2.56**	

Amongst the green attributes in provision for water efficiency, monitoring water use was most (MR 3.67) pseudo-green level adopted in all building categories thus, ranked first. In comparing the building categories, GBC had the highest (MR 4.40) large green integration of usage monitoring, while HCB had the lowest (MR 2.31) little green level. None of the buildings lacked in green adoption.

The attribute sewage waste volume reduction in provision for water efficiency ranked second amongst green adopted, with an MR value of 2.93 denoting little green. The GCB recorded the highest (MR 4.02) large green adoption in this attribute while, HCB (MR 1.40) lacked green levels. Recycling or re-use of waste H_2O ranked third among the attributes adopted in provision for water efficiency with an MR 2.13, denoting little amount of green adoption in all the building categories. The highest adoption was recorded by GCB (MR 3.41) pseudo-green while, lowest (MR 1.25) lacking green was in the HCB category. Rainwater harvest/storage ranked fourth and was the least (MR 2.05) little green adopted in provision for water efficiency. The HCB category lacked (MR 1.01) green in rainwater harvesting yet, GCB integrated adopted green the most (MR 3.26) pseudo-green.

4.2.3 Materials and Technology

Table 4.3 presents Mean Rating indices for values representing the variable green materials and technology. A detailed version of the results is in Table 4.1.3 (Appendix H).

Table 4.3 Green: Level in Attributes of Materials and Technology
Source: Study Data

Green-Variable	Green Attributes	Building Category			Average	Rank
		G1/HCB (Historic)	G2/MCB (Modern)	G3/GCB (Green)		
Materials & Technology	a) Ease of maintenance	2.73	3.13	3. 33	3.06	1
	b)Environment-friendly materials	1.61	1.53	2.01	1.71	3
	c)Buildability	1.74	3.22	3.73	2.89	2
Mean levels		**2.03**	**2.63**	**3.02**	**5.73**	

Ease of maintenance amongst the attributes of materials and technology was ranked first with a high MR index of 3.06 indicating average amounts of green or pseudo-green. In comparing building categories, the attribute was most (MR 3.33 pseudo-green) adopted in GCB and least (MR 2.73-little green) in HCB categories. Considerations for buildability of materials and technology ranked second (2.89-little green), denoting little green with adoption highest (MR 3.73 pseudo-green) in GBC and lowest (MR 1.74 lacking green) in HCB categories. Environmental-friendly materials ranked third and lowest among all the attributes of materials and technology. In comparing its adoption in buildings, GBC had the most (2.01-little green) integration, while the MCB category had the least (1.53 lacking green). In summary, the average green levels adopted in each variable, combined for all the buildings was as shown in Table 4.4 as follows:

Table 4.4: Summary of Green Levels Present in Building Variables
Source: Study Data

Green -Variables	**G1/HCB (Historic)**	**G2/MCB (Modern)**	**G3/GBC (Green)**	**Average**	**Ranking**
IAQ Elements	1.64	3.14	3.53	2.83	2
Water Efficiency	1.51	2.45	3.06	2.33	3
Materials & Tech.	2.02	3.21	3.35	2.86	1
Combined Average	**1.74**	**3.17**	**3.60**	**2.84**	

As captured in Table 4.4, the MR values for IAQ elements in all the building categories showed that considerations for green in materials and technology ranked highest (MR 2.86), followed by IAQ elements (MR 2.83) and lastly provision for water efficiency (MR 2.33). In comparing the building categories, GCB recorded the most (MR 3.53) adoption of green in IAQ elements (pseudo-green), while HCB had the least (MR 1.64), almost lacking in green.

Water Efficiency attracted the least attention in terms of green adoption compared to the other green variables. The category GBC recorded the highest (MR 3.06) consideration for green in the provision for water efficiency, while HCB had the least (MR 1.51) amount. Rainwater harvesting was the least adopted concept, especially by HCB and MCB categories. Materials and technology generally received the highest adoption of green concepts. In comparing the buildings categories, amounts of green adopted in materials and technology were highest in GBC (MR 3.35) while, least in HBC (MR 2.02).

Generally, the amount of green levels within buildings weighted at MR index 2.84 as shown in Table 4.4. The level of green adoption indicated by MR 2.84 was considered little in amount thus insignificant and needing retrofitting exercise. The highest adoption of green was in GCB, and was weighted at MR 3.60 (pseudo-green), followed by HCB at MR 3.17(pseudo-green) and HCB at MR 1.74(lacking green). Therefore, the level of green adopted within commercial buildings in Nairobi City County was 'little' or minimal and needed improving. Based on that result, this study accepted the hypothesis ($H0_1$) stating that there was no significant level of green adopted in Nairobi City County's commercial buildings. Lastly, scrutiny of passive green strategies in all the building categories provided the results indicated in Appendix B and Table 4.5 detailing the passive concepts on green in the different building categories.

4.3 Factors Influencing Adoption of Green Concepts

This section presents an analysis of data gathered to fulfil objective two of the study. The objective was to identify the factors influencing the adoption of green concepts and its awareness among interior designers and building users. The analysis presented data from the two groups of respondents.

4.3.1 Demographics of Interior Designers

Establishing a detailed background of the respondents' demographic characteristics was essential. As it was aimed at, enhancing the understanding of the results obtained thus, improving reliability and insight into the responses. There occurred a response (return) rate of 81% whereby, out of the 69 interior designers involved in the study, 56 responded. The results of the analyses were summarised as shown in the Tables that follow.

Table 4.5: Interior Designers' Demographics
Source: Study Data

Demographic Analysis	**Gender**		**Age (years)**				**Education level**		
Descriptive	Male	Female	23-30	31-37	38-42	>43	Bachelors	M.A.	Ph.D.
Percentage (%)	51	49	48.2	32.1	16.1	3.6	66	30.4	3.6

The information in Table 4.5 summarizes the study's information on the demographic characteristics of the respondents and their firms. Using descriptive statistics, that is, frequencies and percentages, the results showed that most (51%) of the respondents were male, while 49% were female. The respondents' gender representation was almost equal, confirming an adequate sample population with a homogenous composition. Most (48%) of the respondents were below the age of 30 years, with the most negligible (4%) being above the age of 43 years. The respondents' highest level of training was in

PhD, and they were few (3%). Most (71%) of the respondents were bachelor degree holders.

3.3.2 Categories of Firms Employing Interior Designers

There existed two basic categories of firms that the interior designers worked for and they were of different sizes as indicated in Table 4.6 below:

Table 4.6: Categories of Firms Employing Interior Designers in Kenya
Source: Study Data

Category Analysis	**Firm ownership**		**Firm size**				
Descriptive	Private	Public	Large (100+ employees	Medium (50-99)	Small (2-49)	Independent Consultant	Owner/ Partner
Percentage	87	13	7.3	18	25	36.7	12

Many (87%) respondents worked for private interior design firms, while the rest (13%) were in the public sector. The respondents (36.7%) mostly worked as independent consultants, while a few (7.3%) were employed in large firms.

4.3.3 Interior Designers' Response to Aspects of Green Building

Data on the aspects relating to green adoption were as shown in Table 4.7 that follows.

Table 4.7: Interior Designers' Response to Aspects of Green Building
Source: Study Data

Analysis of Green Aspects	**Area of Specialization**				**Green Certification**			**Intentions to Pursue Green**		
Descriptive	Hospitality	Corporate	Mixed-Use	Institutional	KGBS	LEED	None	Not sure	Not at all	Yes
Percentage %	37.3	42.9	16.3	3.5	1.7	10.7	87.6	5.4	12.5	82.1

More information on respondents' characteristics was captured to highlight their areas of specialization, possession of green certification, intentions to pursue green design, levels of awareness on green and channels that informed them on it. As illustrated in Table 4.7, the results showed that most (42.9%) of them specialized in designing for corporate, followed by hospitality (37.3%), then mixed use (16.3%) and fewer (3.5%) for institutional. The majority (87.6%) of the respondents had no certification in green, although few (10.7%) possessed certifications in LEED while even fewer (1.7%) in Kenya Green Building. As for the respondents' future intentions to pursue green certification, most (82.1%) confirmed interest in pursuing it. In comparison, few (12.5%) lacked interest and even fewer (5.4%) were unsure of the move.

4.3.4 Interior Designers' Awareness of Green Building

The interior designers' awareness levels on green building were as shown below:

Table 4.8: Interior Designers' Awareness of Green Building
Source: Study Data

Analysis of Green Related Aspects	Awareness of Green		Channels of Awareness			
Descriptive	Not familiar	Very familiar	Internet	Friend	School	Conference
Percentage	28.6	71.4	46.4	3.5	14.3	35.7

Most respondents (71.4%) were very familiar with green buildings, but few (28.6%) were unfamiliar. The level of awareness on green design was high among the respondents. Many (46.4%) had learnt about it from internet sources. The other popular channels through which respondents became aware of green building were conferences (35.7%), with the least (14.3%) cited source being school training and friends/family (3.5%).

4.3.5 Perception and Frequency of Green Concept Adoption

The data on interior designers' understanding of the concept green building and, their frequency of adoption was presented in the Table 4.9. In order to gauge the respondents' perception of green, information on their frequency of application, motivation and importance attached to the concept were examined. The results showed that many (67%) of the respondents correctly understood or perceived green building but did not adopt the concepts due to lack of confidence and skills.

Table 4.9: Perception and Frequency of Green Concept Adoption
Source: Study Data

Analysis of Green Aspects	**Understanding & adoption**			**Frequency of Green Application**					
Descriptive	Knows & no adoption	Adopts green	Lacks idea	IAQ elements	Lighting	Thermal comfort	Acoustics	Water efficiency	Materials & Technology
Percentage	67	4.4	28.6	48.2	44	51.8	48.2	5.4	48.2

Only (4.4%) adopted green concept in their interior design projects. Regarding frequency of adoption, those respondents that applied the concepts based on IAQ variables were at 48.21% when compared to other variables. The specific IAQ elements given much adoption were in provision for thermal comfort (51.8%), acoustics (48.2) and lighting (44%). Green in materials and technology was moderately (48.2%) adopted, while the least (5.4%) considerations were made in provision for water efficiency and sanitation.

4.3.6 Motivation and Priority Given to Adopting Green Concept

The data on interior designer's motivation to adopt and the importance awarded to green concept was as presented in Table 4.10.

Table 4.10: Motivation and Importance Given to Green Concept
Source: Study Data

Analysis of Green Aspects	**Motivation to Adopt Green**				**Importance Given to Green Design**			
Descriptive	Confidence in handling green	Feel indebted to envt. +society	Government regulation	Business strategy	None	Least	Fair	Most
Percentage %	5.4	33.9	41.1	19.6	33.9	10.7	48.2	7.1

The respondents revealed reasons motivating future adoption of green concepts as if green was instituted as a government regulation in building (41.1%), feeling indebted to the environment and society (33.9%), a business strategy (19.6%) and supposed they gain confidence in applying it (5.4%). In terms of importance attached to green adoption in their design practice, few (7.1%) indicated having much importance while, most (48.2%) gave it fair importance and 10.7% least. Those with no importance (33.9%) attached to green were of a considerable proportion.

4.3.7 School Training and Experience in Green Design

Prior training and experience on green building were dynamics influencing the frequency of its adoption. The related data was as presented in Table 4.11 below:

Table 4.11: School Training and Experience in Green Design
Source: Study Data

Analysis	**School Trained on Green**		**Experience in Green Design**		
Descriptive	Yes	None	Experienced	Fairly	None
Percentage	28.5	71.5	10.7	30.4	58.9

In establishing interior designers': instances of school training, experience levels, the support they would get in practicing, and areas of emphasis in green design training, shows that majority (71.5%) lacked school training on green as depicted in Table 4.11. Only 28.5% admitted to having encountered aspects of green design during their school training. In addition, even most (58.9%) of those aware of green lacked experience in its application, while 30.4% were as experienced in addition to 10.7% who had substantial experience.

4.3.8 Support for Green Adoption and Areas of Emphasis in Training

Results on the amount of support interior designers receive to encourage green adoption and, areas they identified for emphasis during training were as presented in Table 4.12. The respondents' perception of the support they would receive from their employers/supervisors/co-workers was fair (48.2%), with 33.9% indicating no support and few (7.1%) support. The priority areas suggested by respondents for emphasis during training were green materials and technology (48.2%), followed by IAQ elements (32.1%), water efficiency and sanitation (19.6%).

Table 4.12: Support Received and Areas of Emphasis in Green Design Training
Source: Study Data

Analysis	**Support for Green Design**				**Areas to Emphasis in Training**		
Descriptive	Most	Fair	Least	None	Indoor Air Quality elements	Water Efficiency	Green Materials & Technology
Percentage	7.1	48.2	10.7	33.9	32.1	19.6	48.2

Providing for water efficiency and sanitation seemed to be the least widespread. This was reiterated even in the results on its extent of adoption in buildings where application was least.

4.3.9 Critical Factors Influencing Green Adoption in Kenya

Adoption of green concepts among interior designers has been influence by a number of factors. Data identifying some of the critical factors linked are in Table 4.13 below:

Table 4.13: Critical Factors Influencing Adoption of Green Concepts in Kenya
Source: Study Data

Factor Code	Mean	Standard Deviation (SD)σ	Ranking	ANOVA (F)
F1	3.3393	.8152	8	.088
F2	4.0000	0.4671	2	0.184
F3	2.5536	1.142	14	.182
F4	3.6429	.6722	5	.316
F5	2.8393	.7574	13	.286
F6	3.6964	.8510	4	.464
F7	3.1964	.7488	9	.324
F8	.0000	.0000	16	.448
F9	4.3929	.8241	1	.403
F10	1.6429	.6722	15	.163
F11	3.0714	1.006	12	.971
F12	3.1429	.4443	10	.009
F13	3.6429	.7490	5	.028
F14	3.1429	1.085	11	.005
F15	3.3929	1.073	7	.022
F16	3.8571	.7729	3	.318
F17	3.5536	1.174	6	.407

In determining crucial factors affecting interior designers' adoption of green in Kenya, it was essential to identify their criticality based on mean ranking (descriptive analysis). Inferential statistics using Analysis of Variance (ANOVA) to highlight differences between the groups created along the demographics was employed. The results were as presented in Table 4.13 that indicated the F-statistic values, as close to 1-meaning significance values of the 17 adoption factors were more significant than those set by the study (0.05). Therefore, there were no statistically significant differences in perceptions of the respondents' groups when results were compared to the analysis framework. Sequencing of values with ties during mean ranking was in such a way that, one with the lowest Standard Deviation (SD) took precedence. The normalized value indicated the criticality of a factor at >0.50. The ANOVA/F statistic value was insignificant at a greater than 0.05 significance level (> 0.05). The results in Figure 4.1 show top three (3) factors influencing green adoption were absence of legislation/building code on green (F9), lack of technical know-how and experience in green design and construction (F2) and insignificant contribution of Kenya to the global carbon (F16).

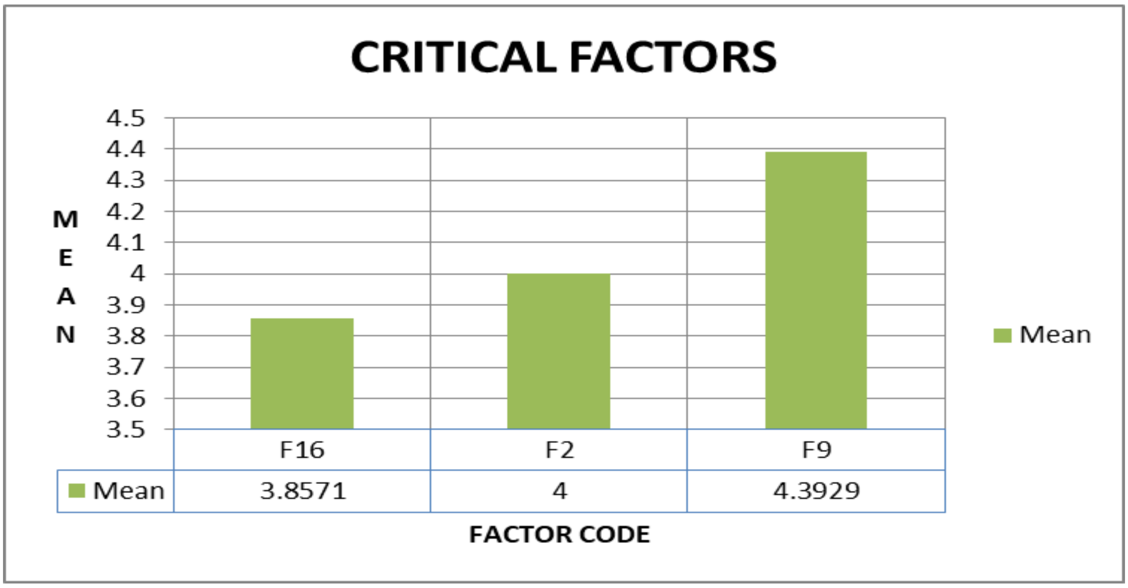


Figure 4.1 Critical Factors influencing Green Adoption by Interior Designers
Source: Study Data

In order to identify the criticality of factors, a number of tests were performed with results indicated in Table 4.14 that follows.

Table 4.14: Results of KMO Measure of Sampling and Bartlett's Test
Source: Study Data

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.753**
Bartlett's Test of Sphericity	Approx. Chi-Square	**631.303**
	df	**136**
	Sig.	**.000**

In selecting the principal components, three tests were performed (Table 4.14) as follows: Kaiser Meyer Olkin (KMO), Bartlett's sphericity test and Scree plots. Kaiser Meyer Olkin was used to measure sample adequacy to identify if the data was appropriate for Principal Component Analysis (PCA); a value of more than 0.6 was acceptable (Jollife & Kadima, 2016). This study obtained a value of 0.753, as presented in Table 4.14. The value 0.753 meant that there was no disparity among the responses. Thus, it was adequate for PCA functions. The other test was Bartlett's sphericity test to highlight the presence of correlations between variables. If the obtained value is immense and the significance level is small, performing a factor analysis is appropriate.

In this study, the value for sphericity was 631.303 while that of significance was 0.000, allowing for factor analysis.In determining critical factors affecting interior designers' adoption of green in Kenya, it was essential to identify their criticality based on mean ranking (descriptive analysis). In addition, inferential statistics was employed using Analysis of Variance (ANOVA) to highlight differences between groups created along demographics. The results were as presented in Table 4.15 that follows.

Table 4.15: Factor Analysis Based on PCA-Eigen Values
Source: Study Data

Total Variance Explained			
Factor Code	**Eigenvalues**	**% of Variance**	**Cumulative %**
F1	6.870	40.409	40.409
F2	2.354	13.849	54.258
F3	1.766	10.390	64.648
F4	1.287	7.571	72.219
F5	.998	5.868	78.088
F6	.750	4.413	82.500
F7	.550	3.235	85.735
F8	.513	3.020	88.756
F9	.334	1.968	90.723
F10	.333	1.961	92.684
F11	.274	1.612	94.296
F12	.244	1.434	95.731
F13	.205	1.205	96.935
F14	.184	1.080	98.015
F15	.169	.995	99.010
F16	.116	.685	99.695

Table 4.15 indicates the F-statistic values as close to 1 meaning significance values of the 17 adoption factors were more significant than those set by the study (0.05). Therefore, there was statistically significant need to reduce the many adoption factors to data sets and increase interpretability but, at the same time, minimize information loss. Thus, Principle Components Analysis (PCA) was employed to achieve that end.

An extraction method Principal Component Analysis (PCA) was used to reduce data into few sets, with the values obtained represented as eigenvalues. Eigenvalues indicate the amount of variance in data in a linear direction. The highest eigenvalue is, therefore, the principal component. Based on the study's results, as presented in the eigenvalues column of Table 4.15, the first four factors with values greater than one were selected while, those with less disregarded when grouping the factors.

The components explaining above 70% of the cumulative variance in the data were acceptable; in this case, it was 72%.

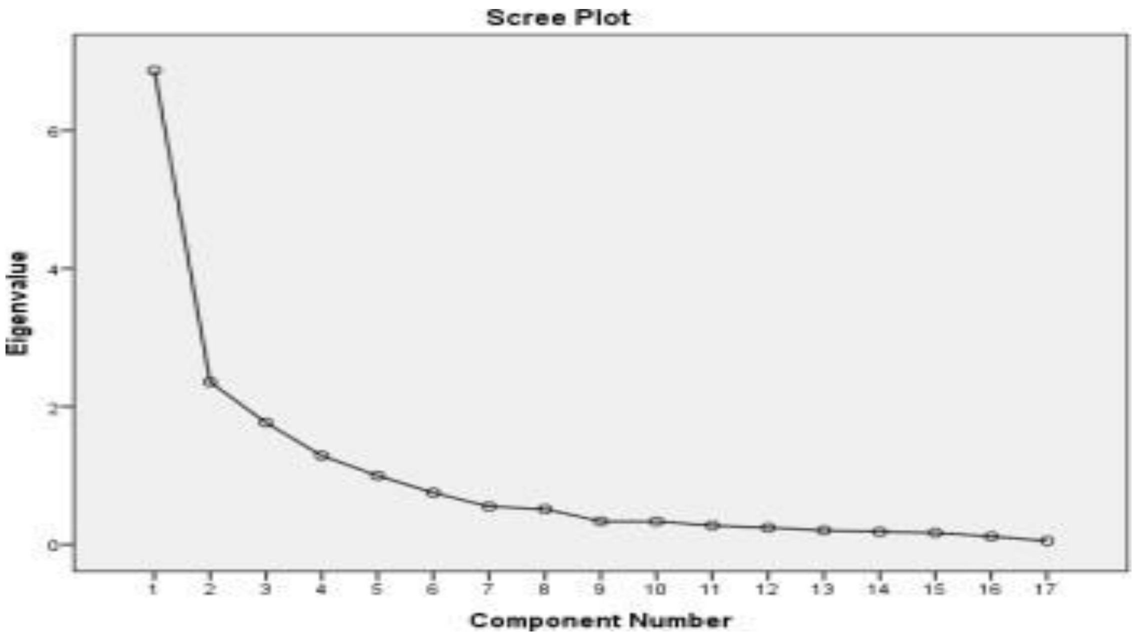


Figure 4.2: Scree Plot on Principal Component Green Adoption Factors
Source: Study Data

In illustrating the significant groupings created by the PCA, eigenvalues must be depicted from the biggest to the smallest in a scree plot as shown in Figure 4.2. The components that appear after the elbow shape are usually ignored since their value is less than 1. This analysis resulted in four principle components proposed as illustrated in Figure 4.2 above.The results of PCA summarized adoption factors into four main groupings, as shown in Table 4.16. The critical factors affecting designers' adoption of green concepts in Kenya were socio-government and education-related. These first two groupings and the first two items were considered as critical factors. The two, F9 and F2, needed attention if Kenya is to experience an increase in green concept adoption. Furthermore, F1 (a perception that cost of green adoption is expensive) needs to be addressed during campaigns aimed at raising public awareness.

Table 4.16: Factor Groupings
Source: Study Data

Code	Factors Influencing Green Concept Adoption by Interior Designers' in Kenya
Grouping One: Social-Government Related Factors	
F9	Absence/Inadequate legislation, building code on green interior design.
F10	Absence of an incentive/award scheme for interior designers who practice green design.
Grouping Two: Education Related Factors	
F2	Lack of technical knowledge and experience in green design and construction.
F3	Lack of knowledge on non-sustainable practices
F4	Lack of knowledge on environmental effects of non-sustainable practices among interior designers.
F5	Lack of education and training in green design & construction amongst interior designers.
Grouping Three: Green Concept Factors	
F1	Cost for green options considered expensive.
F14	Absence of a local contextualized Rating tool to measure sustainability of building interiors
F6	Green interior design products and technologies not available in the area.
F17	High cost of green energy sources (i.e. solar, biomass, wind turbines)
Grouping Four: Designer Factors	
F7	Attitude of Interior Designers (general disregard of green)
F8	Interior designers' preference to traditional design practices
F11	Clients' unawareness of green strategies for interior projects.
F12	Clients' unwillingness to utilize green strategies in their projects.
F13	Overall Client Control on the design.
F16	Insignificant contribution of Kenya to the global carbon

4.3.10 Gender and Adoption of Green Concept

The data providing insight into the perspective of gender, in relation to green adoption among interior designers was investigated. The examination of gender aspect was in relations to: intentions to pursue green in future, green certification and level of awareness on green buildings. The results from the data were as presented in Table

4:17.

Table 4.17: Gender Perspective to Green Adoption by Interior Designers
Source: Study Data

Gender	**Intentions to Pursue Green**	**Green Certification**	**Awareness of Green**	**Frequency of Application**
Women				
Frequency(F_{w})	30	5	38	14
Percentage(P_{w})	65.22	71.43	74.51	66.67
Men				
Frequency(F_{m})	16	2	13	7
Percentage(P_{w})	34.79	28.57	25.49	33.33

The percentage frequency (P_w) for women recorded the highest than in men in all the items that were compared, with awareness of green as having the highest. Percentage frequency for women (P_w) was therefore, greater than that of men (P_w) which was Pm > $P_{w.}$

4.3.11 Awareness of Green Concepts by Building Users

In order to establish the perceptions and awareness of green by building users', their opinions were collected, with results indicated in tables hereafter. Firstly, the study found it important to establish demographic details on the profiles of the building users. The importance of information on demographic profile of the respondents was that it created a background to aid understanding of the outcomes. The results were as shown in Table 4.18:

Table 4.18 Demographics of Building Users'
Source: Study Data

Analysis	**Gender**		**Age (years)**				**Education Level**	
Descriptive	Male	Female	18-24	25-34	35-44	45-55	Secondary	College & above
Percentage	54.5	45.5	4.5	31.8	50	13.6	18.2	81.8

According to the respondents distribution on gender of the, (54.5%) of them were male, while 45.5% were female. Most of them were aged between 35-44 years, with a few (4.5%) aged between 18-24 years and, many (81.8%) had a college education.

4.3.12 Users' Awareness of Green Building

The awareness level among Building Users was established and the results presented in Table 4.19 below:

Table 4.19: Users' Awareness of Green Building Concepts
Source: Study Data

Analysis	**Awareness of Green Building**		**Is Your Building Green?**			**Channel of Awareness**			
Descriptive	Aware	Unaware	No	Yes	No idea	Television	Internet	Friend	Newspaper/ Magazine
Percentage	36.4	63.6	40.9	27.3	31.8	0	62.5	12.5	25

According to Table 4.19, a vast portion (63.6%) of the respondents needed to be aware of the concept of green building. In addition, when asked to gauge if the buildings they worked in were green, many (40.9%) responded that they were not. Nevertheless, there were few who had yet to learn whether their buildings were green (31.8%). Those aware of green building had their main channel of information as internet (62.5%), newspapers (25%), a friend (12.5%), while none (0%) mentioned television.

4.3.13 Building Users' Perceptions of Green Concepts

In understanding users' perception of green building when compared to conventional ones, Principal Component Analysis (PCA) was performed to extract the main perceptions. The respondents' perceptions and understanding of green building were ranked using factor loadings based on extraction values. The ranking was based on values closest to 1, as done Komalofe and Oyewole's (2018) study. The results were as indicated in Table 4.20.

Table 4.20: Users' Perception of Green Buildings Compared to Conventional Ones Source: Study Data

	Factor Loadings		
Perceptions of a Green Building	**Initial**	**Extraction**	**Rank**
Lowers environmental hazards	1.000	.871	5
Preserves natural resources e.g. trees etc.	1.000	.916	1
Provides healthy building indoors.	1.000	.769	9
Construction cost is expensive	1.000	.892	3
Built with recycled material	1.000	.831	7
Reduces building maintenance costs	1.000	.887	4
Creates convenient and comfortable interiors for working.(reduced noise)	1.000	.897	2
Constructed using high quality & durable materials	1.000	.795	8
Easy to maintain	1.000	.761	10
Its energy and water efficient	1.000	.836	6

The results in Table 4.20 revealed three (3) main perceptions described and represented users' understanding of green building when compared to conventional ones. These respondents understood green to be one that: a) preserved natural resources (.916); b) created convenient and comfortable building interiors (.897); and c) whose construction cost was expensive (.892). Findings also identified those descriptions that did not fit users' perceptions of green building. These descriptions were 3 (three), and were ranked last. The descriptions included easy to maintain (.761), provided healthy indoors (0.769), and was constructed using high-quality materials (0.795). Noticeably, the extraction values were close to 1, showing that most of the responses for most indicator characteristics fell on the fourth calibration out of the 5(five) points on the Likert scale that had, the option of 'Some-what more'.

4.3.14 Users' Awareness of their Building Condition

In determining users' awareness of green in buildings, it was essential to determine their perceptions of the quality and conditions of their building interiors. Their perceptions were recorded in Table 4.21 where, mean ranking was used to determine the most prevalent perceived condition. In case of a tie in the mean, a standard deviation with the lowest value took precedence.

Table 4.21: Users' Perceptions of Their Building Condition
Source: Study Data

Interior Conditions	**N**	**Mean**	**Std. Deviation (SD)**	**Rank**
Temperature too warm	22	1.18	2.039	3
Temperature too cold	22	1.73	2.164	2
Lighting too dim	22	3.91	1.998	1
Lighting too bright/glaring	22	.18	.395	7
Insufficient ventilation	22	.05	.213	9
Dusty air	22	.32	.477	5
Too little air movement	22	.23	.429	6
Air too dry	22	.09	.294	8
Air too humid	22	.32	.477	5
Distracting ambient noises	22	.05	.213	9
Unpleasant odour in the air	22	.05	.213	9
Stale air	22	.45	.510	4

The results showed that the top three (3) prevailing conditions in buildings as perceived by its users were: a) lighting too dim (1); b) temperatures too cold (2); and c) too warm (3). These results confirmed the existence of uncomfortable conditions within buildings that could contribute to the heightening of SBS or be the cause.

4.4 Integration of Green Content in Interior Design Training Guides

To increase the adoption of green concepts in the interior design industry, equipping designers with skills and knowledge through training is paramount. The training enables them to develop confidence in practicing green in their building projects (Komalofe *et al*., 2016). According to Leddy (2013), training interior designers to adopt green concepts is the most effective mitigation method to enable the necessary paradigm shift in thinking for increased uptake. Thus, it was pertinent that this study established the extent to which green content was integrated into Kenya's interior design training at the undergraduate level.

4.4.1 Levels of Green Content in Kenya's Training Guides

Establishing the extent to which green content was integrated into training guides was done by categorizing course units into three. This move was informed by accreditation criteria for academic programme content by Kenya's Commission for University Education Standards, 2014. The categories of course units included: University Standard Units (UCU), core units and elective units. The purpose of evaluating those documents/training guides was to reveal the nature and composition (in terms of the proportion of green allocated) of courses existing in interior design training. The evaluation enabled appreciation and understanding of course anatomy and, unique levels of green integrated into its content. Using descriptive analysis such as frequency and mean to obtain data from the course mapping exercise, results were as presented in Table 4.22:

Table 4.22: Categories of Course Units in Art and Design Training Guides
Source: Study Data

Categories	**School A** **$TG1_{KU}$**	**School B** **$TG2_{MU}$**	**School C** **$TG3_{TUK}$**	**School D** **$TG4_{UoN}$**	**Average**
University Common Units	3%	20%	3%	4%	**8%**
Core Units	14%	53%	50%	71%	**47%**
Elective Units	84%	27%	48%	25%	**46%**

The results showed that on average, the bulk of courses in training guides were apportioned almost equally between electives (46%) and core units (47%). In comparison, University Common Units (UCU) took the most minuscule (08%) portion. Further, School A ($TG1_{KU}$) offered the highest (119) number of courses, with a large (84%) portion dedicated to electives. The symmetry perceived in the allocation was not a balanced one since 84% was allocated to electives, 14% to core and 3% to University Common Units. School B ($TG2_{MU}$) almost achieved the balance by allocating 53% to core units, 27% to electives and 20% to University Common Units. School C ($TG3_{TUK}$) allocated 50% to core, 48% to elective and 3% to university common units. The results were similar in balance to School D's ($TG4_{UoN}$) 71% allocation to the core, 25% to elective and 4% to the University Common Units.

4.4.2 Classification of Courses in Training Guides

To determine levels of green content integrated into the training guides, classification of courses in each guide was necessary. The classification was done to identify those courses that addressed the environmental aspect hence, determining the status of teaching green in Kenya's interior design programmes. The classification was enabled by mapping all the course units in sampled training guides. The mapping was as guided by a criterion provided by Kenya's Commission for University Education Standards, 2014 Accurate mapping, with the resulting data represented descriptively as frequencies and percentages in Table 4.23. was aided by titles of courses and their subtopics.

Table 4.23: Course Mapping in Design Training Guides
Source: Study Data

Types of Course Genres	**School A $TG1_{KU}$**	**School B $TG2_{MU}$**	**School C $TG3T_{UK}$**	**School D $TG4_{UoN}$**	**Average**
1. Foundational courses: a) Art/Design History b) Art/Design concepts	23 %	28%	23%	41%	**28.8%**
2.Concept Application, Implementation & skill development	66%	22%	45%	29%	**40.5%**
3. Environmental (Green)	2%	8%	7%	8%	**6.3%**
4. Technology based	11%	24%	11%	13%	**14.8%**
5. Project based	23%	22%	10%	29%	**62%**

The results indicated that, on average, much (62%) of Art, Design courses were project-based, followed by courses on application/implementation of theories and skills (40.5%), foundational courses (28.8%), technology-based courses (14.8%), and least (6.3%) was on environment courses. $TG1_{KU}$ almost recorded nil (2%) integration of green content yet, over-emphasised (66%) allocation to the genre of concept and skill development. Although, other training guides also recorded low on the green, this study's results showed that the level of green content integrated was at 6.3%. The $TG2_{MU}$ and $TG4_{UoN}$ had almost balanced the ratio allocated to each genre, although they still had low integration of the environment courses. Foundational courses received reasonable allocation since concepts and theory informed design practical/studio.

4.4.3 Intricacies of Green Integration in the Course Content

In capturing the levels and intricacies involved in integration of green content within the course units, analysis of course configurations was then carried out to reveal the composition and nature of the existing courses. The information obtained was vital for effective delivery of green content during interior design training. When analyzing the content, environment-related themes were identified in each training guide using the tool 'document analysis chart' as illustrated in Appendix 6. The tool was used to record the required data on frequencies as shown in Table 4.24 that follows:

Table 4.24: Configuration of Environmental Courses Integrating Green Content
Source: Study Data

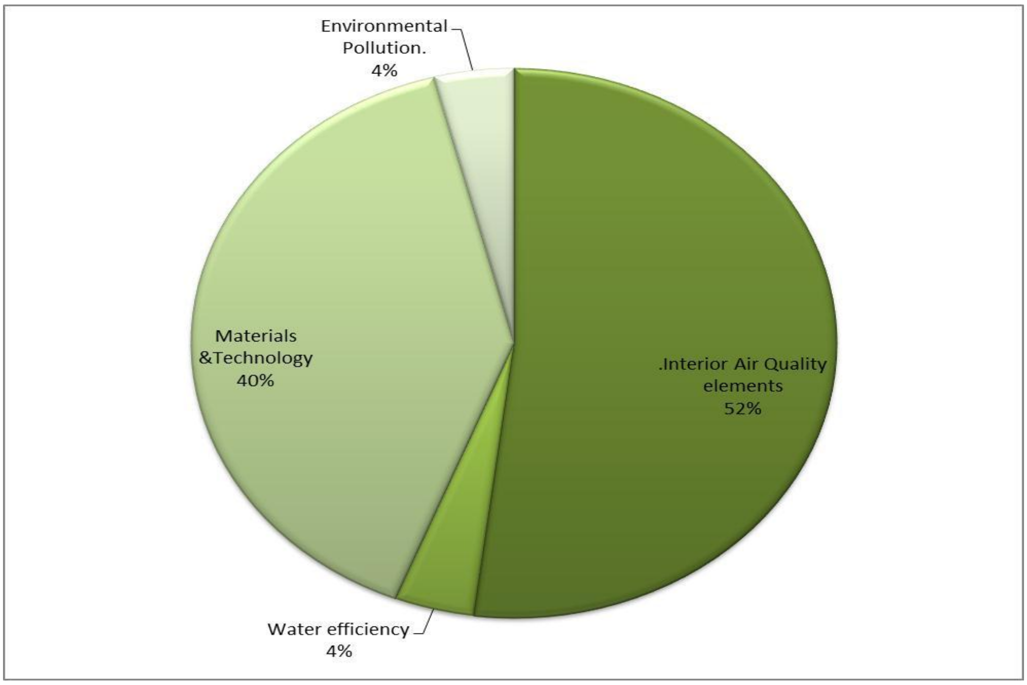
Configuration	**School A $TG1_{KU}$**	**School B $TG2_{MU}$**	**School C $TG3_{TUK}$**	**School D $TG4_{UoN}$**	**Total**
As Topics	3(18.8%)	4 (25%)	4 (25%)	5 (31.3%)	16
An Entire Course	0 (None)	4 (40%)	2 (20%)	4 (40%)	10

The results showed that out of the 4 (four) training guides, only 3(three), $TG1_{KU}$, $TG2_{MU}$, and $TG4_{UoN}$, integrated green content and, regrettably, in the final year of training. This observation highlighted the issue of little time and priority awarded to training on green design. All the 26 courses that had green content integrated in their configuration did so by including it as topics or dedicating entire courses to it. For instance, out of the 26 courses, 16 (61.5%) included green content as topics while, 10 (38.5%) dedicated entire courses to it. University $TG2_{MU}$ and $TG4_{UoN}$ had the highest 4(40%) number of courses entirely dedicated to green while, University $TG3_{TUK}$ had the least 2(20%), with $TG1_{KU}$ having none.

4.4.4 Identification of Topics with Green Content

Content analysis was carried out to examine topics that specifically addressed the green variables. The analysis revealed the level of focus given to integration of green content and the priority awarded to its different variables during training. The course topics identified were classified according to the three green variables, namely IAQ elements, provision for water efficiency, and materials and technology. The variables were similar to those of LEED-green certification points that are considered when highlighting on environmental pollution. The results were as shown in Figure 4.3.

Figure 4.3 Topics on Green Variables in Training
Source: Study Data



The results show that much (52%) priority was awarded to topics addressing green in IAQ elements and especially lighting. Next in priority were topics on green materials and technology (40%), with those linked to provision for water efficiency and unsustainable environmental practices (pollution) being awarded the petite (4%) attention. The only guide that integrated water issues was that of TG2 $_{MU}$ in a single course (ADI 206). The most significant allocation of topics on the green was dedicated to covering those on IAQ elements, while the least allocation went to provision for water efficiency.

4.4.5 Spread of Courses with Green Content

The number and saturation of design courses with green content was essential in determining the efficiency of the exposure to the knowledge and skills on it. This was examined in the spread of the courses with green content at different levels of training as denoted by the years of study. Each of the four universities training on interior design had their programmed guides evaluated. The sample of university training guide included those of Kenyatta University, Maseno University, Technical University of Kenya and the University of Nairobi. The results of the data were as shown in Table 4.26 that follows.

Table 4.26: Spread of Courses with Green Content at Various Training Levels
Source: Study Data

Training & Level	School A TG1KU	School B TG2 MU	School TG3 TUK	School D TG4 UoN	Total
Year 1	**0**	**0**	**2** (**ACDI:1104** Materials and processes A, **1204:** Materials and processes B),	**1**(**BDS:105** Materials)	**1(14%)**
Year 2	**0**	**4** (**ADI 203**:Interior Design Materials and Components, **206**:Environmental Design & Ergonomics, **208**:Flowers and Plants for Interiors, **210**: Interior Architecture, Space Design & Planning)	**0**	**1** (**BDS:200** Ergonomics)	**1 (23%)**
Year 3	**2** (**AAD 356**: Non-Conventional Surfaces, **AAD 382**: Planning of Residential Spaces)	**3** (**ADI 301:** Landscape Design, **303:**Interior Architecture, Space Design & Planning, **309:** Lighting and Acoustics for Interior Design)	**3** (**ACDI: 3101** Human Environ. Relations, **3207:** Intro. to Environ Design **3208**: Environmental Design)	**1** (**BDS:324** Landscaping and Human Environment)	**2(41%)**

Year 4	**1**(**AAD 441**:Planning Interior Spaces for Commercial Buildings)	**1** (**ADI 401**:Universal Design)	**0**	**3** (**BDS 401:** Application of Design Theory, **403:** Advanced form content appreciation, **405:**Advanced Concepts in Communication)	**1 (23%)**

Table 4.26, continued.

The courses on green (represented as unit codes) were spread as per the level of study, with year three (3) in most of the training guides having the heaviest load. Generally, the integration of green courses began in year one (1) of the study. However, only some universities were keen on integrating it at that level of design training, except University CTG3 $_{TUK}$, which integrated two courses, and University D TG4$_{UoN}$, one (1). Much of the integration of green courses was in year three (3) at 41% and in all the guides. This was followed by integration in year four (4) at 23% in all the universities except one (CTG3 $_{TUK}$). At the final level study, as this is year 4, the courses integrated were fewer though School D TG4 $_{UoN}$ had its heaviest (3 courses) at that level.

4.4.6 Pedagogical Modes of Delivering Green Content

Lastly, it was essential to identify different modes used to deliver green content during design training. The purpose was to identify the dominant mode of delivery with its strengths and weaknesses. In using descriptive analysis, results were presented as shown in Table 4.27.

Table 4.27 Mode of Delivering Green Content in Interior Design Training

Source: Study Data

Mode of Delivering Green Content	Percentage
Lecture	40%
Studio Practical	56%
Combination (Lecture + Studio)	4%

The modes of delivering green course content were studio practical (56%), lecture method (40%), and combination (4%), which blended lecture with studio. The results showed that studio practical is the dominant mode of teaching green design. There is also a need for an explicit pedagogy connecting/translating the knowledge gained from theory lessons to studio practical.

4.5 Summary of the Chapter

This study aimed at investigating the extent to which green concepts were adopted in the three building categories; the results were summarized in sections. The green levels in IAQ attributes recorded the highest considerations for green given to provision for energy efficiency in all the building categories. The lowest and almost lack of green was observed in the Historic Conventional Building category. In the provision for water efficiency, monitoring water use was the most adopted in all the building categories. Under green materials and technology, ease of maintenance among attributes ranked highest. Its adoption in the building category was highest in GCB while, the MCB category had the least.

The study also discovered that critical factors influencing interior designers' in adopting green concept were two: absence and inadequate legislation, building code on green to guide interior designing (F9) and lack of technical knowledge and experience in green design and construction (F2). In addition, the awareness level of interior designers on green building was good and rated at 71.4%. The building users were aware of green buildings but a considerable portion was unaware. Most of the building users learned about green building, online.

The study also purposed to determine the extent to which green content was integrated into interior design training guides. The evaluation was done on the undergraduate programme. Results showed that the level of green content integrated into the training guide was low and insignificant. Therefore, based on the findings summarized above, a solid foundation existed to make discussions documented in the next chapter.

CHAPTER FIVE: INTERPRETATION AND DISCUSSION OF FINDINGS

5.1 Introduction

This chapter provides the interpretation and discussions on findings of this study that were presented previously in Chapter Four. The interpretation of findings and the discussions that followed compared with past findings. The discussions were based on the study's objectives.

5.2 Extent of Green Integration in Commercial Buildings

The practice of green in interior design was considered as an adaptive measure valuable in curbing cases of sick building syndrome (May, 2018; SBCI, 2012). Therefore, adopting green concepts in commercial buildings is a practical way of practicing sustainable architecture for healthier interior environments and well-being of occupants. The extent to which green concepts are adopted in building designs matters a lot as they determine the resultant IEQ thus, lower SBS. Knowing the green adoption level is crucial in informing the creation of green building policies, administering of green materials supply and planning of awareness programmes more efficiently. This study, therefore, identified and established the extent to which green was adopted in Nairobi City County's commercial buildings. The findings obtained were interpreted and discussed in the paragraphs that follow. Using the Mean Rating (MR) method, index values ranging from 1-5 were used to represent levels of green in different interiors for the three building categories.

5.2.1 Green Adoption in Interior Air Quality Elements (IAQ)

To establish the levels of green adopted in the variable represented by IAQ element, its attributes were examined for green concepts that were adopted within buildings. The findings were as presented in Figure 5.1 that corresponds with data on Table 4.1. The attribute with the highest adoption of green concepts in buildings in Nairobi were in provision for energy efficiency and technical space performance. The mean energy efficiency rating (MR) value was 3.37, followed by technical space performance at 3.22. The MR value implies that the extent to which green was adopted was pseudo-green in nature and thus average in level. These results concurred with those of Khaemba and Mutsune (2014) and Andrew and Jensen (2016) who identified provision for energy efficiency as being awarded top priority by many building experts. Interestingly, Khaemba and Mutsune's studies were based in Kenya, a developing nation where green policies were yet to anticipate attention from authorities. More of the reason for much adoption of green to provide energy efficiency could have been because of the ongoing campaigns on the same. Likewise, a study by Oladukun and Shinyanbola (2021) concurred with those findings too. This was concluded that even in Nigeria, green concepts providing for energy efficiency were the most demanded for and adopted. In addition, Andrew and Jensen (2016) posted similar results that were strange considering that the UK is a developed economy with elaborate green policies. In the countries mentioned, much effort was put into achieving energy efficiency in buildings, unlike for other attributes. The observation made was probably due to the erratic power supply in developing countries or high cost of electricity or much awareness has been ongoing, with intentions to save both in developed and developing countries worldwide (EEBA, 2018; Nicole *et al*., 2020).

Technical space performance had an average adoption of green since it was crucial attribute that defined the failure or success of space. This is especially true by building users as affirmed by findings in Langat (2016) and Edna *et al.* (2021). These findings showed that comfort and satisfaction of users heighten productivity if the space is of good ergonomics. Therefore, the reason-building designers put in much effort to ensure ergonomics were rightly captured in the design and construction phases of the buildings. The finding also concurred with those of Mushobozia and Younghong (2019) and Ernminia (2012) that users unknowingly put a demand for the high technical performance of spaces by quickly buying out /hiring spaces that have: good ergonomics, allow for multiple functions and enable universal designs that foster quality human interactions. All this was done to enhance users' productivity, as observed by Soujanya *et al.* (2020), echoing the need for ergonomic awareness to be raised among doctors and building designers. This observation was borne from findings that showed 75% of doctors (ophthalmologists) had suffered musculoskeletal disorders due to poor technical space performance.

Generally, considerations for energy efficiency were lowest in the HCB category, implying that adoption of green was minimal, as indicated by an MR value of 2.97. The highest adoption was in GCB, with an MR of 3.81, implying that green was adopted averagely. In the HCB category, low adoption was expected since they were old buildings then designed with little considerations for energy efficiency. Nevertheless, with the ever-evolving technology, retrofitting could be undertaken to achieve the required levels of energy efficiency. This has been demonstrated in Ndichu's (2017) involving Viewpark Towers in Nairobi and Wang *et al.* (2017) studies on China's subway. As for the results of GCB having average/pseudo-green (MR 3.81), it disputed the objective of greening buildings right from the first phase of its life cycle. For this category of buildings should have at least been completely green with an MR value of 5 right from the start thus, denoting efficiency in its every aspect. The average adoption implied an average performance and hence needed retrofitting to achieve the envisioned total green efficiency. Sometimes, low green in buildings may be a case of greenwashing. This is a practice where building managers make misleading/unsubstantiated claims about the environmental benefits of their building. This occurrence should not be so, as building experts need to ensure that a green building is fully green right from its inception to the demolition phase to warrant the term 'green'.

Green in provision for thermal comfort and ventilation was moderately adopted with an MR value of 2.8. This value implied that little green adopted and was especially lowest in the MCB building category. The findings confirmed observations by Ndichu (2017) and EEBA (2018) that many MCB in Nairobi unwittingly imitated designs similar to those in temperate regions for purposes of style/aesthetics. However, those designs need to have taken into account the region's tropical climatic characteristics and created suitable designs. As a result, these designs have resulted in inefficient building interiors, with poor thermal and ventilation comfort. Furthermore, buildings that adopted passive green and mechanical techniques in providing thermal comfort and ventilation were rare yet, Maomen (2016) and Yuzhen *et al.* (2022) discovered that combining the two provided a more superior ventilation quality as compared to adopting them separately.

Few GBC and HBC buildings thus adopted a combined approach to providing ventilation. These results were agreeable with Saleh and Saied's (2016) studies that indicated minimal adoption in Historic building too. The observation was commensurate with those of Aloyo (2015) and Tobias and Ursula (2013). The authors attributed such results to a lack of knowledge/skill on the part of stakeholders on passive/vernacular concepts on green. Therefore, such a situation made it difficult for policymakers and stakeholders to create standards or even raise awareness of adopting passive green concepts locally.

In public and multi-functional buildings, acoustics is crucial and provides healthy and comfortable workspaces that maximise productivity. Long exposures to high noises and vibration cause physiological and psychological diseases and, in turn, increase the burden of health care. The health burden is heightened by a fact that noise that keeps stress hormones constantly high thus causing cardiovascular diseases, sleep disturbances, depression and burnout (Sandberg, 2016). Therefore, acoustics in buildings consider vibrations and background noises of less than 55dB to enable speech intelligibility and privacy (Johnson, 2019). This study's results confirmed that considerations of green in provision for acoustics ranked low (sixth) in existing builds with the most negligible MR of 2.63 among IAQ elements. The value implied that considerations for acoustics in the provision of green were little, with GBC having the highest (MR 3.70) adoption rate. In contrast, HBC had the lowest (MR 1.70) and was considered almost lacking in green. The results mirrored observations made by Langat (2016) that found considerations for acoustics were least among the interiors in Nairobi. The same observation resonated with those of Radwan et al. (2014) studies done in USA. In addition, Johnson's (2019) findings further revealed that acoustics significantly determined users' comfort and satisfaction with their building spaces hence reducing the high turnover experienced by tenants and increasing space sales. The little adoption of green in acoustics may have been due to low publicity awarded to its importance as an enabler of efficient and healthy spaces, which enhanced the well-being and productivity of building users.

On average, the level of green adopted in IAQ elements ranked second (MR 2.83) in comparison to other variables such as water efficiency, and materials and technology. That value implied that the adoption of green was still little hence needed retrofitting to increase its level in buildings. In studies by Kang and Guerrin (2009) and Khaleel (2013), also it was revealed that the adoption of green was low in IAQ elements and almost none on material selection. Kenya’s National Building Code 2014 could attribute the minimal adoption of green in IAQ elements to the lack of mandatory IAQ efficiency requirements. If efficiency requirements are made mandatory, then there is likely to be a change in future patterns and rates of green adoption.

5.2.2 Green in Provision for Water Efficiency

There is a growing focus on environmental conservation and resource management, and many buildings strive to minimise or delay water consumption and maximise efficiency. Some of the methods adopted for water efficiency in various building categories examined were as shown in Table 4.2. According to findings in the table, adopting green to provide for water efficiency in buildings, monitoring water use was the most (MR 3.67) adopted concept. The concept ranked first in all the categories that were examined. The MR value implies that adoption levels were pseudo-green in nature thus considered high. The finding was similar to those of Were (2015) and Fawaz (2013), that further explained that such an occurrence was probably a result of building managers having intentions to cut on building maintenance costs. Reducing sewage-waste volume was another attribute providing for water efficiency that ranked second (MR 2.93) in adoption. The index value denoted that the level of green adopted was small. This was probably because users and clients still needed to fully acknowledge the importance of reducing sewage waste volume, especially in regards to disposal. This is a conclusion also affirmed by Chapman (2014) and Caixia *et al.* (2020). The findings further showed that user' attitudes and acceptance of sewage-reclamation projects were the main reasons influencing their high demand and success. Building users and clients needed to be made aware of the diverse economic benefits of reclaiming and selling sewage waters, as confirmed by Maomen (2016) and Sikhulisa (2013) in studies carried out in Egypt and South Africa, respectively.

Recycling/re-using wastewater ranked third amongst water efficiency strategies adopted, with an MR index of 2.13; meaning that the level of green adopted was little, with only GCB showing the re-use of recycled water. In GCB, the recycled water was mainly used to irrigate gardens, clean walkways and flush toilets. Similar observations were made in studies by Sikhulisa (2013), in which reuse of grey waters was also used in flushing toilets and irrigation of plants around the building sites. Although Sikhulisa noted that wastewater reuse was not widespread in South Africa, it was especially because of an attitude by older folks who needed to yet trust its hygiene and embrace the idea.

On the contrary, Chapman's (2014) findings of a USA based study (State of Arizona) of the reuse of domestic wastewater was much adopted. Re-use was at the state level and the water was even put up for sale by the state government. The Arizona State government also incentivises owners with on-site reclamation systems, to promote provision for water efficiency. The popularity and adoption of the wastewater reuse in the mentioned countries was different in Kenya since the former was developing nation while the latter is a developed nation with clear and developed policies on green design and that explains the difference in its adoption.

Adoption of efficient fixtures and fittings ranked fourth among the green concepts for providing water efficiency. On average, its level of adoption was minimal and was recorded lowest in the HCB category. Such observation was expected especially since most HCB were not fully retrofitted with green concepts in their plumbing system and water fixtures. This was influenced by financial considerations or feelings that it was unnecessary because the earlier fixtures (conventional) were functioning though they could be made more efficient. Mainly, the standard fixtures in the buildings were dual flash toilets and aerated sensor automated taps and faucets. The finding was similar to that of Chieng-Li *et al.* (2016). Other concepts such as waterless toilets-foam flush and highly efficient oil/urinals were adopted in China, unlike in Nairobi (Kenya).

Lastly, the adoption of green concept rainwater harvest and storage ranked fifth and was least (MR 2.05) adopted between HCB and MCB in provision for water efficiency. The low (MR 1.01) index implied that little amount of green was adopted in this particular attribute. Worst in adoption of the rainwater harvest concept was the HCB category that needed improvement. In the building categories where rainwater was harvested, it was either disposed off as wastewater, or used in flushing toilets and irrigating gardens. These observations corresponded with those of Khaemba and Mutusune (2014) in Kenya and Slabbert (2013) in South Africa. In the two studies, rainwater harvesting was also found to be the least adopted popular concept thus not popuar among building professionals. The occurrence could be because of low awareness of raining water harvesting among stakeholders or building designers' negative attitude towards it.

Therefore, they also rarely educated their clients on adopting it.

5.2.3 Green Materials and Technology

Generally, adopting green materials and technology enables provision of healthy environments for the well-being of users, efficient use of resources and preservation of the environment. The level of green adopted in materials and technology of different building categories was previously presented in Table 4.3. On average, adoption of green in materials and technology was the highest (MR 2.86) and ranked first in comparison to other variables. The MR value implied that the amount of green adopted was of little amount. These findings were in agreement with those of Komolafe *et al.* (2016), where materials recorded the highest (MR 2.62) in green adoption. The reason being that, both studies had implemented similar methodologies and arrived at the same findings. In comparing the building categories, GCB had the highest MR index (3.35) in the adoption of green materials and technology.

Moreover, the attribute 'ease of maintenance recorded the highest (MR 3.06) level of green adoption, followed by that of buildability (MR 2.89) and lastly, the use of environmentally friendly materials (1.71). These findings contradicted those of Were (2016) which revealed that building experts were aware of green materials but adopted them minimally with buildability at the rate of 8%. Buildability as an attribute achieved much adoption as it was linked to the ease of accessing skilled labour locally to install green materials. In addition, the finding contrasted those of Kang and Guerrin (2009) and Khaleel (2013) recording nil adoption of green in materials selection. Nevertheless, the variable green materials and technology recorded the highest green adoption in comparison to others. The difference in results was because prior information on availability of green materials was limited. But with awareness campaigns, stocking of it got elaborate, and so was the technology on their installation. The difference in finding could have also resulted from different methodologies employed. In the three studies mentioned, interviews were used to collect the opinions of respondents, while in this study, observation was employed.

The least adopted attribute was that of environmental-friendly materials on average MR value of 1.71. The value denoted a lack of green which was somehow awkward considering that awareness of green was at 92% among building experts in Kenya (Were, 2015). Therefore, experts must have known about green materials. It is absurd that adoption of environmental-friendly materials was lacking, a finding which agreed with those of Were (2015). Were however, revealed that only 8% of building experts confessed to having used green materials in their projects. Yet, environmentally friendly materials are indigenous/vernacular and thus, readily available locally. The installation of indigenous materials does not even require expertise that may need importation.

However, Koffi *et al.* (2020) acknowledge that even in Ghana, the adoption of vernacular green building materials was less appreciated by building experts. Thus, environmentally friendly materials were not adopted in commercial buildings. Similarly, in Kenya, adoption of green materials was low and, even the building code (Sections 33 and 61), stipulates against their use. The building code could be a factor contributing to lack of green material adoption that was observed in this research. On the contrary, adoption of environmentally friendly material was high (MR 2.62), in a Nigeria-based study by Kamalofe et al. (2016). The difference in results between this study and that of Kamalofe *et al.* (2016) could have resulted from the size of sample that was investigated. The sample size for Kamalofe *et al.* study was relatively small (2 buildings), unlike this study that involved 17 buildings. Therefore, the former study failed to achieve good sample saturation usually crucial for increased validity.

On the aspect of technology, the use of green tools in designing buildings was still low, an observation that concurred with those of Mosse *et al.* (2020), Kanyaura, and Obino (2015). These studies reiterated the low adoption of the green tool (Building Intelligence Model- BIM) for designing and establishing building's performance. The low adoption could have resulted from insufficient expert knowledge of such technologies and a lack of a suitable legislative framework to support it.

An average of MR values obtained from the green variables investigated revealed the extent to which green concepts were adopted within commercial buildings in Nairobi City County. The overall resulting MR value weighted at 2.84, implying that the level of green adopted was little and thus, fell below average. This finding denotes a situation that buildings urgently require retrofitting exercise in order to enhance their performance to make them highly efficient. These results confirmed the extent to which green concepts were adopted in Nairobi's commercial buildings as low. This was because the MR values of the three variables used to determine levels of green fell below 3 (average/pseudo-green). The level of green concept adopted in the variable green material and technology, recorded the highest adoption rate with an MR value of 2.86. While those relating to provision for water efficiency ranked least, with an MR value of 2.33.

Lastly, the findings showed that the extent to which green concept was adopted within commercial buildings in Nairobi (MR 2.84) were similar MR of 2.5 to those in Nigeria, as was confirmed in Komolafe *et al.* (2016). The MR value therefore implied that the level of green adopted in the developing African nations was still minimal and insignificant. Therefore, this study accepted the Hypothesis $H0_1$ and stating that no significant level of green was adopted in Nairobi City County's commercial buildings.

5.3 Stakeholders Awareness of Green Building

The awareness and perceptions on green adoption held by two groups of stakeholders that was the focus of current study were discussed under two titles. This was in relation to interior designers and building users in Kenya.

5.3.1 Critical Factors Affecting Interior Designers' Adoption of Green

The current adoption of green in the interior design industry was low and far from the goals of achieving sustainability in buildings (Chan *et al.*, 2019; Nduka & Ogusami, 2015). Thus, in order to increase green adoption in buildings, this study found it essential to identify the critical factors affecting its uptake by interior designers in Kenya. The identification was because many existing studies identified factors affecting designers in developed countries while only a few established those in developing ones (Darko & Chan, 2016). Yet, factors affecting green adoption differed with regions depending with climate, socio-economic dynamics and time (Tarji *et al*., 2020). So identifying specific critical factors allied to Kenya was not only to bridge a knowledge gap but, also served to enhance understanding of green adoption among stakeholders. To enhance understanding, background details of the respondents' demographics and a comparison of these details versus the analysis framework was done. The details were as presented in Table 4.5.

The analysis compared demographics, firm size, and area of specialization versus the analysis framework. The analysis yielded results that were not statistically significant since the values generated were more (1) than the studies set significance level of 0.05. Therefore, from the findings, the observation was that demographics (for example, age, and education, etcetera) firm ownership and size except gender did not significantly influence any trend in designers' responses to frequency of green adoption. Since, demographics insignificantly influenced the results, the ensuing discussions was pursued along that line. These findings were supported by those of Kang and Guerrin (2009) and Faridah and Afham (2018) but sharply contrasted with those of Steven (2010). At the same time, Steven's findings indicated gender and age (demographics) as influencing the frequency and perception of respondents in green consumerism in marketing. Steven opines that gender influenced consumers' choice of green products. The same observation was captured in the study as confirmed by the percentage frequency in Table 4.17.

The difference and similarity in findings between the two studies probably arose because respondents in the previous studies were different. Kang and Guerrin (2009) and Faridah and Afham (2018) investigated interior designers, while Steven (2010) examined consumers of products, not necessarily those for buildings. Furthermore, the two countries where investigations were based had varied economic backgrounds; for example developed ones where green was entrenched in policies and in developing ones where green is at its infancy.

5.3.2 Interior Designers Awareness of Green Building

Concerns arouse to examine the awareness level of green buildings by interior designers in Kenya. The concern was because studies by Nduka and Ogusamin (2015) concluded that the level of knowledge and skill-building that experts have on green determines the confidence and frequency with which they adopted it. The results further confirmed that designers' education levels had no significant relationship to the importance they attached to green or its frequency of application. This observation coincided with those of Kang and Guerrin (2009), based in the USA, and Faridah and Afham (2018), based in Kenya. The observation was so because once the concept green was learnt and a designer was committed to practising it, they would adopt it in their subsequent projects, an observation also upheld by Kootin and Bangdome (2013). Irungu (2016) argues that this was because the attitude and conviction to adopt green was rarely influenced by one's level of training but, by a personal inner drive to conserve the environment. Thus, the need to investigate level of interior designers' awareness of the concept green and whose results corresponds with those on Table 4.8.

The findings revealed that awareness of green by interior designers was high (71.4%), and there existed a positive attitude among them towards its adoption. Many of the designers intended to learn more about green and pursue its certification in future. These findings concurred with those of Nduka and Ogunsanmi (2015) in Nigeria at 60%; Were *et al.* (2015) found high (60%) awareness levels of green among construction managers in Nairobi; Madukani (2020), same as in Kang and Guerrin (2009) studies in the USA among interior designers. The high awareness among building experts could be attributed to the ongoing sensitization on sustainable building issues concerning climate change. The intention to learn more about green design confirmed the need and willingness for in-service training. The intention was, in addition to the call for its integration into design training programmes, to enable them gain confidence to ensure green practice in future, as argued by Nduka and Ogunsamni (2015) and Akinshipe and Aigbavboa (2018).

On the contrary, studies by Khaleel (2013) carried out in Gaza revealed that awareness of green buildings was low among engineers who were the study's respondents. In Nigeria, too, Bungwon *et al.* (2016) indicated low awareness among building professionals. The difference could be as a result of the period, the time the research was done, and the methodology used. Although by now, the situation could have changed with the ongoing sensitization on climate change and sustainability in buildings.

5.3.3 Main Channels of Awareness on Green Building

The interior designers in Kenya learnt information on the green was mainly through common channels such as the Internet, personal research, and conferences (Table 4.8). This finding contrasted that of Madukani (2020), in which television was the main channel of awareness for residents in Nairobi. Umar and Ibrahim (2019) identified television in addition to the Internet, while in Egypt, Rasha (2012) indicated the Internet as the main channel. It was evident from the studies mentioned that the Internet was a significant vehicle of awareness due to its characteristics such as availability, cheapness and widespread audience.

In addition it was also confirmed that school training and professional certification on green building was minimal. The designers' experience in green design could have been higher but. many (58.9%) lacked the experience thus they did not have confidence to practise it. These findings confirmed those of Bungwon *et al.* (2016), who established that professional bodies in Nigeria neither raised awareness of green building nor highlighted the need for its certification. The finding also concurred with those of Akinshipe and Aigbavboa (2018), who found out that curricula for building experts' in South Africa lacked inclusion of green in schools. However, many could be knowledgeable and confident to adopt green concepts in their designs if trained. Bungwon *et al.* (2016) further recommend that it was necessarily the responsibility of professional bodies to begin raising awareness on green buildings amongst stakeholders to increase adoption of green buildings.

5.3.4 Categories of Firms Employing Interior Designers in Kenya

Further findings revealed that the private sector was the principal employer of interior designers in Kenya's building industry. The characteristics of the design firm were as described in Table 4.6. Based on ANOVA results, there was no significant difference in how interior designers working for private ($p=0.748$) and those in public ($p=0.985$) firms applied green, nor in the importance they attached to it. Therefore, designers' perceptions of green were similar, either working for a public or a private firm. This finding was contrary to that of Kang and Guerrin (2019), who found out that in the USA, designers who worked for the public were more inclined to adopt green than those in private firms. The difference in the findings was that since there were established green legislations in the developed countries, fulfilling them is mandatory (Morris, 2012), unlike in developing nations (Kenya) where none exists or is in its infancy.

The findings did not show any statistical significance in designers' awareness influenced by the size of the design firm. The finding was unlike in Kang and Guerrin's (2009), and Akadiri and Fadiya's (2013) studies, where the design firm's size and areas of specialisation had a significant relationship with the frequency of green adoption. The finding was perhaps because of incentives for designers who adopt green in the USA and the UK, where the studies were based.

5.3.5 Specialization, Certification and Intentions to Pursue Green

Although no significant relationship existed between interior designers' demographics and the importance of green, project type was perceived to influence designers' decision of frequency with which they adopted the concepts. Green certification was a rare occurrence among interior designers and, those that had were mainly those of LEED-Green Certification, an American-based body as indicated in Table 4.7. The finding coincided with those of Were (2015) stating that most of those with knowledge on green or certification had been schooled outside Kenya. Most of the designers were interested and intended to pursue green certification in the future. The design firms' main areas of specialization were in the corporate and hospitality categories. This was unlike in Kang and Guerrin's (2009) findings in a study based in USA where, most of the design firms specialized in institutional and hospitality categories. The difference could be attributed to economic development level and geographic location. Such that in Kang and Guerrin's study, clients in that region place more value in the quality of institutional environment as opposed to those in Kenya who value corporate and hospitality. In both regions, hospitality areas were given much priority in matters green building.

This study established that in Kenya, most interior designers' mainly specialised in designing for corporates and hospitality. This could be because these two industries majorly solicited interior design services and paid better than other sectors (Irungu, 2016). These findings differ from those of Kang and Gurrien (2009), in which most interior designers specialised in institutional designs, especially schools and Medicare. They highly adopted green in the designs of such buildings because they thought that was where it mattered most or was necessary.

5.3.6 Support in Adopting Green Concepts

The support that interior designers receive to adopt green concepts is influential in increasing adoption. Therefore, the study examined levels of perceived support from their colleagues and supervisors, as shown in Table 4.12. On the support, interior designers receive in adopting green concepts, the study found minimal to no support from their supervisors and colleagues. This discovery agreed with those of Simpeh and Smallwood (2015) in South Africa. Building experts were reluctant to change from traditional materials to green ones and discouraged others from doing so. The observation was attributed to the fact that many African governments were yet to legislate green or even provide incentives for its adoption (Koigi, 2019; Chan *et al*., 2019). Therefore, support for green adoption naturally dwindled

Further, the respondents identified areas of green concept that needed the most support and emphasis as that of green materials and technology. As in this area of materials and technology, designers desired to gain knowledge and thus, confidence in prescribing and installation of them within interiors. This observation concurred with that of Kang and Guerrin (2009), where interior designers' least adopted green materials because they needed to gain knowledge of where to source them or the skill of installing them within the building envelope.

5.3.7 Motivation and Importance Awarded to Green Design

Motivation to adopt green design is crucial in sustaining increased uptake within any area. Irungu (2016) upholds that motivation results in a change of attitude that causes interior designers to prioritize green design consequently, a change in behavior, that is, green practice in projects. The findings on motivation factors and the importance attached to green are indicated in Table 4.10. The findings implied that the greatest motivation for interior designers to adopt green in future was if the government instituted it as a mandatory building regulation. However, a large portion of the designers continued to attach much importance to adopting green concepts. School training on green design is vital as it institutes designers' sustainability principles. In addition, schools offer a chance for hand-holding to enable acquisition of skills for future practice. Thus, designers gain the experience and confidence to practice green design (EEBA 2020).

The findings showed that most interior designers needed school training in green designing and those knowledgeable were especially self-taught through various channels, especially the Internet. Further findings indicated that most designers were yet to gain experience in green designing, as it was not a practice they were accustomed to. The discovery agreed with Were (2015) who concluded that most of the building experts in Kenya practising green design had schooled outside the country. Thus, training on the green within Kenya's design schools either lacked or was at its inception stage, and integration of related content needed to be integrated in the curriculum.

5.3.9 Critical Factors Influencing Adoption of Green Concepts

In order to overcome the challenges facing the adoption of green in the country, this study needed to identify factors critical to its growth. Factors influencing the growth of green buildings are different for varied regions and cultures. So those specific to Kenya were investigated, and results were as presented in Table 4.16. This study discovered that the two major factors influencing green adoption included absence of legislation/building code on green building (F9) and lack of technical expertise and experience in green design and construction (F2). Lack of legislation was primarily a significant factor also identified by other several studies based in both developed and developing nations (Were, 2015; Dbida *et al.,* 2020; Momanyi, 2019; Chan *et al*., 2019; Rimalini *et al.,* 2022). In all these studies that were based in Africa and Asia, factor grouping termed socio-government related, ranked first in influencing green adoption. The finding means that in developing countries, legislation was not a significant factor as in several developed nations, probably because they had matured in green building activities and most have laid out policies and regulations on it (Chan *et al.,* 2019).

The other factor grouping that majorly influences Kenya's green adoption was education-related (F2). Therefore, lack of technical know-how and experience in green design and construction was a significant setback not only in the developing countries like Kenya and Rwanda (Minami, 2018), Ghana (Chan *et al*., 2019) and Nigeria (Bungwon *et al*., 2016) but in developed ones like the USA (Tarji *et al*., 2020) and South Africa (Hankinson & Breytenbach, 2012). The finding implied that while a critical factor in green adoption in a developing country like Kenya varied from that of a developed one like the USA, education remains a top influencer in both categories mentioned. Therefore, this study further investigated the extent to which content on green was integrated into the training of interior design, especially in higher education in Kenya. This area is discussed in detail in section 5.3 of this study.

5.4 Awareness of Green Concepts by Building Users

The building users are not only stakeholders but immediate consumers of interior spaces. This was because users interact directly with the building spaces; they are the right persons to provide feedback on experiences of these spaces. They can also act to set a demand for green buildings thus, act as a market force for it (Waniko, 2014).

5.4.1 Demographics of Building Users

Based on the importance of users' in the growth of green buildings, this study sought data on their demographics in order to understand dynamics on their awareness of green building, as shown in Table 4.18. The results imply that most building users were educated; yet, many needed to be made aware of the concept of green building and its benefits for their well-being. The conclusion was as arrived at since 81.8% of the users had a college education, yet, few (36.4%) were aware of the concept green building. The observation was unfortunate, for the assumption was that having gone through education, users might have interacted with the subject green/sustainability.

5.4.2 User Awareness Levels and Channels

The results coincided with those of Baird (2015) in Saudi Arabia, Wimala *et al.* (2016) in Indonesia, Kamalofe (2018) in Nigeria, and Samarasinghe (2012) in Sri Lanka, confirming low awareness among building users. It is noteworthy that the studies were from both developing and developed countries, meaning that awareness levels of building users were low regardless of their level of education or country's development. These findings are as shown in Table 4.19 that, although some users were aware of the concept of green, they needed to figure out its features. Since they only thought, their building to be green if it had concepts linked to solar energy, yet, even issues on water efficiency counts. Therefore, campaigns on awareness needed to be made on green concepts even among building users.

In addition, it was revealed that users appreciated the healthy interior environments offered by green working spaces and thus, demanded for more (Samarasinghe, 2012). Apart from these findings that illustrated the need to raise awareness of green concepts among building users, Internet as a channel was identified as the most appropriate for the exercise. User awareness was rated at 36.4%. These results contrasted with those of Kamalofe (2018), based in Nigeria and Jamison (2008) in Washington, USA, as their main channel of awareness was the television. Thus, raising awareness on green through sources such as Internet and television effectively reaches broad audiences. The discovery was why users would demand for green spaces hence, increasing the development of green buildings. Users act as market agents who demand for delivery of more green buildings delivery (Miosander *et al.,* 2010).

5.4.3 User Perceptions of Green Building

In determining users’ awareness of green in buildings, it was essential to establish their perceptions of the quality and conditions of their building interiors. They were ranked to enhance understanding of users’ thoughts on green building. Most prevalent perceptions were as indicated in findings shown in Table 4.20.

Findings showed that users mainly perceived green buildings as that which preserves natural resources and creates convenience. They were also perceived as comfortable working spaces that were expensive to construct. These perceptions of users' were categorized into the three aspects of sustainability. The first one described the environmental aspect. This meant that the second fitted in the social aspect of healthy spaces, and the third expressed the economic aspect. It means users' perceptions of green buildings were balanced and not skewed towards a specific sustainability standpoint. The finding was similar to that of Ibrahim (2019), implying that users' description of green was mostly that of 'an environmentally friendly concept'. This could therefore, be advantageous when enhancing users' attitude towards green buildings to ensure their acceptance and demand.

The finding was unlike that of Kamalofe (2018) where users' perceptions were skewed towards the environmental aspect. This meant that building users in Nigeria perceived green concept as a government 'project', which might jeopardize their acceptance of it in future. The users' perceptions that green buildings were expensive to construct were similar to those of Bond and Perrett (2012) in New Zealand and Kamalofe (2018) in Nigeria. Thus, it is important to note that the users correctly perceived green buildings.

5.4.4 User Perceptions of Interior Conditions

Lastly, in determining users' awareness of green in buildings, it was essential to establish their perceptions of the quality conditions of their building interiors. Various possible conditions of an interior space were enlisted. The users then selected which they thought best described their condition of their interiors at the workplace. The conditions were especially linked to IAQ. The results on their perceptions were as indicated in the Table 4.21. The findings showed that users were keen on qualities of their building conditions and could clearly identify and describe the uncomfortable conditions. Majorly, the users complained of lighting being dim, temperatures being hot or too cold within. These descriptions ascertained the existence of sick building syndrome, although they were unaware that adopting green would curb the condition.

These findings concurred with those of Langat (2015), where users perceived presence of significant benefits to working in greener spaces as opposed to conventional ones. The results are similar to those of Sergio *et al.* (2019) regarding the same topic although based in South Africa. Both results were similar because the research was carried out in the region of Africa through Langat (2015), and the current study focused on Nairobi City County.

Therefore, the hypothesis (HO_2) of the study stating that ‘there are no critical factors affecting interior designers’ adoption of green concept in Kenya’ was rejected.

5.5 Integration of Green Content in Kenya’s Interior Design Training

Integrating content on green building in the education/training of interior designers is influential in increasing its adoption. Training was identified as a key avenue to achieving the desired paradigm shift towards increasing green adoption (Akinshipe & Aigbavboa 2018; Malik *et al*., 2019; Were, 2015). Therefore, it was essential to ascertain the integration of green content and its delivery within the education/training of interior designers, as was also a recommendation given by several studies (Sangster, 2016; Olweny, 2016; Rania, 2015). Therefore, this study investigated the level at which green content was integrated into the training of interior design at the university undergraduate level in Kenya. Various pedagogical skills were interrogated on delivery of green content; with the nature of the courses examined too. The outcomes of this investigation were as discussed below.

5.5.1 Categories of Courses in Interior Design Training

First, in order to understand and appreciate the extent to which green content was integrated into the training of interior designers, the composition and structure/nature of the courses at the undergraduate level were examined. The results were as shown in Table 4.22. The findings showed that University Common Units (UCU) composed small (8%) portions of the training guides with no content on green integrated. Yet, all the Curriculum Heads from the Design curricula that were interviewed to corroborate findings thought it essential to integrate green content in design training. In addition, they thought that the integration of green content should begin at the university level that is, in UCU courses.

In addition, another perception was that green should be captured in the universities' mission statements. So that green is reflected, right from the start and, is then translated into objectives at every level of training (Obrecht *et al.*, 2022). Otherwise, it becomes a challenge to convince the instructors to integrate green in teaching at the departmental level. This is especially if green is not captured and thus, feature in the objectives right from the beginning. On examining the university's mission statements, it was discovered that 3 ($TG1_{KU}$, $TG3_{TUK}$ & $TG4_{UoN}$) made provision for green and indeed included it in their design courses at the department level. However, one sample ($TG2_{MU}$) lacked it in its mission statement yet, captured it well in its courses at the department level. Therefore, University Common Units should have integrated green even at a minimal level so that the designers begin to interact with the concept early enough, as Ramirez (2012) recommended.

Another finding showed that a good balance was achieved in regards to course categories in the composition of 2 (two) training guides -$TG2_{MU}$ and $TG3_{TUK}$. The $TG1_{KU}$ was imbalanced in that it had the bulk (84%) of its courses as electives, while $TG4_{UoN}$ was heavy (71%) on core units. Three courses in $TG1_{KU}$ integrated green in their content, but all fell under elective units. The inference made from the observation was that, the probability of Interior Designers encountering green during their training was low as the chances of electing those courses (with green content) were small. The situation was contrary to that of $TG2_{MU}$, which had (53%), $TG3_{TUK}$ 50% and $TG4_{UoN}$ 71% allocated to core units. This implies that interior designers had greater chances of encountering green during their training as this category was compulsory. These observations were confirmed and strengthen the discovery made by the second objective of this study where, out of 71.4% of interior designers aware of green buildings, only a few (28.5%) had encountered/interacted with it in school training set-up. The observations further ratify findings by Were (2015), indicating that most of those skilled in green design/building had not acquired the training within Kenya. Thus, the more need for an interior design training that focuses on green building interior.

Besides, findings showed that the level of green content integrated in Kenya's interior design training guides was minimal (6.3%) as depicted in Table 4.23, with $TG1_{KU}$ having the least (2%) integration. The training guides dedicated few courses in which green content was integrated. Yet, the Commission for University Education had made provision for it in the course genre and environment aspects. The low integration of green content concurs with the findings of Akinshipe and Aigbavboa (2018), Rasha (2012), Olweny (2013), Ambole (2011) and a report by the Association of African Universities (2012). These were studies from developed and developing nations, indicating low integration of green content in the training of building professionals. Most of the studies mentioned were based in Africa, and even though there was insignificant inclusion of green content, at least they provided a chance for design students to interact with the concept at school.

5.5.2 Course Mapping in Design Training Guides

Mapping of courses into categories as guided by the Commission for University Education provided details of the distribution. The main categories of courses that were highlighted include foundational courses, concept application and skill development, environmental related courses, technology and project-based courses. All the universities A, B, C and D were examined against the set criteria. This exercise on mapping was done in order to enhance the understanding of the topic. The results were as shown in Table 4.23. The discovery made was that some faculty taught green out of a personal initiative, especially where it was lacking in some design training programs. This observation was revealed by interview responses from Heads of Curriculum ($TG4_{UoN}$ and $TG3_{TUK}$). The findings agreed with those of Rasha (2012) carried out in Egypt, where faculty taught green out of personal initiative. Some design programmes, e.g. $TG1_{KU}$, emphasized specific genres (Application- 66%) at the expense of others (environment-2%) in their training composition. These results implied that a minimal consideration was given to integrating green/environmental content in interior design training. However, balancing allocation of genres within the training composition was necessary to uphold the See-Hear-Do instructional delivery method which most design programmes assume. If the application/do aspect is emphasized above others, it results in some degree of skewness in skill acquisition during training (Bill *et al*., 2011).

Evidence also showed that integrating green content in the training guides was done through two approaches; by either including topics on it or dedicating an entire course to it. The course integration is shown in Table 4.24. Most of the courses on green were integrated as topics while, the rest of the course, explored other topics unrelated to it. Some few courses had all topics entirely dedicated to green content. Rasha (2012) opined that dedicating an entire course (stand-alone) to green was advantageous since it allowed for in-depth interactions with the subject matter and afforded ample time for internalizing the concepts. Rasha advised that stand-alone courses on the green should be avoided since students will not give it the emphasis needed and would even view it as optional. Olweny (2013) endorses this advice and adds that linking information from stand-alone courses with studio/practical is usually challenging. Instead, topics on green should be integrated all throughout the training programme, with their intensity being the same from start to finish.

5.5.3 Spread of Green Courses at Training Levels

The spread of green courses across the training levels is crucial as intensity saturation and continuous indulgence in the design aspect ensures its future practice. The intensity of green courses was spread as indicated in Table 4.26. In this study, findings showed that many of the topics relating to green were concentrated in the final years (3 & 4) of study, instead of being spread throughout the training. This finding was in line with nature cycles where peak concentration is achieved gradually, and a decline in the same follows (Celadyn, 2020). The discovery should have informed the spread/distribution of green courses over the levels, with most of them to be taught at year three of training. In examining topics to identify those explicitly addressing green in relation to its variables, Table 4.25 displays the distribution.

The table reveals that priority was least given to training designers on provision for water efficiency and environmental pollution. Training on green was mainly emphasized or integrated in IAQ elements, followed by materials and technology. Although the topics on green were based on LEED-certification points, just as in Rania (2015), more is yet to be done. This is to ensure that equal priority is awarded to the three areas of green during design training. This is because the area of water efficiency needed to be more emphasized in all the levels of training. These findings resonate with those made from the first objective of this study where the adoption of green in Nairobi's commercial buildings was lowest in provision for water efficiency and highest in IAQ elements. The result implies that lack of green integration in the content of Kenya's interior design training translated into minimal adoption, even within buildings. These findings coincided with those of Khaemba and Mutsune (2013) but not those of Fawaz (2013), although both researches were based in Kenya. The difference in results was probably because of various methodologies applied in carrying out the different researches.

5.5.4 Modes of Green Content Delivery in Training

The delivery of green content in training is just as important as its adoption during design practice. The pedagogies used in the delivery were as shown in Table 4.27. Generally, the teaching modes used in delivering green content in the training guides were studio practical (56%), lecture method (40%), and a combination (4%) which blends lecture with studio. Findings revealed that studio practical was the dominant mode of delivering green content. A more explicit pedagogy was thus needed, that would connect and translate the knowledge gained from theory lessons to studio practicals. These findings are in tandem with those of Olweny (2016) and Assali (2017) which assert that, a combined mode was preferable, since it presented an ideal and superior platform. The method immediately combined theory on green concepts with its technical aspects in the studio, thus enabling students to understand the subject better.

When delivery modes were used separately, chances of students recalling information from previous theory classes to input in studio classes later diminished with the lapsing of time (Assali, 2017). The advantage of using lecture mode alone was that it allowed for ample time for delivering green content in-depth and time to reflect on it, unlike when combined. Applying studio practicals alone was advantageous in that it facilitated the implementation of the green content learned. This study, therefore, concluded that using a combined mode in the delivery of green content was preferable but, better still, was blending it with industry collaboration. Findings by Afcan (2013) points out that industry collaboration significantly increases students' awareness, understanding and integration of green in studio projects, thus achieving better results than ordinary teaching especially where students perform theoretical exercises.

In addition, co-teaching, as pointed out by Olweny (2013), enriches the experience during training on green in design. Co-teaching enables diverse views on the same issue to be realised thus, heightening understanding of green issues by giving it a broader and a lasting base. Although co-teaching is advantageous, Heads of Curricula in Design felt it was inappropriate since their departments were understaffed, and teaching on green was only attempted with postgraduate only classes when possible. Another challenge was that many of the instructors were not conversant with green design while some were not convinced of its benefits. Likewise it Olweny's (2013) observation too.

Also, Sangster (2016) advised that students should be given significant control over green design programmes and allowed to participate in deciding what goes into them. Concerning this, Heads of the curriculum in the Design departments confirmed that none of their students participated in curriculum reviews and need to do so. Only $TG2_{MU}$ factored in suggestions from students' internship experience, alumnae and possibly comments by internship supervisors while $TG4_{UoN}$ allowed alumnae to provide industry insight in the stakeholders meeting for curriculum review.

Lastly, the study sought views from Heads of Design Curriculum. Although outside the sample groups investigated by this study, their input was integral in corroborating and elaborating on facts identified in their respective training guides. Collectively, the four heads revealed that although the concept of green was relevant and a trend in the 21st century, not much priority was accorded to its integration in the curricula during reviews. The green concept did not even feature as a concern in their latest review meetings since respective faculty needed to gain expertise in green design and therefore could not teach. In addition, faculty/instructors needed a method of integrating green content into the training with minimal effort, time and resources. Their training programmes were already saturated and therefore, allowed no room for additions. The observation was a challenge similarly identified by Rasha (2012) in a study carried out in Egypt. This concern by the Heads of curricula formed the foundation for a proposal made and fulfilled by this study. The proposal was that this study avails a model framework that would aid integration of green content into interior design training in Kenya.

Generally, the findings of this study showed insignificant (6.3%) integration of green content in the training of interior design at the undergraduate level in Kenyan universities. The findings agree with those of Akinshipe and Aigbavboa (2018), based in South Africa where building and construction management curricula also incorporated content on the green at a shallow and vague level. Therefore, the hypothesis ($H0_3$) stating that 'there was no significant level of green content in Kenya's interior design training for undergraduate', was accepted by this study.

5.6 Summary of the Chapter

This study investigated the extent to which green concept was adopted within Kenya's building interiors. The findings showed minimal and insignificant adoption of green concepts within interiors of commercial buildings as denoted by a Mean Rating of 2.84. The awareness levels of green concepts by Interior Designers were high at 71.4% while, that of Building Users was low at 36.4%. There were critical factors influencing green adoption among interior designers and they included absence of legislation/building code on green (F9) and, lack of technical expertise and experience in green design (F2). In addition, there was insignificant (6.3%) adoption of green content in interior design training at the universities in Kenya (Table 4.23). Therefore, there was need for a model-framework to aid integration of green content into the training of interior design at undergraduate in Kenya.

CHAPTER 6: SUMMARY, CONCLUSIONS AND RECOMMMMENDATIONS

6.1 Introduction

This chapter presents a summary of the study's key findings and therefore, conclusions to the whole study. The section also gives implications and recommendations emanating from the study's findings and areas of further research.

6.2 Summary of the Key Findings

Three objectives guided this study. They were determining the extent to which green concept was adopted in interiors of commercial buildings in Nairobi City County; critical factors influencing the adoption of green concepts by interior designers; and the level of green content integration into the training guides for interior design at the undergraduate level in Kenya. The following are the key highlights of the main findings for each objective.

6.2.1 Extent of Green Concept Adoption in Interiors of Commercial Buildings

Main findings were based on observations to ascertain the extent of green concepts adopted into the interiors of commercial buildings in Nairobi City County. The response rate was 100% as per the 17 buildings originally sampled. Fourteen (14) were accessed, while three had sample replacement since they were inaccessible for security reasons. Thus, quality results were guaranteed due to the high response rate considered good for credibility (Creswell, 2014). The extent to which green was adopted in the interiors of sampled commercials buildings weighted at an MR value of 2.84. The value implied that the level of green adopted was low and below average according to a 5-point Likert scale that was used for the study. The result was obtained by averaging the MR values of all the three green variables: Interior Air Quality (IAQ elements, water efficiency, materials and technology.

The highest adoption of green concepts was in Materials and technology (MR 2.86) followed by IAQ elements (MR 2.83) and lastly water efficiency (MR 2.33). The highest adoption was especially in the attributes: ease of maintenance, provision for energy efficiency and in usage monitoring respectively while, the least adoption was in acoustics. The amount of green adopted in all the variables was referred to as average or pseudo-green. The extent to which green was adopted in the provision for water efficiency recorded at MR value of 2.33. The variable ranked last in its level of green concept adoption when compared to the other three variables investigated. The HCB category of buildings totally lacked (1.01) green in provision for water efficiency. The variable green materials and technology had the highest MR value (2.86) of green adoption.

On average, the amount of green adopted was low since it weighted an MR value of 2.84. The observation on MR value fell below 3, which in accordance with the Likert scale denoted average/pseudo-green (Table 4.4). Therefore, the study concluded that the level of green adoption in Nairobi City County commercial buildings was insignificant.

6.2.2 Critical Factors Influencing Adoption of Green Concepts in Kenya

The study's second objective sought to identify critical factors influencing interior designers' adoption of green concepts. Findings showed that designers' demographics (except gender), did not affect their trends or frequency of adopting green concepts. There was no significant difference in how interior designers working for private and public firms adopted green or the importance they attached to it. The conclusion, therefore, was that the difference in employers did not affect the designer's perception of green concept. The awareness levels on green design among interior designers was high (71.4%) and a positive attitude existed among them towards its adoption it.

The main channel of awareness on matters green building among interior designers was the Internet, followed by personal research and conferences. The designers' experience with green design was low, with 58.9% devoid of it. Thus, they needed to gain more confidence in order to practice green design. In addition, they lacked industry support for those designers who desired to adopt green concepts in their projects (Table 4.12). Lastly, it was identified that the two major factors influencing green uptake among designers in Kenya were the absence of legislation/building code on green (F9-Socio-Government) and lack of technical expertise and experience in green design and construction (F2-Education). Therefore, there existed critical factors influencing the adoption of green concepts among interior designers in Kenya. Training interior designers on green and creating awareness among building stakeholders was recommended to enable them gain confidence to practice it (Table 4.18). School training and experience in green designing were rare in Kenya's education.

The majority of the building users needed to be made aware of the concept of green buildings, even though 81.8% had a college education. The awareness of green buildings mainly came through internet sources. In addition, green was mostly perceived to be those buildings that preserved natural resources and created convenient and comfortable working interiors though they were expensive to construct. The study recommended that much awareness be raised among users as stakeholders in order to enable them to demand for more green spaces and hence, increase adoption.

6.2.3 Level of Green Content Integrated In Interior Design Training Guides

In determining levels of green content integrated in interior design training guides, topics that directly addressed green were identified. Four training guides used to direct interior design training in Kenya, were sampled for the study. The documents were successfully investigated and so achieving a response rate of 100%. Then the nature and structure of the courses were examined alongside the pedagogical methods involved in the delivery of green content (Table 4.22 - 4.26). The key findings revealed that none of the University Common Units courses in all the training guides had integrated green in their content. Yet, several of the institution's mission statements had suggestions of green or a reflection of it. The bulk of design courses with green content belonged to elective units so the probability of being missed during selection was high, thus, lowering trainees' chances of encountering green along the training.

Generally, the level of green content integrated in Kenya's design training guides was minimal (6.3%) and therefore, insignificant (Table 4.23). The training guides integrated green content by either including topics on it or dedicating an entire course to it. Those topics that addressed green in the provision for water efficiency were few and, thus, not given much priority. The dominant pedagogy used in delivering green content in a class set-up was studio practical (56%), while the least used was a combination (4%) that blended lecture with the studio (Table 4.27). Although green was relevant and trendy in the 21st century, the least priority was awarded to its integration into curricula, let alone feature in review discussions. The observation was because of lack of an efficient method of integrating green content into training guides with minimal effort, time, resources, and lack of faculty knowledgeable/trained to deliver on green concepts. Thus, owing to lack of an efficient method of integrating green content into the training, this study proposed a model framework that could aid with the exercise.

6.3 Conclusions

This study aimed to establish the extent to which sustainable-green concept was adopted within Kenya's commercial buildings. The review of related literature showed a great need to increase the adoption of green concepts in Kenya's building industry, of which the interior design industry was part. Consequently, this study set out to answer the four research questions as outlined in Chapter One, section 1.4.

In order to answer the research questions, this inquiry used a Mixed-method approach as its research design, with details on it elaborated in sections in Chapters 3 and 4 of this thesis. The conclusion to the first objective was that adoption of green concepts in Nairobi's City County commercial buildings was below average, thus insignificant. The observation was confirmed after obtaining an MR value of 2.84 on a Likert scale of 1-5. According to this study's scale, the value was interpreted as having 'little green' that was below average. According to the study, average meant having an MR value of 3 (pseudo-green) and above. This study, therefore, concluded that there existed insignificant levels of green concepts in Nairobi's commercial buildings. This conclusion supports previous studies that observed low adoption of green concepts in buildings regionally and worldwide.

The findings provide a platform and raise the need for a more inclusive discussion among stakeholders and policymakers on green building, especially in order to increase adoption. Besides, the findings highlighted the need to seek and implement campaigns and other strategies to increase adoption. While, closely followed by incentives, motivation and reinforcement measures.

Moreover, findings indicated use of green materials and technology in buildings as having the highest green adoption while, the least was in the provision for water efficiency. The results highlight areas of potential business opportunities in research, production and marketing of related green concepts. For instance, acoustics was much ignored and during the 2020 COVID-19 pandemic, until a work-at-home approach was embraced by several sectors. Only then did lack of acoustics pose as a challenge. Since, dynamics such as of noise and privacy played out in the residential buildings. Thus, affecting job productivity because several dwellings were ill prepared in terms of acoustics. Likewise, provision for water efficiency offers entrepreneur opportunities, especially the sale of reused/recycled water for irrigation or other purposes. There was also a need to integrate gender and youth aspects in campaigns to increase the adoption of green in buildings because both had an imprint on the whole aspect of green or the environment.

Critical factors influencing green adoption by interior designers in Kenya included absence of legislation/building code on green (F9-Socio-Government) and lack of technical expertise and experience in green construction (F2-Education). The findings demonstrated that the government of Kenya holds the key to increasing green adoption in buildings. There is need for government legislation on green buildings if there is to be growth in the aspect. Legislation is then closely followed by enforcement to ensure the implementation of green-related laws in the buildings. Those charged with reinforcement, just as well as implementation of the concept, should be equipped with knowledge on green building. This will enable them know that which to target during law enforcement; otherwise, the whole exercise may be unproductive.

The level of green content in Kenya's interior design training guides was minimal (6.3%) and insignificant. Therefore, raising a need for integrating green into the training of interior designers at undergraduate level. Owing to this finding, the study proposed a model-framework that would guide integration of green into existing design guides for undergraduate training in Kenya. This was a position and recommendation also firmly held by past studies, such as Obrecht *et al.* (2022), Olweny (2016), Were (2015), and Rania (2015). The Heads of Art and Design Curricula representing various Universities on the need for a guide to aid integration of green content in undergraduate design training also put the need forward.

The findings have demonstrated a positive way forward for adotping green buildings in

Kenya. They also provided local information thus, a blueprint to inform future interdisciplinary research in design and environment, sales and marketing strategies by investors, policymakers and educators. In conclusion, this study presents a fortified case for green-retrofitting exercises, not only in Nairobi County commercial buildings but also in Kenya as a whole.

6.4 Recommendations

The current study was intended to provide an understanding on the extent of sustainable/green building practices within commercial buildings in Kenya. Based on the findings, this section puts forward the study's first recommendation and main contribution, a model framework for green integration in interior design training. This was prompted by existence of a gap that required a model framework to aid integration of green content in interior design training in tertiary institutions.

Reviewed literature had earlier alluded to this gap as low levels of green integration in majority of the building design training in Africa. Later, samegap was confirmed by the findings of this study in that, it was one of the critical factors influencing interior designers' adoption of green concepts. In addition, reviewed literature revealed that available models for guiding green integration were mainly from engineering disciplines and not specific to interior design. The few models that were specific to interior design needed to be improved since they presented processes and methods to achieve sustainability but, failed to avail a holistic, educational approach to integrating green in design training.

Another major concern by Heads of Curriculum in the Design Departments was the need for a cheap and convenient method (in terms of resources) of integrating green into the already loaded training guides. However, the HoC expressed that if a model framework would be availed, it would motivate them to integrate green into the content of existing design training guides. Owing to the concerns stated above, this study proposed a model framework to aid integration of green content in interior design training. Figure 6.1 illustrates the recommended model.

6.4.1 Framework to Aid Integration of Green Content in Interior Design Training

The study's first recommendation and the main contribution to knowledge is a new framework for integrating green into interior design training. The model illustrates particular dimensions of green necessary for equipping interior designers with knowledge and skills to create green designs for building interiors. The proposed model was as illustrated in Figure 6.1 and was based on the findings of this study. The model was discussed in the study and proposed for adaption to guide the integration of green in interior design training.

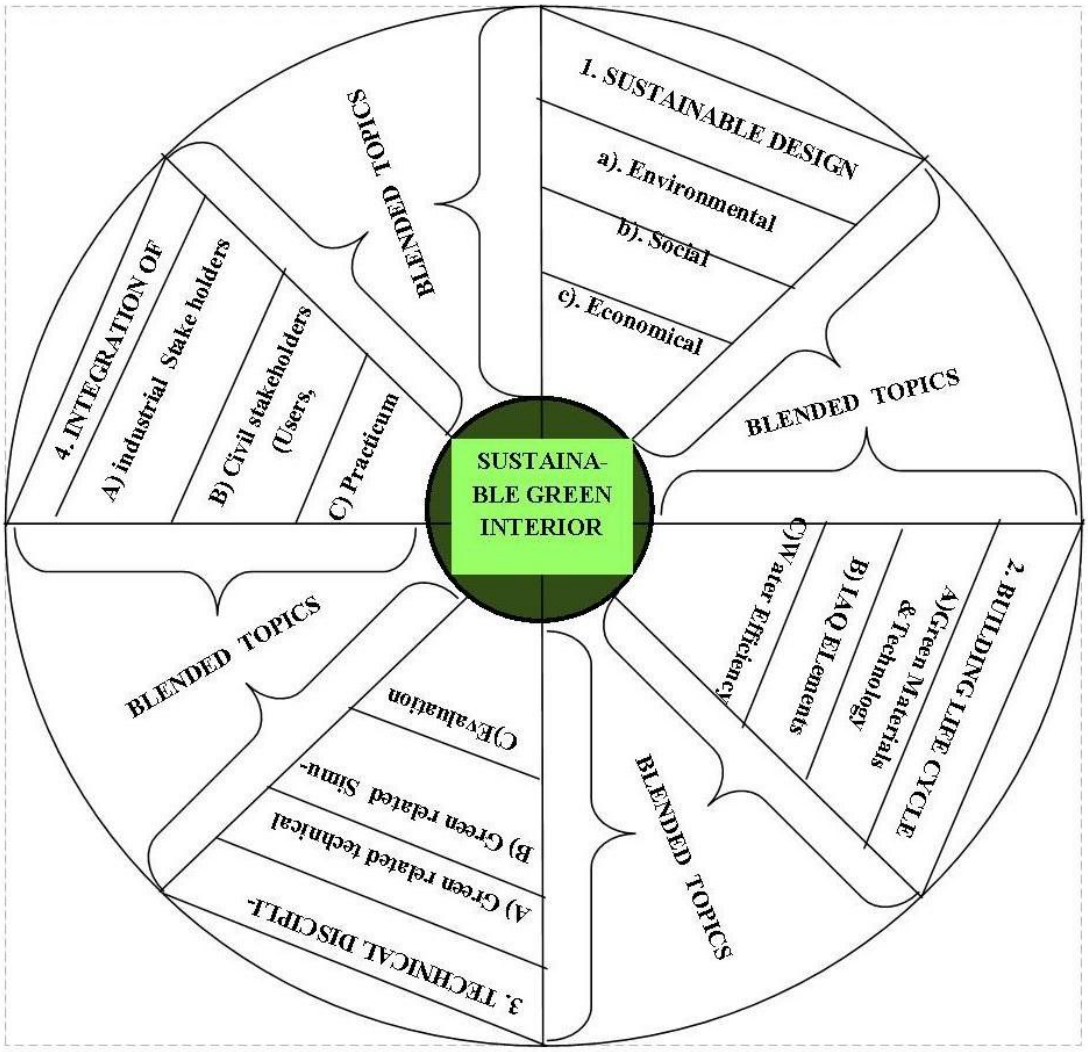


Figure 6.1: Proposed Model to aid Green Integration in Interior Design Training

Source: Researcher's Design (2024)

The description of the proposed model is as follows: it has five broad dimensions divided into levels. This was informed by the fact that the study identified three (3) variables that describes the concept ‘green’. The variables were described with less than five (5) attributes, each further broken into several indicators. The idea was also affirmed by Cowan (2001) advice that, in order to create an easy-to-understand framework, 3-5 dimensions/parts of a whole should be upheld. Similarly, to a pie, the concept of sustainable-green building/design comprises many aspects that designers must understand well. Just as it was discovered that many factors influence the rate of green adoption by interior designers, understanding their different dimensions in training does affect the level of confidence developed for future adoption.

These dimensions are embedded with disciplinary requirements/course units on green, enough for each year of training (1-4). For instance, in the first year, the main topic is sustainable green design, divided into three sub-topics (environmental, social, and economic). This approach therefore, enables integration of green with a reduced load that takes into account the concerns of Heads of Design curricula on already overloaded programmes. The dimensions should not be taught as stand-alone courses but, blended with the other courses. This is because the students may not accord them the necessary importance when taught as stand-alones (Perpignan *et al.*, 2019; Olweny, 2013). The blending ensures that the concept green is seamlessly integrated with other courses and adopted by interior design students as a whole. In this manner, they will effortlessly adopt green into future projects with lots of confidence. Confidence was an issue that the study found as a setback factor influencing adoption of green by interior designers in Kenya.

The model framework has 5 (five) dimensions with levels embedded in each of them. The 5-dimensions are the main topics to be taught. The topics were gleaned from literature review and field findings of our study. The dimensions include canonical sustainable design philosophy, under which issues on the environment, social and economic aspects of green are to be taught and then blended with studio projects (Pezesheki *et al.*, 2012; Perpignan *et al*., 2019; Berceric-Gerber *et al.,* 2014). Buildings as products should have a topic on life cycle taught with each phase examined in entirety. This would be in observance of McDonough and Braungart's 2002 philosophy of 'Cradle to Grave’ that is in line with findings of Celadyn (2017). Our study and

Celadyn's findings emphasized that the different phases in a building's cycle should be elaborated on.

Major discussions should revolve around green in materials and technology, water efficiency and IAQ elements. Such an order was preferable since the neglected elements would now be given priority during training and hence, adoption. Provision for water efficiency need to be stressed more at this point. This is because it received insignificant attention in both the buildings and in design training guides. Each of the phases of a building's lifecycle that include siting, designing, construction, occupation, re-modelling and demolition should be discussed in depth during teaching.

During the acquisition of 'Technical, disciplinary' skills, teaching should be in a way that is specific to green design. For instance, during studio projects or industrial internships, the skills being imparted should always integrate aspects of green even in the technology used (Berceric-Gerber *et al.*, 2014).

Evaluation is another crucial topic that should be taught during green design training. The topic functions to gauge the progress of acquisition and practice of skills in green design. This is in congruence with our study's finding, where apparently few (39%) interior designers had experience/confidence and certification on green standards. Likewise, Wilkison *et al.* (2006) and Winship (2007) opined that evaluation is essential and provides a platform for teaching different tools in building simulation and green rating used in gauging building performance.

Another topic to be explored is integrating civil (for example, policy makers) and industrial (for example manufacturers) stakeholders in the training of interior designers. Stakeholders should be introduced early enough in the training so that designers learn to interact with issues revolving around them and thus benefit from the relationship. This experience be enabled before the students go out for industrial internships, so that they can gradually internalise and adjust to aspects surrounding their relationship with stakeholders (Celadyn, 2019; DfS, 2009; ECOS, 2019).

Lastly, the interior designers' acquisition of communication and cooperative skills should be prioritised. Therefore, the desired skills be deliberately inculcated during training rather than automatically being thought of as gained during an internship. This has been the norm in most design programmes and so, needs to be adjusted (Vallet *et al.*, 2014).

6.4.2 Description of the Proposed Model

The model framework is presented as circular and divided into pies labelled: 1, 2, 3, and 4. The pies form the major dimensions or topics under which green is integrated into interior design programmes. The dimensions are further divided into 3(three) levels labelled: A, B & C to identify the sub-topics that would be explored in an academic year. A circle shape was suitable since it provided an arena within which elements and methods find a holistic representation and interaction. Just like the continuous loop of 'cradle to cradle' philosophy by McDonough and Braungart's (2002). The topical elements can be blended to achieve creative yet, successful design training on green.

The framework can be applied by taking one of the dimensions for example 1, 2, 3 or 4, as the topic to be taught for one academic year. For instance, dimension 1(Sustainable Design Philosophy) with all its three levels/subtopics (Environmental, Social and Economic aspects) will be embedded in design courses in the first year of training. The other method of application would be to integrate the same levels into courses of the respective years of training. For instance, all sub-topics/levels labelled A are to be embedded in the first year of training courses. The dimensions/major topics can also be blended uniquely to come up with topic compositions for projects/research papers to enhance creativity and diversity even with the green concept. The approach to teaching topics with green content should be that of co-tutoring and collaboration. Each subtopic/level is to be embedded in different courses offered for the identified academic year. This is in order to achieve that aspect of variety in terms of content delivery, as it concurs with Celadyn (2017).

Some topics can be delivered as theory, while others could be worked into a blended mode and delivered as both theory and studio (Olweny, 2013). The tutor will be fully in-charge of selecting topics and teaching while; students can choose their creative projects and take charge of research (Celadyn, 2017). The topics will be spread over the four-year tier of interior design training. That will include internship so as gain hands on experience in working with green concepts (Rasha (2012). The ratio of topic spread responded to findings of our study's objective 2. Where, the factors influencing adoption of green were summarised into four groupings. The groupings were synchronised to form topical issues/dimensions, under them were related issues that were addressed as t sub-topic/levels in the model. For instance, the grouping referred to as designer factors informed the topic on 'Integration of Stakeholders'. The topic of 'green concepts was synchronised with that of 'Building life Cycle', etcetera. The embedding of topics is simple and can be used immediately without overhauling the existing training guides. The model addresses the concerns raised by the Heads of Curriculum for a solution/model that considers the limited resources and the overloaded programmes facing interior design training.

Second recommendation is to increase the adoption of green concepts by retrofitting the existing buildings to achieve a full green status. Thus, the buildings would offer a greater efficiency/performance. Retrofitting exercises could be tailored along the three variables (IAQ elements, materials and water efficiency) and done in phases in order to be achievable and affordable.

The third recommendation is to increase green adoption among interior designers and other stakeholders. The increase will be through creating support for green using incentives and awareness campaigns among stakeholders, including building users. Building users will be educated on the benefits of green so that they raise demand for such spaces to increase adoption. Green content should also be integrated into the training of interior designers at the undergraduate level. This would ensure that they get knowledge and experience thus, acquire confidence in executing green designs to increase future adoption thus, healthier environments. This is because the need for confidence in green adoption was cited as one of the factors influencing its practice.

The last recommendation was to advise the government to create clear policies and guidelines on green building. The Kenya's National Construction Authority need to create necessary regulations on green building concepts since, the absence of government regulation was identified as a significant factor influencing the growth of green buildings.

6.4.3 Areas of Further Research

Based on the findings of our study, which could be used to inform future studies, other related areas that require further research are as follows:

First, this study focused on the green (environmental) design aspect of sustainability in commercial buildings. New studies could interrogate green in residential buildings. That are in a different setting which considers the geographic region, social and economic aspects, this could provide diverse yet beneficial information. Other studies could also investigate sustainable building in terms of its socio-cultural or economic dynamics instead of the environmental (green) one that was examined by this research. This is because the two were outside the scope of this study however are among the three aspects that constitute sustainability.

The present research investigated the integration of green content in undergraduate interior design training guides. A new study could examine the integration of green by interior design students in their studio projects during their summative years of university training.

An exploration of the subject gender and green building would yield valuable results. Further, identifying and engaging in entrepreneurial opportunities related to concepts in green building, be it with women/youth, would be advantageous.

Lastly, another possible area of further research would be to examine green in terms of national policies and laws in Kenya. This is in addition to identifying incentives that would motivate adoption of green among building stakeholders.

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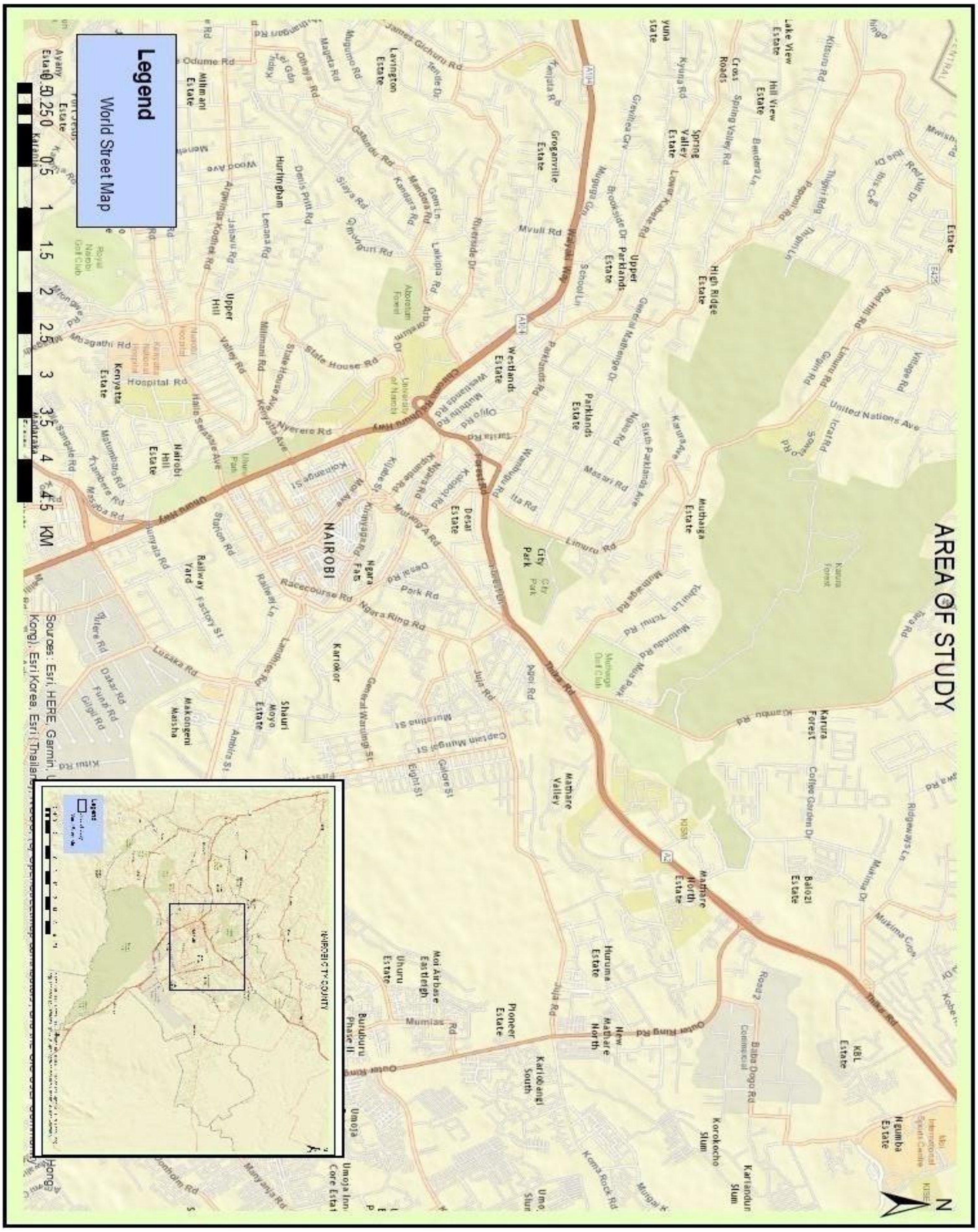
APPENDICES

Appendix A: Map for Nairobi City County with Areas under Study



Sources: Esri, Here, Garmin, USGS, Intermap, Increment P, NRCan, Esri Japan

Appendix B: A Green -Check List for Determining Green Levels

BUILDING CODE:____________________NAME:_________LOCATION:_______________DATE:

VARIABLE	Green Design Strategies	1. Lack of green	2. Little Green	3. Pseudo-average green	4. Large amount of green	5.Full green
IAQ ELEMENTS:- a)Acoustics:	1.Sound insulation materials.					
	2.Openings of high sound conduction.					
	3.Noise reduction from water pipes.					
	4.Double skin facade					
b) Lighting:	5.Day lighting Openings in the design.					
	6. Exterior views.					
	7. Light colored Interiors, light from windows/skylights.					
	8. Use of LED, HID lights.					
	9. Low reflectance surface materials.					
	10. Lighting control systems (dimmers, wall controls, sensors, time out)					
	11. Renewable energies(solar, wind, biogas)					
	12.Energy monitoring systems					
c) Thermal Comfort:	13.Passive technologies (Shading, reflection, absorption devices).					
	14. Energy saving windows and door treatments, louvres.					
d) Ventilation & Humidity Control:	15. Insulation and green interior walls.					
	16. Mechanical methods of indoor ventilation.					
	17.Cross ventilation					

	18.Purification Filters barring outdoor pollutants					
	19.Preventing interior pollution migration.					
	20. Low pollutant emitting materials.					
	21. Cooling tower techniques					
	22.Air quality monitoring systems.					

	23. Moisture removal					
	24. Provision for smoking area.					
e)Technical **i) Functionality** **ii)Universal design** **iii)Adaptation** **iv)Ergonomics**	25 Allows for multiple functions					
	26. Provision for universal design					
	27. Allows for Future adaptive needs.					
	28. Good ergonomics					
2.WATER EFFICIENCY **i) Reduce** **ii) Recycle** **iii) Alternative source**	29.Efficient appliances, fixtures and fittings (sensor- tap					
	30. Green plumbing.					
	31 Leakage monitoring devices.					
	32. Sewage waste volume reduction(bi- flushing, water less toilets)					
	33. Recycling/re- use of wastewater (bio-digesters).					
	34. Usage monitoring (meters)					
	35. Rain-water harvest & storage.					
3.MATERIALS & TECH. i. **Ease**	36. Floor -Durable materials and finishes.					
	37. Easy to clean and maintain					
	38. Walling- Durable materials, & finishes					
ii.Environmental friendly materials	39. Easy to clean and maintain					
	40. Materials salvaged from waste (re-use).					
iii. Buildability	41. Recyclable materials.					
	42. Localized materials.					
	43. Natural materials (live).					
	44. Low Emitting materials					

	45. Advance material use plan					
	46. Use standardized materials &prd					
	47. Use of industrial modules (off-site prod.)					
	48. Considerations of life cycle cost of different component service lives.					
	49.Allows retrofits/ renovation ideas					
	50. Technology use in design phase.					

Source: Yan et.al. (2017) & with revisions informed by LEED-certification points 2017 and Green Mark- Kenya

Appendix C: Questionnaire for Interior Designers

Dear Interior Designer, Code: ___________________

Hallo! I am an Interior Designer from Kenyatta University carrying out a study on Sustainable-Green Interior Design in Kenya. You have been selected to provide important information on the subject. Confidentiality is assured. I appreciate your participation. Kindly take a few minutes and answer the following questions.

Yours

Rose Oduho

Instructions: Please indicate your answer by marking in the box or writing on the lines provided.

SECTION A DEMOGRAPHICS

a) Your Gender: 1. Male ☐ 2. Female ☐

b) Your age in years: 23-30 ☐ 31-37 ☐ 38-42 ☐ Above 43 ☐

c) Years of interior design practice ☐

d) Level of interior design training: 1.Certificate ☐ 2. Diploma ☐ 3.Bachelors ☐ 4. Masters 5. PhD degree ☐

e) Ownership of Interior Design Firm 1. Public ☐ 2.Private ☐

i) Size of interior Design Firm: 1.Large (100+ employee 2.Medium ☐ (50 99employees) ☐ 3. Small (1-49 employees) ☐ 4. Independent design consultant 5. Owner/Partner at a firm ☐

f) Which area of Interior Design do you specialize in? (**Please mark all that applies)**:

1. Residential ☐
2. Hospitality ☐
3. Corporate ☐
4. Mixed-Use ☐
5. Institutional ☐

Others (please identify) _____

g) Do you hold any *green* professional certifications? (**Mark all that apply**):

1) Kenya Green Building Certification (KGBC) ☐
2) Leadership in Energy and Environmental Design (LEED) ☐
3) Others (please identify) ____
4) None ☐

h) Do you plan to pursue any *green* certification in the future? 1. Yes ☐ 2. No ☐

B. SOCIAL FACTORS (MEANINGS)

a) i. Have you heard of the term ***green interior*** design?

1. Not familiar at all ☐ 2. Some- what familiar ☐ 3. Very familiar ☐

ii) If your answer is **2** or **3** How did you know about '*green'* interiors? 1. Television ☐

2. Internet/Website ☐ 3.Friend/Family ☐ 4. School ☐ 5. Conference ☐

6. Seminar/Workshop ☐ 7. Any other ________________

b) In your opinion what are *green* interiors?

Official: 1. ☐ 2. ☐ 3. ☐

c) Mark on the table below, green strategies you have applied in interior design projects.

d) Use numbers to represent your frequency of use.

e) Which area of Interior Design do you specialize in? (**Please mark all that applies)**:

1. Residential ☐

2. Hospitality ☐

3. Corporate ☐

4. Mixed-Use ☐

5. Institutional ☐

Others (please identify) ________________________________

f) Do you hold any *green* professional certifications? (**Mark all that apply**):

1) Kenya Green Building Certification (KGBC) ☐
2) Leadership in Energy and Environmental Design (LEED) ☐
3) Others (please identify) ________________________________
4) None ☐

g) Do you plan to pursue any *green* certification in the future? 1. Yes ☐ 2. No ☐

B. SOCIAL FACTORS (MEANINGS)

1. i. Have you heard of the term ***green interior*** design?

1. Not familiar at all ☐ 2. Some-what familiar ☐ 3. Very familiar ☐

i) If your answer is **2** or **3.** How did you know about '*green'* interiors? 1. Television ☐

2. Internet/Website ☐ 3. Friend/Family ☐ 4. School ☐ 5. Conference ☐

6. Seminar/Workshop ☐ 7. Any other ______________

2. In your opinion what are *green* interiors?

Official: 1.☐ 2.☐ 3. ☐

3. Mark on the table below, green concepts you have applied in interior design projects.

Use numbers to represent your frequency of use.

Green Concepts	**Attribute**	**1 none**	**2 least**	**3 fair**	**4 moderate**	**5 most**
1.Indoor Air Quality	1.Use of day lighting and solar devices					
	2.Use of renewable energy e.g. solar					
a) Lighting	3. Use of control systems					
b) Thermal Comfort and ventilation	4. Design to enable lots of indoor Ventilation.					
	5.. Using shading, reflection, absorption devices, door/window treatments.					
	6. Insulation, green interior walls.					
	7. Low pollutant materials,					
	8. Provide for smoking area.					
c) Acoustics	uses sound insulation materials Noise reduction					
2.**Water Efficiency**	1.Efficient appliances, fixtures					
	2. Green plumbing.					
	3. Leakage monitoring devices.					
	4. Sewage volume reduction (bi-flushing, water less toilets).					
	5. Waste water recycle, consumption meters)					
	6. Enable rain harvesting & use.					
3. Materials and technology.	1. Durable materials/finishes.					
	2. Materials salvaged/ waste re-use.					
	3. Recyclable materials.					
	4. Localized materials.					
	5. Natural materials (live).					
	6. Low Emitting materials					
	7. having a material use plan					
	8.Specify standardized materials/ products.					
	9. Specify industrial modules/off-site products.					
	10. Considering material's durability					
	11. Allowing retrofits & renovation					
	12. Use of green technologies when designing.					
4. Others (Specify)						

e) Applying *green* concepts in your designs would be for which reason: 1. I like it ☐

2. I am comfortable handling it ☐ 3. I feel indebted to the environment and society

f) Mark the number representing level of importance you would attach to green in Interior design. 1 Less ☐ 2. Fair ☐ 3.Moderate ☐ 4. Most ☐

g) During your training in interior design, did you receive any education/experience on using green design strategies? 1. Yes ☐ 2. No ☐

h) How experienced are you in applying sustainable green design strategies?

1. Not experienced at all ☐ 2. Less ☐ 3. Fairly ☐ 4. Experiences ☐ 5. High ☐

i) How much support if any, do you receive/ would receive in using green concepts in designing? (i.e. From employers/supervisors, colleagues/coworkers and consultants).

1. None ☐ 2. Little ☐ 3. Fair ☐ 4. Moderate ☐ 5. A Lot ☐

j) Please suggest the areas of green design that should be emphasized when training interior designers?

1. Indoor air quality elements (lighting, acoustics etc.) ☐

2. Water efficiency & sanitation ☐ 3. Materials (construction and finishes) ☐

k) Mark those factors that you consider to affect Interior designers' use of green design strategies.

Code	Critical Factors	5(Very)	4(Critical)	3(Moderate)	2(less)	1(Not)
F1	Cost for green options considered expensive					
F2	Lack of technical know-how and experience in green design and construction.					
F3	Lack of knowledge on non-sustainable practices					
F4	Lack of knowledge on environmental effects of non-sustainable practices among interior designers.					
F5	Lack of education & training in green design & construction amongst interior designers.					
F6	Green interior design products and technologies not available in the area.					
F7	Attitude of Interior Designers (general disregard of green)					

F8	Interior designers' preferenceto traditional design practices					
F9	Absence/Inadequate legislation, building code ongreen interior design.					
F10	Absence of an incentive/ award scheme for interior designers who practice green design.					
F11	Clients' unawareness of green strategies for interior projects.					
F12	Clients' unwillingness to utilize green strategies in their projects.					
F13	Overall Client Control on the design.					
F14	Absence of a local contextualized Rating tool to measure Sustainability of building interiors					
F16	Insignificant contribution of Kenya to the global carbon					
F17	High cost of green energy sources (i.e. solar, biomass, wind turbines)					

Appendix D: An Interview Guide for Building Users

Building Code________________ **Date____________**

To whom it may concern. Dear Respondent,

I am a Postgraduate student in the Department of Fine Art and Design at Kenyatta University. I am conducting a research entitled **"Sustainable-Green Interiors in Commercial Buildings of Nairobi City County'.** You have been selected to participate in this study. Kindly respond to the following interview questions. The information obtained is exclusively for academic purposes, intended to shed light on sustainable-green building practice in Kenya.

Yours faithfully, Rose Oduho.

Demographics:

Gender: 1.Male ☐ 2.Female ☐

Age: 18-24 ☐ 25-34 ☐ 35-44 ☐ 45-55 ☐ Above 56 ☐

Level of Education: 1. Primary school ☐ 2. Secondary school ☐

3. College & above ☐

Approximate time in hours spent in the building per day:

1. In your opinion describe the idea of ' green' building?

Official: 1. ☐ 2. ☐ 3. ☐

2. (i) Do you think your work place building is `green'

1. Yes ☐ 2.No ☐

(ii) Do you think your work place: building is ' green?

Yes ☐ No ☐

(iii) If your answer is yes for 2 (ii), explain why you think so.

'Green' **Building concepts (ideas)**	**5: Much more; 4: Somewhat more; 3: About the same; 2: Somewhat less; 1: Much less 0: Not at all** (Mark inside the cell that best describes your response)					
Lowers environmental hazards	5	4	3	2	1	0
Preserves natural resources e.g. trees etc.						
Provides healthy building indoors.						
Construction cost is expensive						
Built with recycled material						
Reduces building maintenance costs.						
Creates convenient and comfortable interiors for working.(reduced noise etc)						
Constructed using high quality and durable materials						
Easy to maintain						
Its energy and water efficient						

7. Perceptions of your building interior conditions

Interior Conditions	**Mark against condition affecting your interior**
a. Temperature too warm	
b. Temperature too cold	
c. Lighting too dim	
d. Lighting too bright/glaring	
e. Insufficient ventilation	
f. Dusty air	
g. Too little air movement	
h. Air too dry	
i. Air too humid	
j. Distracting ambient noises	
k. Unpleasant odour in the air	
l. Stale air	
a. Temperature too warm	

THANK YOU.

Appendix E: Analysis Chart for Undergraduate Course Guides

ITEM CODE	UNIVERSITY CIRRICULA	LEVEL OF STUDY	COURSE TITLE	DESCRIPTION	NATURE OF COURSE			%
					L	ST	E	
1.	University of Nairobi (UoN)	Yr 1.						
		Yr 2.						
		Yr 3.						
		Yr 4.						
2.	Kenyatta University (K.U.)	Yr 1.						
		Yr 2.						
		Yr 3.						
		Yr 4.						
3.	Maseno University (MSU)	Yr 1.						
		Yr 2.						
		Yr 3.						
		Yr 4.						
4.	Technical University of Kenya (TUK)	Yr 1.						
		Yr 2.						
		Yr 3.						
		Yr 4.						

Key: Yr- Year, Lecture based-L, Studio based-St, Elective-E

Criteria	**University (Kenyatta) A**	**University (Maseno) B**	**University (TUK) C**	**University (UON) D**	
1. Foundational courses: a) Art/Design History b) Design Concepts(theory)					
Integration/application / implementation of concepts & skill development					
3. Environment					
4. Technology based					
5. Project based					

Appendix F: Levels of Green as Represented by Indicators

Table 4.1.1, 4.1.2, 4.1.3 depict detailed green levels as represented by indicators in the three building categories.

Key to Likert scale: 1. Indicates lack of green 2. Little green 3**.** Pseudo/ average green 4**.** Large amount of green and 5. Indicates the presence of full green.

TABLE 4.1.1 **: HISTORIC CONVENTIONAL BUILDINGS (HCB-G1)**

VARIABLES OF SGID	ATTRIBUTE S	INDICATORS	CODE	1.Kipande Hse	2.Cameo Bldg	3.Old Mutual	4.Panafric Bldg	5. G.P.O Bldg
1. IAQ ELEMEN TS:-	**a)Acoustics:**	1. Sound insulation materials.	IE 1	3	2	1	2	`2
		2. Openings of highsound conduction.	IE 2	2	2	1	3	2
		3. Noise reduction from water pipes.	IE 3	1	1	2	1	2
		4.Doubleskin facade	IE 4	1	1	1	1	3
	b) Lighting: i) Natural	5. Day lighting openings in the design (windows cover>40%, skylights, atriums.)	IE 5	4	4	4	2	3
	ii)Outdoor views	6. Exterior views.	IE 6	3	2	2	2	2
	iii)Glare control	7. Light colored interiors,	IE 7	3	4	4	2	2
	iv)Energy efficiency	8. Use of LED, HID lights.	IE 8	3	1	2	3	2
		9. Low reflectance surface materials.	IE 9	2	4	3	3	3
		10. Lighting control systems (dimmers, wall controls, sensors, time out).	IE 10	1	1	1	1	1
		11 Energy monitoring systems. Energy used: Bill paid:	IE 11	2	1	1	2	2
	v)Alternative energy	12. Renewable energies (solar, wind, biogas).	IE 12	1	1	1	1	1

	c)Thermal Comfort: i)Evaporative cooling passive techniques)	13. Shading, Water features, courtyards, green wall, absorption devices.	IE 13	1	2	1	2	2
	ii)Mechanical (active technique)	14. Energy saving windows and door treatments, louvres.	IE 14	1	3	1	1	3
		15. HVAC system	IE 15	3	1	1	2	2
		16. Combined.	IE 16	1	1	1	1	1
	d) Ventilation & Humidity Control: i)Passive designs	17. Insulation & green walls.	IE 17	1	1	1	1	1
		18. Cooling tower techniques/vent ducts	IE 18	1	2	2	1	1
		19.Cross ventilation/apertures	IE 19	2	3	2	2	2
		20. Low pollutant emitting materials	IE 20	1	1	1	1	2
		21. Provision for smoking area.	IE 21	1	1	1	3	1
	ii) Mechanical	22. Air quality-monitoring systems.	IE 22	1	1	1	1	1
		23.Purification Filters barring outdoor pollutants	IE 23	1	1	1	1	1
	iii)Combined technique	24. Mechanical dehumidifiers.	IE 24	1	1	1	2	2
	e)Technical Space performance	25Allows for multiple functions.	IE 25	1	1	1	1	2
		26. Provision for universal design.	IE 26	1	1	1	1	3
		27. Allows for future change/adaptive needs.	IE 27	1	1	1	1	2
		28.Good ergonomics	IE 28	3	2	2	3	3
ATER EFFICIE NCY	**i)Efficient appliances, fixtures/fittings**	29.sensor-taps, aerated water etc.	WE 29	1	1	1	1	1
		30.Green plumbing.	WE 30	1	1	1	1	1
		31Leakage monitoring devices.	WE 31	1	1	1	1	2
	ii)Sewage waste volume reduction	32.Bi-flushing, water less toilets)	WE 32	1	1	1	1	3

	iii)**Recycling/re-use of waste H_2O**	33. bio-digesters.	WE 33	1	1	1	1	1
	iv)Usage monitoring	34. Consumption Meters	WE 34	2	3	2	3	3
	v)Rainwater harvest/storage	35. Storage tanks	WE 35	1	1	1	1	1
MATERI ALS & TECH.	**i)Ease of maintenance**	36. Floor -Durable materials & finishes.	MT 36	3	3	3	3	4
		37. Easy to clean & maintain	MT 37	3	2	2	3	4
		38. Walling- Durable & finishes	MT 38	2	3	2	2	2
	ii) Environmental friendly materials	39. Easy to clean and maintain	MT 39	2	2	2	3	2
		40. Materials salvaged from waste (re-use).	MT 40	1	1	1	1	1
	iii) Buildability	41. Recyclable materials.	MT 41	1	2	1	1	1
		42. Localized materials.	MT 42	3	3	2	2	3
		43. Natural materials (live).	MT 43	2	3	2	1	2
		44. Low Emitting materials	MT 44	1	1	1	1	2
		45.Advance material use plan	MT 45	1	1	1	1	1
		46.Use standardized materials	MT 46	3	3	4	3	3
		47. Use of industrial modules (off-site prod.)	MT 47	2	2	3	3	3
		48. Considering life cycle cost of different component service lives.	MT 48	1	1	1	1	2
		49.Allows retrofits/renovation ideas	MT 49	2	1	1	1	2
		50. Technology use in design phase.(BIM)	MT 50	1	1	1	1	1

TABLE 4.1.2. **MODERN CONVENTIONAL BUILDINGS (MCB-G2)**								
VARIABLES OF SGID	**ATTRIBUTES**	**INDICATORS**	**CODE**	**1. KI CC**	**2.National Bank House**	**3.Anniversary Towers**	**4.Lonrho House**	**5.Reinsurance plaza**
1. IAQ ELEMENTS:-	**a)Acoustics:**	1. Sound insulation materials.	IE 1	4	2	3	2	2
		2. Openings of high sound conduction.	IE 2	4	3	4	3	2
		3. Noise reduction from water pipes.	IE 3	4	3	3	2	3
		4.Double skin facade	IE 4	3	3		4	1
	b) Lighting: i) Natural	5. Day lighting openings in the design (windows cover>40%, skylights, atriums.)	IE 5	4	2	4	3	4
	ii)Outdoor views	6. Exterior views.	IE 6	4	3	3	3	4
	iii)Glare control	7. Light colored interiors,	IE 7	2	3	2	2	2
	iv)Energy efficiency	8. Use of LED, HID lights.	IE 8	3	2	3	3	3
		9. Low reflectance surface materials.	IE 9	4	2	3	1	3
		10. Lighting control systems (dimmers, wall controls, sensors, time out).	IE 10	1	1	1	3	1
		11 Energy monitoring systems. a.Water bill:5.4m to 2.4m b.Electric bill p.m.:	IE 11	3	1	3	3	3
	v)Alternative energy	12. Renewable energies (solar, wind, biogas).	IE 12	2	2	2	1	3

	c)Thermal Comfort: i)Evaporative cooling passive techniques)	13. Shading, Water features, courtyards, green wall, absorption devices.	IE 13	4	4	3	1	3
	ii) Mechanical (active technique)	14. Energy saving windows and door treatments, louvres.	IE 14	4	3	3	2	2
		15. HVAC system	IE 15	2	2	2	2	2
		16. Combined (passive + mecha+ preventing poll. Migration)	IE 16	3	1	3	1	2
	d) Ventilation & Humidity Control: i) Passive designs	17. Insulation & green walls.	IE 17	3	2	4	2	2
		18. Cooling tower techniques/vent ducts	IE 18	3	1	3	1	2
		19. Cross ventilation/apertures	IE 19	4	2	2	1	2
		20. Low pollutant emitting materials	IE 20	3	2	1	2	1
		21. Provision for smoking area.	IE 21		1	1	1	1
	ii) Mechanical	22. Air quality-monitoring systems.	IE 22	1	1	4	1	4
		23. Purification filters barring outdoor pollutants	IE 23	1	1	3	1	3
	iii)Combined technique	24. Mechanical dehumidifiers	IE 24	3	1	1	2	2
	e)Technical Space performance	25. Allows for multiple functions.	IE 25	1	3	2	3	3
		26. Provision universal design.	IE 26	3	3	2	3	2

		27. Allows for future change/adaptive needs.	IE 27	3	2	2	2	3
		28.Good ergonomics	IE 28	4	4	2	3	3
WAT ER EFFI CIENCY	**i)Efficient appliance, fixtures/ fittings**	29. Efficient fixtures: Sensor-taps, aerated water etc.	WE 29	3	3	3	1	4
		30. Green plumbing	WE 30	3	3	2	1	2
		31. Leakage monitoring devices.	WE 31	1	1	1	1	1
	ii) Sewage waste volume reduction	32. Bi-flushing, water less toilets)	WE 32	3	2	2	1	2
	iii) Recycling/re-use of waste H_2O	33. Bio-digesters.	WE 33	1	1	1	1	1
	iv)Usage monitoring	34. Consumption Meters	WE 34	3	3	3	3	3
	v)Rainwater harvest/ storage	35. Storage tanks	WE 35	1	1	1	1	1
MAT ERIA LS & TECH.	**i) Ease of maintenance**	36. Floor- Durable materials & finishes.	MT 36	3	3	3	3	4
		37.Easy to clean & maintain	MT 37	1	4	4	2	4
		38. Walling-Durable & finishes	MT 38	4	3	3	3	3
	ii) Environmental friendly materials	39. Easy to clean and maintain	MT 39	1	2	3	2	2
		40. Materials salvaged from waste (re-use)	MT 40	1	1	1	1	1
	iii) Build ability	41. Recyclable Materials	MT 41	3	2	2	1	2

		42. Localized materials	MT 42	4	3	3	2	3
		43. Natural Materials(live)	MT 43	4	2	2	1	2
		44. Low emitting materials.	MT44	4	2	2	2	3
		45.Advance material use plan	MT45	2	1	1	1	1
		46.Use Standardized material	MT46	3	3	3	3	4
		47.Use of industrial modules(off-site)	MT47	3	4	3	3	3
		48.Considering life-cycle cost of different component service lives	MT48	2	1	1	1	2
		49. Allows retrofits/renovation ideas.	MT49	2	3	2	2	3
		50. Technology use in design phase (BIM).	MT50	1	1	1	1	1

*TABLE 4.1.3.***GREEN CATEGORY BUILDINGS (GCB - G3)**

VARIABLES OF SGID	ATTRIBUTES	INDICATORS	CO DE	1.Eat on Place	2.Kenya-Re Towers	3.Garden City Mall	4. KCB Plaza Upper hill	5. Britam Towers
1. IAQ ELEMENTS:-	**a)Acoustics:**	1. Sound insulation materials.	IE 1	2	2	2	3	4
		2. Openings of High sound conduction.	IE 2	2	3	1	3	3
		3. Noise reduction from water pipes.	IE 3	3	4	2	2	4
		4.Double skin facade	IE 4	1	1	1	4	4
	b) Lighting: **i) Natural**	5. Day lighting openings in the design (windows cover>40%, skylights, atriums.)	IE 5	4	3	4	4	4
	ii)Outdoor views	6. Exterior views.	IE 6	4	3	3	4	4
	iii)Glare control	7. Light colored interiors,	IE 7	4	3	4	4	4
	iv)Energy efficiency	8. Use of LED, HID lights.	IE 8	5	4	4	3	4
		9. Low reflectance surface materials.	IE 9	4	3	4	2	4
		10. Lighting control systems (dimmers, wall controls, sensors, time out).	IE 10	2	1	4	3	4
		11. Energy monitoring systems. a.Water bill b.Electric bill	IE 11	3	2	4	4	4
	v)Alternative energy	12. Renewable energies (solar, wind, biogas).	IE 12	4	1	4	2	3
	c)Thermal Comfort: **i)Evaporative cooling passive techniques)**	13. Shading, Water features, courtyards, green wall, absorption devices.	IE 13	3	3	4	3	3
	ii)Mechanical (active technique)	14. Energy saving windows and door treatments, louvres.	IE 14	4	4	2	4	3
		15. HVAC system	IE 15	2	2	1	2	3

		16. Combined (passive+ mecha + preventing poll. Migration)	IE 16	3	1	4	3	4
	d) Ventilation & Humidity Control: **i) Passive designs**	17. Insulation & green walls.	IE 17	2	2	1	2	3
		18. Cooling tower techniques/vent ducts	IE 18	2	1	1	2	4
		19.Cross ventilation/apertures	IE 19	3	3	4	4	4
		20. Low pollutant emitting materials	IE 20	3	3	4	3	4
		21. Provision for smoking area.	IE 21	1	1	1	3	4
	ii) Mechanical	22. Air quality-monitoring systems.	IE 22	3	1	1	3	3
		23. Purification filters barring outdoor pollutants	IE 23	2	4	1	1	1
	iii)Combined technique	24. Mechanical dehumidifiers.	IE 24	3	3	2	2	3
	e)Technical Space performance	25 Allows for multiple functions.	IE 25	3	5	3	3	4
		26. Provision for universal design.	IE 26	4	3	3	4	4
		27. Allows for future change/adaptive needs.	IE 27	3	5	3	3	4
		28.Good ergonomics	IE 28	4	3	4	4	4
WATER EFFICIEN CY	**i)Efficient appliances, fixtures/fittings**	29.Efficient fixtures: sensor- taps, aerated water etc.	WE 29	4	4	5	4	4
		30. Green plumbing.	WE 30	3	3	4	2	4
		31Leakage monitoring devices.	WE 31	1	1	4	1	1
	ii)Sewage waste volume reduction	32.Bi-flushing, water less toilets)	WE 32	4	3	2	2	4
	iii) **Recycling/re-use of waste H_2O**	33. bio-digesters.	WE 33	4	1	1	1	5
	iv)Usage monitoring	34. Consumption Meters	WE 34	4	4	4	3	4

	v)Rainwater harvest/storage	35. Storage tanks	WE 35	5	1	4	1	5
MATERIA LS & TECH.	**i)Ease of maintenance**	36. Floor -Durable Materials & finishes.	MT 36	3	3	4	4	4
		37. Easy to clean &maintain	MT 37	4	3	3	3	4
		38.Walling- Durable & finishes	MT 38	3	3	2	1	4
	ii) Environmental friendly materials	39. Easy to clean and maintain	MT 39	2	2	1	3	4
		40. Materials salvaged from waste (re-use).	MT 40	3	1	2	1	1
	iii) Build ability	41. Recyclable materials.	MT 41	2	2	2	2	3
		42. Localized materials.	MT 42	3	3	3	3	3
		43. Natural materials (live).	MT 43	3	2	3	2	4
		44. Low Emitting materials	MT 44	4	3	4	3	4
		45.Advance material use plan	MT 45	2	1	2	1	2
		46.Use standardized materials	MT 46	4	3	4	4	4
		47. Use of industrial modules (off-site prod.)	MT 47	4	4	4	4	4
		48. Considering life cycle cost of different component service lives.	MT 48	2	2	2	2	3
		49.Allows retrofits/ renovation ideas	MT 49	3	4	4	4	4
		50.Technology use in design phase.(BIM)	MT 50	4	5	4	4	4

Appendix G: Analysis of Green Concepts-Passive in Commercial Buildings

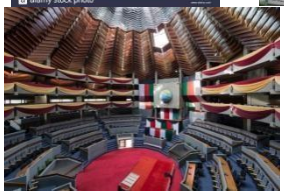
Category: Historic Conventional Buildings(HCB)	Details	Passive strategies	Green weighting (Indices)
1. Kipande House   *http://mrwavetheory.blogspot.com/2006/12/ipo-fever-hits-africa-stanbic-uganda.html*	• Not much structural adjustments allowed dueto museum restrictions, • Situated on Kenyatta Avenue in Nairobi junction with Loita streetin Nairobi's Central Business District(NCBD) • Built in 1913 as designedby Gurdit Singh. • Formerly railway warehouse	• It is two-storied building with a ventilation tower thattappers into a 165ft clock tower/ shaft • 5-volume/tier ventilation vent through which hot air risesand escapes through the fenestration on the sides. • \Cross ventilation is combined with mechanical devices. • Unfortunately, the passive vent system is interrupted by aceiling that runs across at the start of its triple volume. • Massive blocks form thick walls that provide sound and thermal controls. It has partly hand-dressed blue granitestone and a cladding finish. • Has two commercial fronts' thus double façade and lighting that is more natural. • Being a building that hosts a bank, access was limited forsecurity reasons.	**Variables** / **Index** **1.IAQ ELEMENTS:-** 1.65 **2.WATER EFFICIENCY** 1.14 **3.MATERIALS & TECH** 1.87
2. Stanbic House  *https://www.google.com/search?client=firefox-b-&q=inside+torr%27s+house+kimathi+street*	• Situated at the junction of Kimathi Street and Kenyatta Avenue (NCBD). • Designed and Built in1910, by Henderson andPartners inspired by City Hall in Stockholm, Sweden that now housing Stanbic bank. • Formerly known as Torr's House and was acquired by Stanbic bank in 1992	• Mid-space (three quarters) of the interior opens to adouble volume allowing for provision of natural ventilation and thermal comfort. • Being at the street corner give it an advantage of two commercial fronts thus double façade enabling entrance ofmore light through the windows. • Built with fired bricks but, outside renovated with brickcladding • Being a building that hosts a bank, access was limited forsecurity reasons.	
3 Cameo Building	• Located on Kenyatta avenue	• One storied building done in hand dressed blue	**Variables** / **Index** **1.IAQ ELEMENTS:-** 1.63

 *http://buildesign.co.ke/a-stoned-history-of-nairobi-by-kamau-mutunga/*	• Built in 1912 as the Theatre Royal i.e. firstcinema hall in Kenya.	stone • Has a courtyard opening to the sky thus providing natural light and ventilation to the spaces within and so saving onpower costs. • Two commercial fronts with the main entrance at the backsideopening to Kimathi Street. Has a bend to control entrance of noise and dust from from the back. • The courtyard floor material finish is slate which is hard tomaintain because of its joint that keep lot of dirt	**2.WATER EFFICIENCY** — 1.23 **3.MATERIALS &TECH** — 1.93
4. Old Mutual Building  *https://www.businessdailyafrica.com/bd/lifestyle/society/tracing-historical-footprints-of-the-old-mutual-in-kenya-2137038*	• Built in 1907's and is located on Kimathi Street	• Walls are built in stone, smooth rendered and finished in a brilliant white lime plaster beneath a Mangalore tiled roof. (repels the heat) • Windows are glazed in steel casements while doors are made of timber hung in embellished hand- carved hardwood frames. • Courtyard space that opens to the sky enabling infusion of natural light and ventilation to the building interiors, • 3rd, 4th and 5th floors are naturally illuminated and have a double screen/mesh façade enclosing its balconies, to control entrance of light while allowing cross ventilation. • It is a five-storied building of an art-deco architectural design.	**Variables** — **Index** **1.IAQ ELEMENTS:-** — 1.4 **2.WATER EFFICIENCY** — 1.14 **3. MATERIALS & TECH.** — 1.8

5. Panafric House  *https://ucldigitalpress.co.uk/Book/Article/19/44/1362/ accessed February 2021*  *http://buildesign.co.ke/a-stoned-history-of-nairobi-by-kamau-mutunga/*	• It was built in 1928, located on KenyattaAvenue and covers four floors. • It is done in Georgianstyle characterized by symmetry and proportion. It spares ornamentation and is akin to classical architecture of Greeceand Rome.	• The roof is covered with half-round Spanish tiles. • Walls were made of smooth dressed blue stone with flush mortar joints to the main façade and brick facing to other elevations. • Windows are made of glazed steel casements held in pediment openings to the main façade and wooden louvered shutters to the rear elevation providing additional weather protection. • The interior of the building has been remodeled to meet modern office needs with the mid part of the building open to the 4th volume. Thus enhancing ventilation and lighting • Smoking area was designated behind the gate leadingto the outside parking.	**Variables** | **Index** **1.IAQ ELEMENTS:-** | 1.95 **2.WATER EFFICIENCY** | 1.29 **3.MATERIALS & TECH.** | 2.48
6. Nairobi General Post Office(Teleposta Towers)  *http://www.travel-images.com/photo/photo-kenya116.html accessed April 2021.*	• The building was completed in 1999 • The building was designed by AnthonyGleeson and constructed by Laxmanbhai Construction. • It covers 27 floors	• It has a double skin façade and plans are underway to install solar systems. • The design of the lower part of the building affects air movement on 1-5th floor, and as a result, the air feels humid and stale thus compromised ventilation quality.	**Variables** | **Index** **1.IAQ ELEMENTS:-** | 2.03 **2.WATER EFFICIENCY** | 1.71 **3.MATERIALS & TECH.** | 2.20

MODERN CONVENTIONAL BUILDINGS

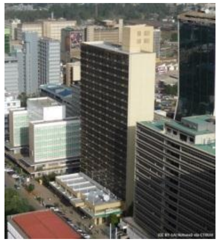
1. Kenyatta International Conventional Center (KICC)

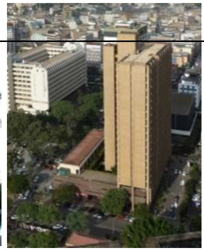


- It was designed by David Mutiso & Karl Henrik Nøstvik and constructed by Solel Boneh & Factah contractors.
- Design inspired a traditional hut.
- Building begun in 1967 and was completed in 1973.
- It consists of a main tower, podium, and plenary hall.
- It covers 28 floors.

- Its cylindrical design enables maximum use of natural light thus quality ventilation and thermal comfort is maximized while lowering energy needs.
- No double façade but, horizontal shaders running across with treated windows to avoid interior glare and to achieve thermal comfort.
- Green is achieved in the shape of the building and presence of fenestration covering over 80% of the walls. In turn sufficient daylight floods through the interiors.
- The presence of a courtyard and a water feature (gardens, pools and geyser fountain) in front of the buildings circulates under the buildings. This provides natural cooling within the interior spaces above it, and flows back to the fountain.
- KICC sunk a borehole and has since been selling to other buildings around.
- The plenary is fortified with soundproof grey stone, deep natural wood and lofty baffled ceilings. The roof is designed to allow in light as shown in photo
- Electricity bill per year was Ksh. 5.3million but after integrating solar energy it reduced to Ksh.2.4m. The energy savings were established using a smart device installed to monitor energy savings.
- It re-uses its grey waters to irrigate flower gardens.

Variables	Index
1. IAQ ELEMENTS:-	2.26
2. WATER EFFICIENCY	1.97
3. MATERIALS & TECH.	2.65

2. National Bank House  	• Situated along Harambee Avenue. • Designed and built in 1976. • Covers 21 floors/82m	• Presence of a double façade with tinted glass that prevents solar gain and so provides thermal comfort. • Harvesting of rainwater is done only that it is not used in the building but, directed into waste water system and disposed off. • The reception is a double volume therefore allowing in lots of air for quality ventilation	**Variables** | **Index** **1.IAQ ELEMENTS:-** | 2.41 **2.WATER EFFICIENCY** | 1.87 **3.MATERIALS & TECH.** | 2.13
3. Anniversary Towers:  	• It was built in 1992 along University Way. • Designed by Mutiso Menaz • It covers 26 floors above the ground. • It is 79.86m tall.	• There's presence of a refuse chute creatively integrated within the building, and it sorts garbage right from the source. • Notice the glass applied throughout to form a double façade that enhances acoustics but, compromises thermal comfort. • There are wind turbines installed but, don't function because the buildings are built beacon to beacon. Thus slowing the speed of wind, so generation of energy never took off as was expected.	**Variables** | **Index** **1.IAQ ELEMENTS:-** | 2.52 **2.WATER EFFICIENCY** | 1.43 **3.MATERIALS & TECH.** | 2.81
4. Lonrho House   	• Built in 1990 located on Standard street. It covers 22 floors. • It is 88 m in height. • Architect Jim Archer designed it.	• Minimum use of natural lighting with much of the Interiors artificially lit, the double façade is covered with tinted glass for insulation against sunrays • LED lights with dimming devices to reduce on consumption,	**Variables** | **Index** **1.IAQ ELEMENTS:-** | 3.10 **2.WATER EFFICIENCY** | 2.33 **3.MATERIALS & TECH.** | 2.59

Building	Details	Passive strategies	Green weighting (Indices)
5. Reinsurance Plaza:  	• Designed by Mutiso Menez International andbuilt in • Located on Agakhan Walk along Harambee Avenue. • Covers 18 floors	• Presence of sensors/systems monitoring carbon monoxide levels in the basement, for mechanical regulation to rid of carbon monoxide gas. • Has a refuse chute creatively integrated in the design that sort's garbage right from the source. • Automated lifts that are solar powered including parts of the building. • The mezzanine floors are designed partly open to the sky with plants incorporated interiors. It enables natural light and ventilation to filter through from all sides of the building without being hindered by adjacent buildings. • On the outside, the balconies on each floor acts as a sun -shader to the previous floor and enhances interior's thermal comfort/glare. • There are intentions of incorporating solar but, the roof area is small and has limited incorporation • Electricity bills were at Ksh. 2.2milion per year but once solar energy was incorporated, amount reduced to Ksh. 1million thus amounting to 45% savings.	**Variables** / **Index** **1. IAQ ELEMENTS:-** 3.41 **2. WATER EFFICIENCY** 2.32 **3. MATERI ALS & TECH.** 2.26
	G3-GREEN CONVENTIONAL BUILDINGS		
1. EATON PLACE    	• Located in Gigiri area of Nairobi County. • Designed by Beglin-Woods Architects andbuilt in	• The building sits on a site that slopes to the river with the design taking advantage to host basements on split levels guided by the gradient. This achieves naturally lit basements and six floors rising through series of cascading terraces resonating with landscape. • Presence of a courtyard and shading features including trees that improve interior ventilation and thermal comfort. • There is a mound/slope that acts as a sound buffer, right in front the building and it naturally blends with it. .	**Variables** / **Index** **1. IAQ ELEMENTS:-** 3.84 **2. WATER EFFICIENCY** 3.82 **3. MATERI ALS & TECH.** 2.98

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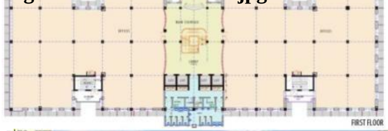


 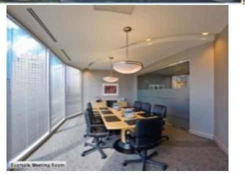</td>
<td>It covers six floors.
Built in the year 2013</td>
<td>There is an indoor garden at the basement and ground floor, irrigated by grey waters from the building. The same waters are used to irrigate thelawn surrounding the building.
Rain water harvesting and onsite waste water treatment plant is present</td>
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<td>3. Britam Towers
</td>
<td>Designed by Chris Krosse and built in theyear 2013.
Inspiration was a design that it lasts as a sky outline forever.
Covers 32 floors and is 195 meters tall.</td>
<td>It has a double façade done creatively with a mesh made from steel instead of the traditional glass. It does not trap heat but allows free flow of air between interiors and exteriors.
Presence of BMS (Basal.) consumption smart devices, Window glass are UV treated.
There is a fire sprinkler system and in the event ofa fire, pressure is automatically reduced in the interior core to reduce the risk of spreading.
Notable, is creative use of bamboo for cladding and granitic tiles with provision for smoking in anarea on the first floor terrace.</td>
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        	• The inspiration to be natural and blend with the environment transcends to the interiors. • The colours of materials chosen are subtle and warm for both exteriors and interiors. • To bring harmony with the exterior and interiors, the patterns and shapes used mimic nature. • Hence, practice of biomimicry as an element of green design.	• Grey waters are collected in a tank in the basement and recycled for non-portable use such as flushingtoilets and watering floors. • The shape of the building is in a way that floorsizes reduce as one goes up the building. • The narrowing with height challenges with subdivision, rental space and view thus in a wayaffecting quality of the interiors.	

3. Kenya Commercial Bank Pension Fund Building  *https://www.skyscrapercenter.com/building/kenya-commercial-bank-plaza/16433*	• Located in Upper Hill area. • Designed by Planning Systems. • Built in 2010 • Height is 147m with 26 floors, 2 below and 24 above the ground.	• The glass façade enables saving lighting energy and water efficiency is provided by presence of a recycling plant for re-flush. • Has a garden with beautiful lawn inside the building, space for relaxation. It enhances thermal comfort too. • Building is fitted with solar panels to supplement the power from the national grid. It also has the ability to harvest and treat rainwater for use in the building. It is also fitted with water recycling capability, thereby reducing the cost of running the skyscraper	**Variables** — **Index** **1. IAQ ELEMENTS:-** — 3.75 **2. WATER EFFICIENCY** — 2.94 **3. MATERIALS & TECH.** — 2.88
4. Kenya-Re Towers  *https://www.kenyare.co.ke/index.php/2012-03- 05-13-25-35)*	• It is located in Ragati Road Upper-Hill • It was designed by Mutiso. • Built between in the years 1978 and 1982. • Covers 26 floors and height 80m	• It is glass cladding finishes on a twin tower building with one tower rising to 10 floors and another one with six floors. • Has a refuse chute creatively integrated in the design that sort's garbage right from the source.	**Variables** — **Index** **1. IAQ ELEMENTS:-** — 2.43 **2. WATER EFFICIENCY** — 1.94

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<tr><td>3. MATERIALS & TECH.</td><td>2.87</td></tr>
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5. Garden City Mall
 

https://www.skyscrapercity.com/threads/garden-city-kasarani-50-000m%C2%B2-retail-space-u-c.1513841/page-7
</td>
<td>

Located on Thika Road area
Designed by….
Built in
Height the ground

</td>
<td>

Garden City mall plans to install a solar panel roof covered car park to generate energy for use by tenants. A solution that could produce clean power and pay for itself with the energy it Garden City,
Being developed by Actis using a ‘green-by-design’ approach.
The system will automatically switch over to provide power together with back-up generators during times when the power goes off, reducing diesel use and saving money.

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Appendix H: Permit for the Research from Kenyatta University

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 4150

Internal Memo

FROM: Dean, Graduate School

DATE: 24th September, 2020

TO: Oduho Achieng Rose
C/o Fine Art and Design Dept.
Kenyatta University

REF: M88/37071/2017

SUBJECT: APPROVAL OF RESEARCH PH.D PROPOSAL

We acknowledge receipt of your revised Proposal as per our recommendations raised by the Graduate School Board at its meeting of 11th September, 2020, Entitled, **"Sustainable-Green Interior Design Practice within Commercial Buildings in Upperhill and Central Business District Areas of Nairobi City County; Kenya".**

You may now proceed with your Data Collection, Subject to Clearance with Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

By copy of this letter, the Registrar (Academic) is hereby requested to grant you substantive registration for your Ph.D. studies.

Thank you.

KENYATTA UNIVERSITY OFFICE OF DEAN 24 SEP 2020 GRADUATE SCHOOL

JULIA GITU
FOR: DEAN, GRADUATE SCHOOL

C.c. Chairman, Department of Fine Art and Design
Registrar (Academic) Att: Mr. Likami

Supervisors:

1. Dr. George Vikiru
   C/o Department of Fine Art and Design
   Kenyatta University

2. Prof. Caleb Mireri
   C/o Department of Environmental Planning and Management
   Kenyatta University

JG/nn

Appendix I: National Commission For Science, Technology & Innovation

Ref No: **334744** Date of Issue: **25/November/2020**

REPUBLIC OF KENYA

RESEARCH LICENSE

This is to Certify that Ms.. ROSE ACHIENG ODUHO of Kenyatta University has been licensed to conduct research in Nairobi on the topic: SUSTAINABLE GREEN INTERIOR DESIGN PRACTICE WITHIN COMMERCIAL BUILDINGS IN UPPERHILL AND CENTRAL BUSINESS DISTRICT AREAS OF NAIROBI CITY COUNTY; KENYA.

for the period ending : **25/November/2021.**

License No: **NACOSTI/P/20/748**

Applicant Identification Number 334744

Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

mputer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

Appendix J: Letter of Permission to Access the Buildings

KENYA RE

STRENGTH & WISDOM BEYOND BORDERS

Kenya Re is ISO 9001:2008 Certified

Kenya Reinsurance Corporation Ltd.
Reinsurance Plaza
P.O Box 30271- 00100
Nairobi, Kenya.
Telephone: +(254 020) 220 2000, 0703083000
Telefax (254 20) 2223944, 340486, 340967, 2252106,
Email:kenyare@kenyare.co.ke
Website: http://www.kenyare.co.ke

19th March 2019

Kenyatta University,
P. O. Box 43844 – 00100,
Nairobi, Kenya.
Rose.oduho@students.ku.ac.ke
Attn: Ms. Rose Achieng Oduho,
Registration No. M88/37071/2017

Dear Madam,

RE: PERMISSION TO CONDUCT A STUDY ON ADOPTION OF GREEN DESIGN CONCEPTS IN KENYA RE COMMERCIAL BUILDINGS IN NAIROBI

This has reference to the subject matter above and a reply to your letter dated 6th March 2019.

The Corporation has reviewed your request and hereby wishes to grant you access to its various buildings in Nairobi, that is: Anniversary Towers Nairobi, Reinsurance Plaza Nairobi and Kenya Re Towers Upper Hill.

The access and information given shall strictly be for research purposes and it is expected that you shall maintain utmost confidentiality on the same.

The Kenya Re contact person for the duration of your study shall be the Mr. Brian Kithinji Njoka of the property department who shall facilitate your movements and access to information that you may require.

We wish you the best in your research endeavours and we trust the data you collect shall be beneficial to your research.

Yours faithfully,

BRIAN NJOKA
njoka@kenyare.co.ke
PROJECTS OFFICER (PROPERTY)