T.C.
ISTANBUL GEDİK NIVERSITY
INSTITUTE OF GRADUATE STUDIES

MOTIVATION AND OBSTACLES TO CONSTRUCTION OF GREEN BUILDING IN IRAQ

MASTER's THESIS

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LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ MÜDÜRLÜĞÜ

Yüksek Lisans Tez Onay Belgesi

Enstitümüz, Civil Management Department İngilizce Tezli Yüksek Lisans Programı (211291017) numaralı öğrencisi Ali Khamees Abdulkareem ABDULKAREEM'in "Motivation and Obstacles to Construction of Green Building in Iraq" adlı tez çalışması Enstitümüz Yönetim Kurulunun 02/08/2023 tarihinde oluşturulan jüri tarafından *Oy Birliği* ile Yüksek Lisans tezi olarak *Kabul* edilmiştir.

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2) Jüri Üyesi: Doç. Dr. Redvan GHASEMLOUNIA

3) Jüri Üyesi: Dr. Öğr. Üyesi Yaşar MUTLU

DECLARATION

I, Ali Khamees Abdulkareem, declare that this thesis titled “Motivation and Obstacles to Construction of Green Building in Iraq” is original work I did for the award of the master’s degree in Civil Engineering. I also declare that this thesis or any part of it has not been submitted and presented for any other degree or research paper in any other university or institution. (02/08/2023)

Ali Khamees Abdulkareem ABDULKAREEM

DEDICATION

I dedicate my research dedicate this research to my loving family.

PREFACE

Foremost thanks to Allah, the most beneficent and merciful, who helped me to complete this study and to submit it in such a way.

I would like to express my thanks, appreciation, and gratitude to my supervisor, Asst. Prof. DR. Hasan Bozkurt Nazilli for his concern, guidance, and advice.

August 2023 Ali Khamees Abdulkareem ABDULKAREEM

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ABBREVIATIONS

ABGR	: Australian Building Greenhouse Rating
AFM	: Association of Facilities Managers
BEPAS	: Building Environmental Performance Analysis System
BIFM	: British Institute of Facilities Management
BREEAM	: Building Research Establishment's Environmental Assessment
CASBEE	: Comprehensive Assessment System for Built Environment Efficiency
CED	: Cumulative Energy Demand
EFM	: European Facilities Management Network
FM	: Facilities Management
FMAA	: Facilities Management Association of Australia
GB	: Green Building
GBI	: Green Building Index
GHEM	: Green Home Evaluation Manual
GSA	: General Services Administration
IFMA	: International Facility Management Association
LCA	: Life Cycle Analysis
LEED	: Leadership in Energy and Environmental Design
NFMA	: National Facilities Management Association
SBAT	: South African Sustainable Building Assessment Tool
SBTooL	: Sustainable Building Tool
SD	: Sustainable Development
STARS	: United States Assessment and the Rating System
TQA	: Total Quality Assessment
USGBC	: United States Green Building Council

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MOTIVATION AND OBSTACLES TO CONSTRUCTION OF GREEN BUILDINGS IN IRAQ

ABSTRACT

The construction sector is an important place to apply more environmentally conscious practices, and "Green Buildings" perform a significant part in this. Even though there is a shift taking place in the construction sector of Iraq at the present time toward the application of green procedures, not a lot of research has been done to look at the factors that motivate the market as well as the significant obstacles that stand in the way of the movement toward sustainable construction.

The purpose of this research is to make a contribution to the body of knowledge concerning the construction of environmentally friendly buildings in Iraq and to fill a gap that has been identified in the existing body of research. The findings will be useful for the government as well as market specialists in the process of developing the green construction industry.

The majority of the information that is presented in this study came from an extensive survey questionnaire that was designed after an exhaustive review of the relevant literature. Individuals who have an understanding of this subject or who are actively involved in green construction initiatives are the ones who fill out the questionnaire.

For the purpose of performing an analysis of the data that was acquired, a number of different statistical approaches are utilized, and the findings are analyzed in great depth. In accordance with this, in addition to the aforementioned questionnaire survey, explanations are provided about economic considerations, obstacles encountered, and lessons gained.

The results will help in understanding the true requirements for the development of environmentally friendly buildings in the Iraqi building industry. In conclusion, suggestions are provided for the government and for scholars to consider in order to move the building industry in the direction of more sustainable practices.

Keywords: *Green Construction, Sustainability, Iraq construction Industry, Obstcals, Green Design.*

IRAK'TA YEŞİL BİNA İNŞAATI İÇİN MOTİVASYON VE ENGELLER

ÖZET

İnşaat sektörü, çevreye daha duyarlı uygulamaların hayata geçirilebilmesi için önemli bir yer ve bunda “Yeşil Binalar” önemli bir paya sahip. Şu anda Irak inşaat sektöründe yeşil prosedürlerin uygulanmasına doğru bir kayma olsa da, piyasayı motive eden faktörlerin yanı sıra ayakta duran önemli engellere bakmak için çok fazla araştırma yapılmadı. sürdürülebilir inşaata doğru hareket yolunda.

Bu araştırmanın amacı, Irak'ta çevre dostu binaların inşasına ilişkin bilgi birikimine katkıda bulunmak ve mevcut araştırmalarda tespit edilen bir boşluğu doldurmaktır. Bulgular, yeşil inşaat endüstrisini geliştirme sürecinde hükümet ve piyasa uzmanları için faydalı olacaktır.

Bu çalışmada sunulan bilgilerin çoğu, ilgili literatürün kapsamlı bir şekilde gözden geçirilmesinden sonra tasarlanan kapsamlı bir anketten geldi. Anketi dolduran kişiler, bu konuda bilgisi olan veya yeşil inşaat girişimlerine aktif olarak dahil olan kişilerdir.

Elde edilen veriler üzerinde analiz yapabilmek için bir dizi farklı istatistiksel yaklaşımdan yararlanılır ve bulgular derinlemesine analiz edilir. Buna göre, söz konusu anket çalışmasına ek olarak, ekonomik hususlar, karşılaşılan engeller ve çıkarılan dersler hakkında açıklamalar yapılır.

Sonuçlar, Irak inşaat endüstrisinde çevre dostu binaların geliştirilmesi için gerçek gereksinimlerin anlaşılmasına yardımcı olacaktır. Sonuç olarak, inşaat endüstrisini daha sürdürülebilir uygulamalara yönlendirmek için hükümete ve akademisyenlere dikkate almaları için öneriler sunulmaktadır.

Anahtar Sözcükler: *Anahtar Kelimeler: Yeşil İnşaat, Sürdürülebilirlik, Irak inşaat sektörü, Engeller, Yeşil Tasarım*

1. INTRODUCTION

1.1 General Review

As the global supply of fossil fuels continues to dwindle, the cost of energy continues to climb. In response, nations throughout the world are taking action by developing policy instruments that are aligned with the green movement. In order to preserve the natural world and enhance the standard of living of future generations, organizations in all spheres of society, including commerce, transportation, and industry, have initiated the process of formulating and integrating environmentally friendly practices into their operations.

Particularly for housing and buildings, which are very costly in terms of resources, the building sector's "cradle-to-grave" operations in the construction sector have a significant impact on worldwide environmental implications, such as the depletion of earth's resources and adverse consequences, waste materials, pollution of the contamination, etc.

Because of this, it is the responsibility of the construction industry to lessen the adverse social and environmental effects it has and increase the beneficial contributions it makes to both the economy and the natural world. It has the potential to be the most important contributor from a single industry toward attaining green prosperity.

The building market constitutes a significant portion of the construction industry. The buildings in which people live work, and play have a significant influence on their surrounding environment, and this influence extends to the buildings' placement, execution, construction, service, and eventual removal. Carbon dioxide, the principal greenhouse gas, is released from buildings owing to the combustion of natural gas, petroleum oil, and power. This contributes to global warming. At this time, there are a great number of research and papers in the published literature that debate the consequences that building activities have on the environment, energy utilization, worldwide global warming, and the well-being of people.

The green construction sector in Iraq is still in its infancy. As a result, those working in the construction industry require a deeper comprehension in order to put sustainable initiatives into action. On the one hand, there is a growing interest in green buildings, but on the other, there is a lack of valuable and practical understanding regarding green buildings. Very little study has been done in Iraq that focuses on identifying the factors that motivate or hinder the construction of environmentally friendly buildings.

This vacuum in the green building domain is one that this thesis hopes to solve by looking at and understanding the true impact that sustainability challenges have in practice.

1.2 Sustainable Development

Therefore, efforts to improve the SD pushed construction practitioners to make efforts to refute practices that were destructive to the environment ecologically. According to the report (Gunnarsdóttir et al., 2020), it has spurred sustainable development, which is the establishment of specific aspects of a sustainable building design centred on productive and ecologically friendly resources. This has led to sustainable development being referred to as sustainable development (SC).

SC might be used as a guarantee to create structures in which the principles of SD are incorporated into the building process and sustainable buildings are always constructed. This would make the use of SC a viable option.

In addition to this, it is essential to derive, from the design of environmentally friendly buildings, the attainment of a more environmentally friendly urban environment.

According to Alghamdi et al. (2017), sustainable buildings are those that lower the amount of energy and water supplies they need, cut down on unwanted outputs like carbon dioxide emissions, and improve both the occupants' and the general public's health.

The development of sustainable buildings encompasses not only their construction but also their design, operation, and eventual removal.

In order for a building to be really sustainable, it must first be built with conservation measures taken into consideration before the construction processes begin, and it must also have an impact on the environment while it is being constructed.

However, due to the fact that this stage of the construction life cycle is the most advanced, the operational process does, in fact, have the most significant impact on the environment (Ghosh et al., 2006).

Sustainable buildings are those that reduce the negative effects that these practices have on the surrounding environment while also producing a more hospitable atmosphere within the building. These are the kinds of buildings that make it possible for building users to improve their well-being and level of comfort while also maximizing the financial rewards to which they are entitled (Durovic et al., 2014).

The dissemination of SB's concepts and components among industry professionals and construction engineers will contribute effectively to the design process and has the largest influence in the operational phase by limiting the passive effect that implemented buildings have on the environment at the present time.

The requirement for the construction industry to satisfy SD's desire for a sustainable environment also, consequently, contributed to the invention of sustainable structures that can be completed by construction experts and engineers, giving the theoretical backdrop to this research. These sustainable buildings can be accomplished by construction professionals and engineers.

The term "management of sustainable building" refers to an activity that combines the ideas of corporate governance, design, behavioural sciences, and technology with the work that is done by the manufacturer. This integration also takes into account the physical organization of employees.

Buildings in Iraq typically display symptoms of poor management, including poor design in regard to ventilation, natural lighting, water, waste management, and other construction facilities.

1.3 The Historical of Green Building in Iraq

Iraq, much like a number of other countries, is focused on developing ecological systems that are self-sustaining. This is the top objective for building developers and practitioners as they work toward meeting the SD criteria while also achieving a high level of protection and comfortable pleasure in their projects.

Companies have produced measures such as the selection of non-deleterious and renewable building materials because they recognize that the environmental, economic, and social aspects of SD have generated measures that might be advantageous and preferred to the community in respective proportions.

The environmental aspect entails the safeguarding of renewable resources, the maintenance of intact ecosystems, and the regulation of the impact that expanding economies have on the natural world. The economic component includes activities such as economic development, resource assistance, reducing the use of non-renewable resources, and protecting sustainable resources from being depleted.

The social component addresses issues such as the reduction of poverty, the enhancement of productivity at an adequate population level, and the provision of social services such as improved health and quality of life for individuals.

People are reliant on their environments for both their protection and their basic survival, and it is imperative that environments be preserved in a state that allows subsequent generations to make the most of the resources they contain. However, human beings have never taken adequate measures to ensure its continued existence.

Because it was clear that human actions were worsening the state of the planet's environment, it was clear that sustainable development was something that was needed. This comprises programs for both physical construction and technical advancement.

Buildings are responsible for the use of enormous amounts of fuel, water, and ground and are therefore accountable for the majority of the world's environmental problems. This impact of construction on the deterioration of the natural environment has been shown by the activities of the construction industry (Clark, 2017).

The approach that the study took, as well as the role of participation in understanding, there isn't much research done on the subject of what constitutes environmentally responsible building practices in Iraq. Experimentation on obtaining sustainable structures is also being done, albeit in a limited capacity; nonetheless, the few recent studies that are relevant have not focused on Iraq.

This study provided documented verification of what constitutes sustainable construction in Iraq, as well as the accomplishment of sustainable construction during the course of the country. This study is in line with the existing understanding of sustainable buildings in Iraq, an area in which only a small number of studies have been conducted previously.

In order to provide the technical experts and engineers in building construction in Iraq with sufficient awareness of how a sustainable building comes to be, the specified sustainable building elements are required.

The study contributes fresh information to our understanding of SC from an environmental, social, economic, and managerial perspective. As a result of this, we will be better equipped to provide our end-users with a sustainable environment.

1.4 Study Aims and Concerns

The increase in the amount of green construction projects around the world, as well as the possibility of the construction of green buildings in Iraq, has resulted in the necessity to find answers to the following two significant inquiries:

1. What are the most significant impediments and opportunities facing the movement toward green building in the Iraqi construction marketplace?
2. What types of solutions can be implemented to make it easier for green building practices to be widely adopted throughout the built environment of Iraq?

There are a great number of reasons to develop environmentally friendly structures, but there are also a great number of reasons not to. The purpose of this research is to use a questionnaire survey to respond to the questions that were raised earlier. Learning from those who are really working in the field can be the most effective method to gain a deeper comprehension of the factors that motivate and impede progress in the sector, as well as to steer it in the direction of an agenda that prioritizes sustainability.

In addition, examples of green building projects that have been completed in Iraq are shown, together with a discussion of the financial considerations, challenges encountered, and lessons gained. The findings of this study will be of use to both government agencies and market actors in their efforts to advance the green construction industry.

1.5 Research and Development Program

The research approach that was used in this study can be demonstrated by using a research framework that is composed of three stages:

A review of the relevant literature and an investigation of the sustainable building documents and the components they contain make up the first stage.

In addition to the literature research and document study that was a part of stage one, an emphasis was placed on the difficulty of putting sustainable buildings into practice in Iraq. This was discussed in the context of the study of sustainable buildings.

The second stage is an analysis of questionnaires, which is done to conduct a more in-depth analysis of the findings from the content review. In the third stage, we will validate and scrutinize the findings of the research in further detail.

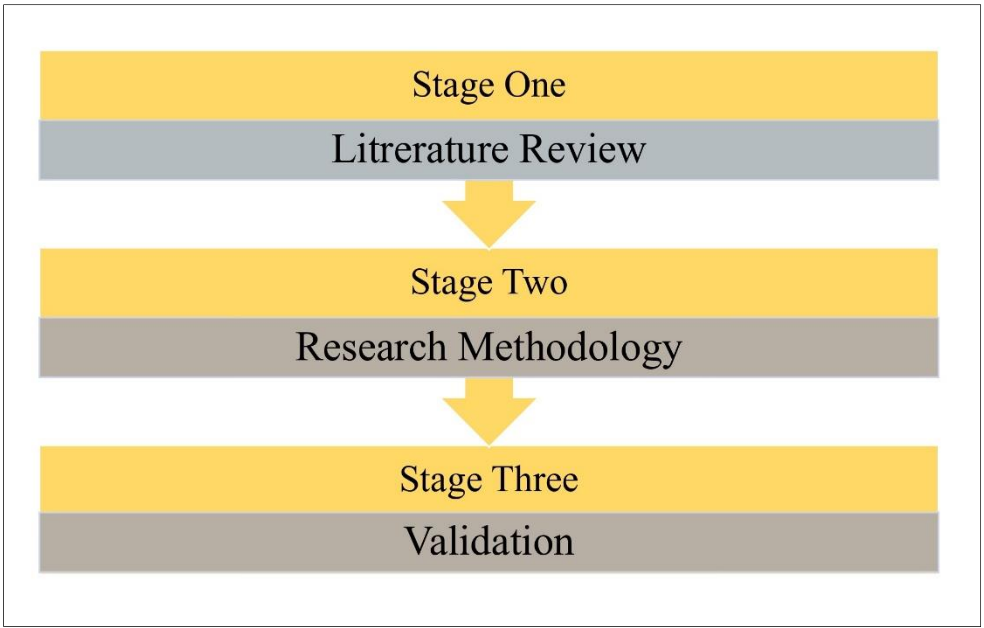

Figure 1.1: Framework for Research Stages

Source: Author

Residents of the building have also voiced their dissatisfaction with the building's lack of essential amenities, such as properly functioning air ventilation and trustworthy instructions for garbage management.

Therefore, the focus of the research is on developing the management of sustainable building practices and concepts. This is accomplished by providing specialists and engineers in the building construction industry with a description of the components of a sustainable building. This ensures the design of buildings that give the building user a sustainable environment and comfort.

Where the specialists, experts and engineers in building construction (such as civil engineers, architect engineers, mechanical engineers, electrical engineers, construction inspectors, quantitative inspectors, and so on) spend a small amount of time in the lifecycle by beginning their role in the design process and completing it in construction. This is because their time in the lifecycle is spent beginning and ending with the construction phase.

In Iraq, the participation of specialist specialists and engineers in building construction can make a substantial contribution to the realization of sustainable buildings. This can be accomplished through the use of expertise in building construction.

2. GREEN BUILDINGS

An exhaustive literature review was carried out in order to analyze the growing momentum of the green building sector all over the world. To get started, the ideas of sustainability and green construction are disassembled into their constituent pieces, which are an integrated design process, evaluation criteria, and strategies for putting sustainable practices into action. Following that, a succinct history of the sustainable architecture movement in Iraq is given to the reader. This chapter comes to a close with a comprehensive search of previously published studies and research that focuses on the drivers of the green building movement as well as the barriers that stand in the way of them achieving their goals.

2.1 General Review

Since it became apparent that "global warming" was a significant issue, the concept of "sustainability" has become increasingly prevalent. The International Commission on Environment and Society established the first definition of the term "sustainability" in 1987. According to this definition, "sustainability" means "meeting the requirements of the present without compromising the ability of future generations to meet their own needs." The objective of achieving a balance between social and economic progress as well as environmental sustainability is referred to as the "triple bottom line" (Figure 2.1). This is the word that is used to express the goal of achieving this equilibrium.

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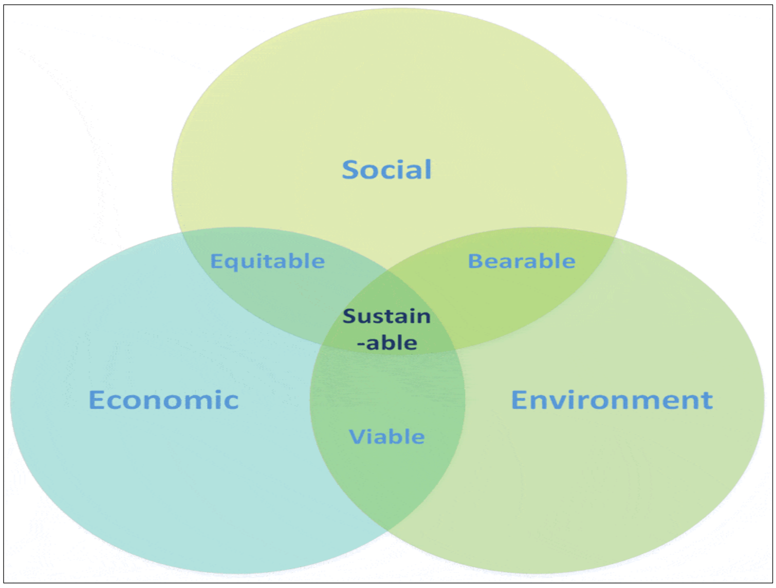

Figure 2.1: Sustainable Development

Source: (Blewitt, 2014)

According to this definition, "sustainability" means "meeting the requirements of the present without compromising the ability of future generations to meet their own needs." The objective of achieving a balance between social and economic progress as well as environmental sustainability is referred to as the "triple bottom line" (Figure 2.1). This is the word that is used to express the goal of achieving this equilibrium.

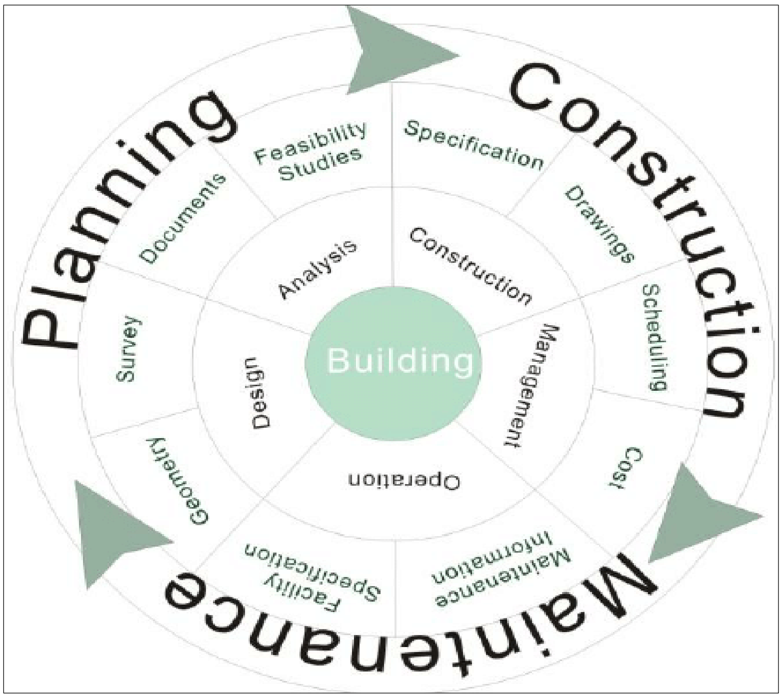

Figure 2.2: Life-Cycle of Sustainable Buildings

Source:(Marzouk et al., 2018)

The topic of sustainable development was discussed in relation to the construction of environmentally friendly buildings as part of the scope of this thesis. The design phase, the construction phase, the operational and service phase, and finally, the destruction phase are the four key stages that a structure will go through in its lifetime.

As can be seen in figure (2.2), sustainable building entails shifting away from processes that result in pollution and the consumption of non-renewable resources in favour of using resource-efficient ingredients and processes that are advantageous to the environment and society throughout the pre-building, building, and post-building stages of the construction process. This can be done in order to meet the requirements of sustainable building.

Marzouk et al. (2018) suggest that the building processes should be assessed at each of these three phases so that a clearer understanding can be achieved regarding the ways in which the design, construction, operation, and disposal of a structure might have an effect on the larger environment.

In this study, the concept of a "green building" is dissected in terms of its characteristics, goals, and the methods that have been put into practice to limit the adverse impacts that construction can have on both the wellbeing of individuals and the natural environment. There are also a variety of terms that can be interchanged with one another. These phrases include "high-performance building," "environmentally friendly building," "sustainable building," and "energy-efficient building." The terms "green building" and "sustainable building" will be used in a manner that is analogous to and interchangeable with one another throughout the course of this thesis.

Every project ends up with its own one-of-a-kind environmentally friendly solutions due to the fact that every sustainable concept is constructed according to the specific needs of that project, which might vary greatly in terms of climatic conditions, geographic variables, environmental and social requirements, and the construction materials that are used. It is absolutely necessary to define the "integrated design process" in order to fulfil the description of "green building".

It is vital to handle each of the green construction strategies that are stated in the table that is placed above in order to produce a building that is sustainable in terms of the environment, the economy, and society. These approaches ought to be treated in a coordinated and unified fashion. The Integrated Development Process is a method that is used in the design phase to identify and address any issues that may have a big bearing on the project's long-term sustainable effectiveness (Luo et al., 2022).

This method is used to identify and address any issues that may have a substantial bearing on the project's long-term sustainable effectiveness. Utilizing an integrated design approach that promotes synergy between different fields of study and different technologies is one way to achieve substantial levels of building efficiency.

This type of procedure can be seen in many modern construction practices. When coupled with a high-efficiency building envelope, such as stronger windows and greater insulation, reducing the size of the building's mechanical structure can be one approach to decrease expenses in this area (Renauer et al., 2021).

During each stage of the design process, mechanical engineers, construction engineers, architects, and any other relevant professionals should work together to generate synergies and find additional options.

According to Luo et al.'s research from 2022, every design decision must be based on a careful analysis of the costs and advantages associated with it. Integrated design, however, is about more than just getting everyone on the design team in the same room at the start of a project to agree on performance goals.

It's also about creating a common vision for the work that needs to be done and enhancing the quality of connectivity and data used to notify it. This was pointed out by Deutsch (2011). Integrated design is about more than just getting everyone on the design team in the same room at the start of a project.

According to Othman et al. (2008), the following are the most significant features of the integrated design methodology:

1. Recruiting members for the design team who are interested in taking part in an innovative approach to the design and implementation of buildings.
2. Establishing ambitious goals for the entire group and assessing their progress in light of those objectives.
3. Bringing the group to the point where they have no costs.

4. Include "thinking" time, such as charrettes, research, and other comparable activities at the beginning of the design process.
5. Making sure that there is sufficient time for input and modifications before committing to the ultimate design conception.
6. Include everyone in the project as much as possible.

For one to be able to comprehend the integrated design process, it is absolutely necessary to have previous knowledge of the traditional design process. According to Renauer et al., 2021, the traditional method offers very few options for optimization, which frequently leads to problems in the later phases of the process.

On the other hand, integrative design provides a wide variety of options for optimization from the very beginning of the design process, as can be seen in figures (2.3). This can be considered an advantage of integrative design.

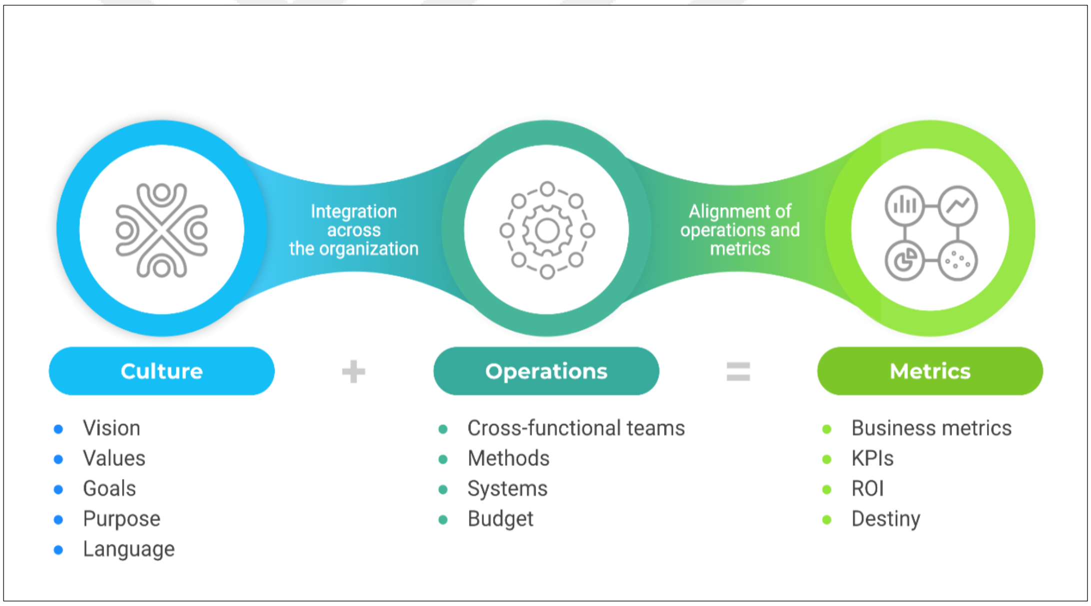

Figure 2.3: Possibilities for Design-Integrated Business-Defined

Source: (Renauer et al. ,2021)

Certification programs or grading tools, which are used to evaluate the performance of the building in question and to promote green building practices and techniques, are another essential component of green buildings. These programs and tools are also important features of green buildings.

These grading systems are continuously being enhanced over the course of time in response to advancements in technology, expert knowledge, and trends in the industry. The acronym "BREEAM," which is an abbreviation for "Building Research

Establishment's Environmental Assessment Method," was first introduced in the United Kingdom in the year 1990. Other examples of rating systems are "LEED," which was developed in the United States in 1998, and "CASBEE," which stands for "Comprehensive Assessment System for Building Environmental Efficiency", and was developed in Japan in 2001.

Both of these rating systems are examples of rating systems that were developed in their respective countries. The fact that all of these distinct rating methodologies make it possible to share industry expertise, which in turn accelerates the movement toward greener building practices, is a major benefit of using them.

2.2 Green Building at Iraq Constriction Projects

There is no denying the undeniable fact that the rate of expansion of the green construction movement is picking up speed in each and every part of the planet. In point of fact, "green building" or "sustainable methods" have a long history due to the fact that they were developed in response to a movement to conserve the environment as well as an energy crisis. As a direct consequence of this, a rapid process of change is occurring in the built environment of Iraq, and there is a rapidly growing interest in the construction of environmentally friendly buildings.

Many of the concepts that are encompassed within the term "green building" have previously been investigated for use in construction projects and put into action from the point of view of the design that is prevalent at this juncture in history. These concepts have a history that predates the year 5000 by a significant margin. Conventional houses and modern houses have been compared and contrasted with one another in the course of an investigation into methods for creating energy-efficient constructions in a heated and dry region of Iraq (Alfaiz et al., 2021).

These concepts of design requirements include the choice of area, a way away between buildings, alignment, building envelope, and form. According to the findings of the study, the average temperature inside traditional homes during the hot summer months is noticeably cooler than the average temperature inside modern homes.

2.3 Targets of Green Buildings

The green building revolution is producing a transformation in the building industry, which is leading to an increase in this sector's market share as a consequence of the transformation. Hurmekoski et al. (2018) noted that despite the fact that the strategies and ideas are already in existence, the issue is in stepping beyond the comfort zone of "business as usual" and daring to be innovative. This was stated despite the fact that the strategies and ideas are already in existence. In order to investigate the current state of study on the difficulties and potential benefits associated with projects involving green construction, a search of the relevant published literature was carried out.

2.3.1 Economic targets

There are significant financial benefits associated with environmentally friendly buildings. These benefits include lower direct capital costs, lower operating expenses, and lower overall costs over the life cycle of the building. In addition, there is an improvement in labour productivity and a boost in property values for building participants. The following is a summary of some of the published research that is relevant to the subject at hand, and that has attempted to quantify the financial benefits of using environmentally friendly building materials.

According to Rana et al. (2021), who carried out the first comprehensive research examining the costs and financial benefits of green buildings, investing an additional two per cent of budget estimating delivers life cycle gains that are 10 times greater than the initial expenditure.

The decreased consumption of electricity, water, and waste, the decreased expenses connected with management and maintenance, and the enhanced tenant productivity and health all result in financial gains for the business. As an illustration, the initial upfront expenditure of $100,000 to include environmentally friendly construction technologies into a project that costs $5 million would provide savings of $1 million over the estimated lifetime of the structure, which is 20 years (Rana et al., 2021).

In 2004, the "General Services Administration (GSA)" carried out yet another study in which they evaluated and contrasted "12 LEED" certified buildings that were located in different parts of the United States. According to the data, environmentally friendly buildings have significantly lower running expenses in addition to improved energy efficiency.

The international cost assessment firm known as "Davis Langdon" published a report in October 2004 in which it compared the construction costs of 138 buildings (libraries, laboratories, and the like) located throughout the United States. Of these 138 buildings, 93 were not designed to “LEED” standards and 45 were attempting to become certified as “LEED” buildings.

According to the findings of the study, there was no economically significant difference in the total expenses incurred by either sustainable or conventional constructions. A reexamination of the research in 2006 reveals the same results when it comes to drawing inferences. An additional study that aimed to quantify the benefits of sustainable buildings showed that manufacturing efficiency increased by around 25% and electricity usage reduced by nearly 30% on a square foot basis in the new facility that was designed in a green style (Liu et al., 2019).

These results were found in a new study that attempted to quantify the benefits of sustainable buildings. As a result of an improved working environment, decreased building running expenses, and reduced infrastructure maintenance costs, environmentally friendly buildings have three positive effects on the capital value of the building. One of these benefits is an increase in the building's overall worth.

Figure (2.4) illustrates these three positive aspects of the situation. In the following paragraphs, an explanation will be given of a few studies that confirmed the enhanced worth of environmentally friendly buildings.

Awadh (2017) have just published research that provides evidence that buildings with green qualities have a beneficial influence on the transaction prices of rental and sales per net square meter on the order of 21 and 26 per cent, respectively. This research was conducted in the United States. According to the findings of a different study that investigated the relationship between energy-efficient design and the leasing and revenue markets for commercial property, it was discovered that rents are approximately seven per cent to seventeen per cent higher; the selling subscription is found to be thirty dollars per square foot for Energy-Star labelled properties and one hundred thirty dollars per square foot for “LEED” certified properties, respectively.

Figure 2.4: The Economic Targets of Green Buildings

Source: (Rana et al., 2021)

Awadh (2017) conducted research that investigated the connection between energy-efficient construction and residential real estate leasing and revenue markets. This study looked at the market for residential real estate.

In a different piece of research, Wen et al. (2020) investigated the financial impact that environmental certification has on commercial real estate properties. They found that there is a price premium of 10% and 31%, respectively, for 292 Energy Star-Certified buildings and 30 "LEED" Certified structures when compared to non-certified buildings in the same metropolitan location and that this premium applies to both “LEED” and Energy Star certifications. This is in contrast to the other buildings in the area that do not have the appropriate environmental accreditation.

2.3.2 Social targets

There is a growing body of knowledge, in addition to a few case studies, that demonstrates the benefits that daylighting, healthy ventilation, and improved air quality provide for environmentally friendly architecture. These advantages include improved air quality. All of these benefits contribute to an increase in worker productivity, as well as improvements in their health and a reduction in absence and illness. An extensive study on the topic of air-conditioned environmental quality was used as the foundation for an article that compared the levels of satisfaction level in green and non-green office buildings about the quality of the indoor environment.

The article was written to compare the levels of satisfaction level in air-conditioned environments.

According to the data, people who work in green buildings are, on average, more satisfied with the amount of thermal comfort and air quality that is available at their place of employment. On the other hand, the average levels of satisfaction in green buildings with regard to illumination and acoustic quality were comparable to those reported in no green building constructions (Huang et al., 2019).

These findings were published in the journal Environmental Science & Technology. According to the conclusions of an additional study that Fatourehchi et al. (2020) had commissioned, environmentally friendly workplaces have a considerable favourable effect on the efficiency and contentment of staff members in the workplace.

According to the findings of a third study (Rafindadi et al., 2014), the finest sustainable construction in Australia exceeded even the highest quality structures on a consistent basis. This was determined by looking at the buildings from the perspective of the people who lived in the buildings.

In spite of this, Vyas et al. (2019) found no evidence to support the concept that sustainable buildings are more acceptable when they compared the levels of felt comfort of persons working in a green campus building with those of people working in two conventional campus buildings on the same campus. The green campus building was the control group.

In spite of this, there are still problems, questions, and difficulties related with this topic because there is not yet a clear conceptual framework for measuring human outcomes and linking them to design features.

According to Jensen et al. (2018), the complexity of the problem prohibits academics from conducting adequate investigations into the social components of sustainable architecture.

According to the findings of the statistical study, professionals working in the green building business in Canada are unsure of the benefits of green construction in terms of health and efficiency, and they do not understand how to evaluate these advantages.

This was supported by the fact that these professionals do not understand how to evaluate these benefits. These factors are thus very significant when it comes to the turnover rates of tenants and the selling anticipations of the property.

According to Jensen et al. (2018), this indicates that the effects they have on the economy are not just considerable but also easily apparent. The findings of an analysis into how the construction of buildings and the quality of the interior environment affect the occurrence of respiratory illnesses, the severity of "allergy" and "asthma" illnesses, and the productivity of workers give solid evidence for this assertion. As a direct consequence of this enhanced health and productivity, as shown in figure (2.5).

Figure 2.5: The Social Targets of Green Buildings

Source: (Jensen et al., 2018)

2.3.3 Environmental targets

As can be seen in figure (2.6), the extraction of raw materials for use in the building industry has a variety of unfavourable effects on the natural environment in its immediate vicinity. These effects can be seen as a result of the pollution caused by the processing of these resources. The activity sequence begins with the mining and manufacture of raw materials, continues with the provision of resources such as energy, water, and industrial machinery, and then culminates with the destruction of structures and the disposal of rubbish.

Building Environmental Performance Analysis System (BEPAS) is a system that was developed in accordance with the life cycle evaluation framework. Its purpose is to evaluate the effects that buildings have on the surrounding environment in three key areas: building facilities, construction materials, and location (GhaffarianHoseini et al., 2013)

"BEPAS" stand for in an acronym. According to the findings of this system, the phase of a structure's life during which it is working is accountable for the biggest share of the sum of all environmental impacts. During this time period, there will be a huge quantity of use of natural resources and an enormous amount of pollution that will be discharged into the environment.

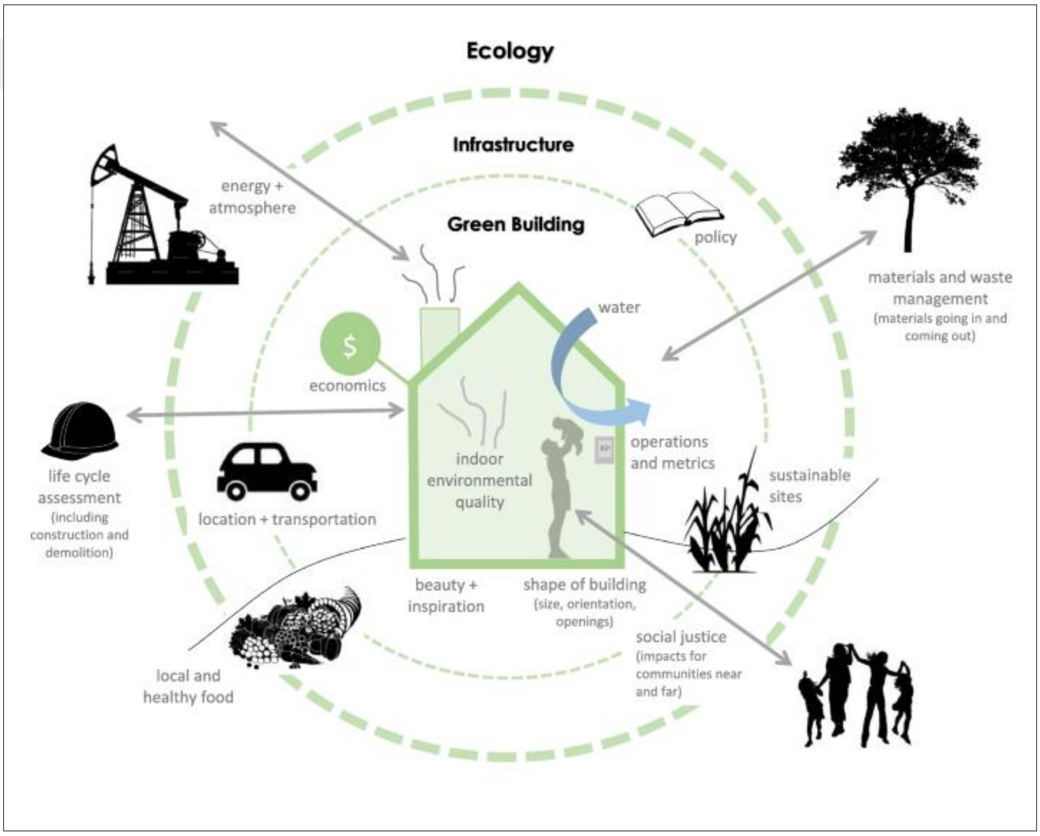

Figure 2.6: The Environmental Targets of Green Buildings

Source: (GhaffarianHoseini et al., 2013)

The warming of the world is the first consequence that will occur as a result of all of these effects; this will be followed by the exhaustion of fossil fuels, the depletion of water resources, and the acidification of the oceans (Singh, 2018). As a result of this, the construction of environmentally friendly buildings has the potential to alleviate these undesirable repercussions and inspire activity within the sector.

2.3.4 Organizational targets

The development of more sustainable procedures and strategies results in alterations in the management, procedures, and values of an organization. According to Häkkinen and Kaisa Belloni (2011), organizations will make environmentally friendly buildings the standard within the next five to ten years, and as a result, sustainability is becoming more than just a trend.

Aktas et al. (2015) used the framework of the balanced scorecard to describe the potential links between sustainable design and organizational success. These potential connections were described in terms of financial, business process, client relationship, and human resource improvement, as shown in figure (2.7).

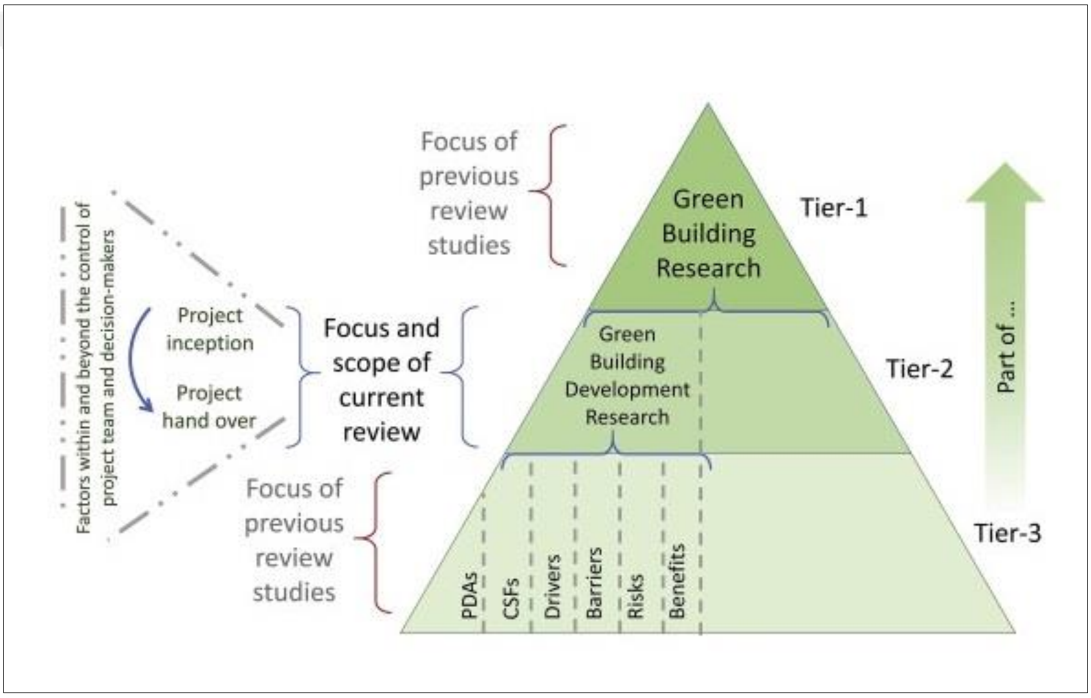

Figure 2.7: The Organizational Targets of Green Buildings

Source: (Aktas et al., 2015)

It is possible for businesses to include environmentally conscious concepts into their overarching strategy planning.

According to the interpretation offered by Van et al. (2014), the core idea behind the sustainable strategy is that innovators can acquire a sustainable competitive advantage by contributing to ecological flexibility, environmental preservation, and social accountability. Buildings that are low in their impact on the surrounding environment and efficient in their use of energy can help develop a reputation for environmental sensitivity.

2.3.5 Market targets

The most recent pattern demonstrates that there has been an increase in the number of buildings all over the world that are environmentally sensitive. This improvement can be seen in every region of the world. A growing number of nations across the globe are developing and implementing building certification systems as part of their national building codes. This development brings in freshly established strategies and procedures that are kinder to the environment than their predecessors (Matisoff et al., 2016).

The nature and rate of innovation in the construction industry are notably unique from the nature and rate of development in other industries due to the fact that the physical element of construction as well as the social and economic circumstances of a construction firm, have a significant impact on the nature and rate of innovation in the construction industry, as shown in figure (2.8).

Figure 2.8: The Market Targets of Green Buildings

Source: (Matisoff et al., 2016)

In order to achieve this milestone in the building and construction industry, it is necessary to enlist the cooperation of both producers and suppliers. It is feasible that they will build their understanding on their own or with the assistance of "R&D" firms and then give it to construction companies and design professionals after they have accomplished this. Another aspect that may be contributing to its rising popularity is the demand for "GB" from customers and their willingness to pay for it.

Despite the fact that green buildings have higher construction and environmental performance advantages and lower operational costs, customers are not willing to pay extra for green buildings at this time (Wu et al., 2022).

2.4 Challenges to Realizing Green Buildings

The challenge that faces those working in the construction sector is figuring out how to incorporate the positive aspects of environmentally responsible procedures into projects in a way that clients will be able to comprehend and will garner their support.

2.4.1 Economic challenges

There is still some area for disagreement in regard to the potential roles that the government may play in assisting with the marketing of environmentally friendly buildings. This is owing to the fact that governments at all levels play a crucial role in the process of promoting and putting into reality green construction plans all over the world. A great number of studies have been conducted in an effort to determine which approach would be most effective in terms of providing assistance from the government.

Additionally, because the government should enhance the amount of work it puts into making public buildings ecologically friendly, safe, and healthy while simultaneously lowering the negative impact these buildings have on the surrounding environment and providing a good financial value (Zhang et al., 2019).

It is possible that consumers are under the idea that the initial expenses associated with environmentally friendly structures are higher. As a consequence of this, a significant number of studies have concentrated their attention on the management of startup costs for ecologically friendly structures.

(2005) show that there is a modest environmentally friendly premium of (2.42%) in overall advancement cost and that the overall building cost of research papers ranges from (18%) below each (9%) above the expenditures for corresponding conventional affordable homes. These findings are supported by the fact that the overall construction cost of research papers ranges from (18%) below each (9%) above the expenses for equivalent conventional affordable homes.

(2005) was the year that saw the publication of the study that compared the costs and benefits of living in environmentally friendly but more inexpensive dwellings. It gives the impression that the initial costs might be cut down to a lower level.

There are even a few researchers who are of the belief that there won't be any requirement for any more costs in the not-too-distant future. According to Bungau et al. (2022), there is the possibility for initial construction costs as well as ongoing operational costs of a facility to be decreased if high-technology and low-technology solutions are combined effectively. This might apply to both the initial building of the facility as well as ongoing operational costs.

Figure (2.9) indicates that if you save even more energy, you can "tunnel through the cost barrier," which means that your costs will go down while your return on investment will go up. This is illustrated by the graph. Insulation that is sufficiently thick and windows that are functional enough, for example, can eliminate the need for a furnace, which is an expense that is greater than the cost of such efficiency improvements (Raouf et al., 2019).

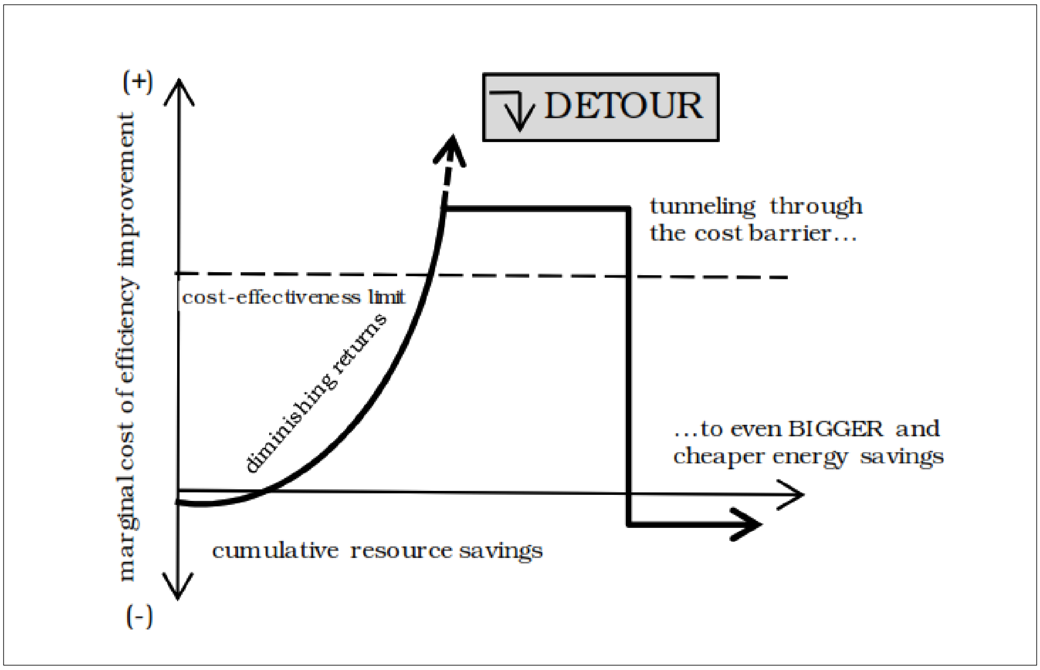

Figure 2.9: Break Expense Obstacle of Green Building

Source: (Raouf et al., 2019)

The following is a list of important strategies that can be used to address the problem of "high first cost":

1. Starting early on by setting goals that are both explicit and quantifiable.
2. Form an integrated team and select a group of people that are skilled in designing in a way that is responsible for the environment.
3. Utilizing an integrated design methodology the fundamental benefit of an integrated design approach is its capability to provide higher-performance outcomes without boosting total construction costs; this advantage can be seen in integrated design's ability to generate higher-performance outcomes.
4. Seeking inducements and financial help from the government or other utilizes

2.4.2 Educational challenges

Life-cycle thinking is vital to the actualization of the concept of sustainable construction because of the significant amounts of material and energy that are expended throughout the course of a building's existence. In order to facilitate the formulation of an informed decision and the fulfilment of a client's long-term requirements by taking into account potential developments, the purpose of a life cycle evaluation, which is also referred to as a cost evaluation, is to determine how much money will be spent over the course of a building's realized lifespan. This is done in order to determine how much money will be spent over the course of a building's realized lifespan.

On the other hand, the life-cycle costing technique is not commonly used since there is not yet a well-defined methodology, there is a shortage of data, and there is a lack of comprehension. Consequently, there is not much of a demand for it. This can be demonstrated by a survey that was carried out in Canada to determine the level of awareness and confidence that specialists have regarding the research work that was done to determine the expense premiums, long-term advantages, as well as health and efficiency advantages of green buildings.

The survey was carried out to determine the level of awareness and confidence that specialists have regarding the research work that was done. The outcomes of the survey indicated that practitioners proceeded to mention excessive cost premiums as the key hurdle to investing in environmentally friendly activities.

Tran et al. (2020) established a set of potential sustainability critical productivity indicators, and those indicators are displayed in table (2.1).

Table 2.1: Indicators of Potential Sustainability for Critical Productivities

Requirements	**Indications for the evaluation of existing structures**
Object characteristics/object performance	
Technical efficiency	Achieved class for thermal insulation Class of soundproofing achieved. Implemented fire safety training. Capacity to carry a load in practice. Facilitating the performance of maintenance, service, and recycling tasks.
Functional efficiency	Performance and maintainability Adaptability and receptivity. Appropriateness for extended service life. Availability.
Environmental efficiency	
Energy consumption	Need for primary energy sources throughout residence (measured)
The exhaustion of raw materials	The utilization of fossil resources
Land use	Level of lot sealing at present. The present value of land utilization.
Effects on the environment	“GWP100 (CO2-equivalent)” “ODP” “AP (SO2-equivalent”) “EP” Energy of photo-oxidation
Waste generation	Generation of waste during habitation and use. Cumulative waste buildup (by categories).
Effects of lots on soil and groundwater table	effects of lots on soil and groundwater table
Economic efficiency	
Life cycle expenses	Expenses associated with renovation and alteration. Effective management and maintenance expenses. Effective/anticipated disposal expenses.
Increasing one's income and value.	Streams of income/the current value of the market/the most recent evaluation of worth
Social efficiency	
The health of the residents and clients	The manifestation of Sick Building Syndrome/BRI. The presence of black mould.
The health of the occupants'/users' satisfaction and well-being.	User/occupant pleasure.

Table 2.1: (Cont.) Indicators of Potential Sustainability for Critical Productivities

Requirements	Indications for the evaluation of existing structures
Object characteristics/object performance	
Protection for residents	Amount of accidents connected to construction
The efficiency of indoor air	Aromatic freshness the concentration of particular substances (TVOC). Radon content concentration
The contentment and well-being of neighbours	The disruption caused by construction and building occupancy.
Cultural efficiency	Existing historic protections

(Source: Tran et al., 2020)

Furthermore, the majority of specialists lacked understanding regarding the magnitude and influence of efficiency and health benefits, in addition to the most efficient method to measure these elements (Ekung et al., 2022).

This was a problem because the majority of professionals work in the field of health care.

These indicators were derived not only from the characteristics of the thing in question but also from its environmental efficiency, economic efficiency, and social efficiency. With the help of these indicators, we will evaluate whether or not the required performance has been met while having a minimal impact on the environment around us.

In order to make genuine and long-lasting changes to the way sustainability is practised in a field that is developing at such a rapid pace, there may be a need for more education programs and papers that have been around for a longer period of time. This is one of the educational challenges that must be overcome.

This is because the majority of the metrics that respond to quality, efficiency, and the impact on the environment continue to be subjective, making them difficult to measure and, as a result, difficult to award. The reason for this is due to the fact that the majority of the metrics that respond to quality, efficiency, and the impact on the environment continue to be subjective. It is necessary to have needs and specifications that are well-balanced, such as having policies for both society and the environment, in order to carry out an analysis that takes into account all of these components together.

2.4.3 Market challenges

At this point in time, it would appear that the Iraqi construction sector is unaware of the potential benefits that could help shift the market and client demand. Because of this, the process of selecting the offer that will be awarded the contract will be quite simple and easy in principle: the offer that is either the most financially advantageous or the offer that has the shortest time to construct the building will be awarded the contract. When doing an analysis of a product or service's quality, efficiency, and environmental impact, one must not only take into account its cost and the amount of time it will take to supply it but also take into account issues regarding its ability to be sustained (Ismael et al., 20219).

Two other concerns that have the potential to impede the expansion of the industry are the scarcity of both environmentally friendly materials and technological solutions. When it comes to the acquisition of building materials and technological advancements, two of the most important considerations that need to be made are what to purchase and who to obtain it from. To use sustainable raw materials, such as those derived from recycled or agricultural waste, and that do not have any harmful or other emissions that contribute to the health of building occupants, it is vital to have knowledge of the quantitative environmental life-cycle of the product. This information is required in order to employ these types of raw materials. These materials are able to be produced from various waste sources.

During the course of the study project titled "Breaking Through the Barriers: Challenges and Solutions to Code Approval of Green Building," code officials were questioned regarding the aspects that led to the denial of applications for environmentally friendly products, materials, systems, and designs. This was done in order to identify the variables that contributed to the denial of these applications. The findings indicated that there are obstacles in the form of building codes that prohibit the acceptance of environmentally friendly building alternatives. These hurdles prevent the adoption of greener building solutions.

According to Meacham et al. (2020) research, a disagreement with the goal of the code is considered to be a non-technical limitation, but the supporting information for alternatives that accompany plans is considered to be a technical challenge. In addition, there is the chance of resistance to the adoption of new technologies due to the fact that these technologies require a procedure of modifications, are difficult to implement, operate, and integrate into the building, as well as having the potential for hazards and expenditures that were not anticipated.

These factors all contribute to the possibility of resistance to the adoption of new technologies. Because of the complex nature of the supply chain in the construction industry, the various actors in the sector each have their own unique areas of focus and perspectives on a wide range of subjects. Because of this, meeting the requirements for sustainability will be a more challenging endeavour to undertake. The importance of having an integrated design team is emphasized in this context since having such a team makes it possible for all of the parties concerned to communicate with one another, which is one of the main reasons why having such a team is necessary (Nguyen et al., 2017).

2.4.4 Organizational challenges

Building organizations in Iraq, including both consultants and contractors, have a limited quantity of competence and experience with this topic at the moment. This is the case for both of these categories of building companies. This causes the project timelines to be delayed and large starting expenses to be incurred, which, in turn, impedes the expansion of the green construction sector.

This problem raises the question of what should be done to develop new information, cultivate existing knowledge, put new knowledge to use, and distribute existing knowledge among professionals in order to urge construction enterprises to reform their management methods (Ismael et al., 20219).

Despite the fact that environmental problems have an impact on businesses and that businesses have an impact on the preservation and quality of the environment, businesses should work to improve their awareness of sustainability, and they should be cautious about financing and taking risks in today's highly demanding and uncertain business climate (Van et al., 2014).

2.5 Rating System of Green Building

The objective of the total quality assessment system, also known as “TQA”, is to evaluate three distinct aspects: environmental and energy pollution considerations;

investment economic reasons and equity; and social demands, such as the accessibility and quality of the places. The goal of the system is to create a comprehensive framework for the environmentally responsible construction of buildings. In addition, the term “TQA” refers to multi-criteria assessment systems (Chandratilake and Dias, 2015).

The “Building Research Establishment Environmental Assessment Method (BREEAM)”, which was developed in the United Kingdom, the “Leadership in Energy and Environmental Design (LEED)”, which was developed in the United States, the “Comprehensive Assessment System for Built Environment Efficiency (CASBEE)”, which was developed in Japan, the “Sustainable Building Tool (SBTOOl)”, and the “Green Building Index (GBI)”, which was developed in Malaysia, Hong Kong, and other Asian countries are all examples of multi-criterion systems. The Building Environmental Assessment Method, which was developed in Hong Kong, the Australian Building Greenhouse Rating (ABGR), the Green Home Evaluation Manual (GHEM) of the Chinese Three Star, the “United States Assessment and the Rating System (STARS)”, and the “South African Sustainable Building Assessment Tool (SBAT)” (Maling et al., 2021).

Multi-criterion frameworks are what really help to help quantify how sustainable a building is; while frameworks help to identify sustainable construction requirements, multi-criterion frameworks are what really help to help quantify how sustainable a building is. while frameworks help to identify sustainable construction requirements, multi-criterion frameworks are what really help to help quantify how sustainable a building is. In the evaluation, there are a total number of points up for grabs, and each strategy is worth a different amount of those points. When it comes to sustainability, total quality assurance (TQA) is the collection of findings that result from analyzing the factors.

It also adds that the system's summing process is crucial because it assigns rankings to components that have been positively evaluated. It is generally intelligible and may be executed in steps for each criterion, which enables a building to be evaluated at different stages from design to design and, furthermore, over the entirety of the construction as accurately as possible (Karmany, 2015).

According to Awadh (2018), the three basic categories of multi-criteria that should be considered are metrics, assessment frameworks, and evaluation of research instruments. The most prevalent kind of multi-criteria is measurements, sometimes known as metrics. Evaluation frameworks can be thought of as models of evaluation that are interrelated to one another and standardized. These models provide a set of tools that can be utilized in the process of contrasting a variety of various project options. These instruments can be classified as either reduction tools or non-reduction tools, according to Awadh (2018).

The evaluation of research tools is helpful in analyzing and providing prospective solutions for specific problems that arise during the construction of a house. These simplistic methods involving non-reductionist instruments involve a multi-criteria analysis that involves partly subjective analytical equivalents (Maling et al., 2021).

A cost-benefit analysis was used to assess output by minimizing the challenging structure according to fewer variables and combining its properties. This allowed for fewer variables to be taken into account when evaluating the output.

According to Awadh (2018), performance indicators are used to determine whether or not a building is environmentally sustainable. These indicators include the Ecological Level (such as the Environmental Impact), the Building Level (such as Zero Energy), and the Building Environmental Level (such as LEED, BREEAM, GREEN GLOBES, SBTOOl, GBI, SBAT, and so on).

2.6 The Advancement of Criteria for Rating Green Buildings

The past progression of green building evaluation approaches around the world is depicted in figure(2.10) as below. The initially such categorization was released in the year 1990 in the United Kingdom with the term BREEAM.

An increasing number of categorization has started expanding in many nations with a range of techniques of rating green buildings in line with the the environment, economic capacity, and social capacity of the country in question (Khoshbakht et al., 2018).

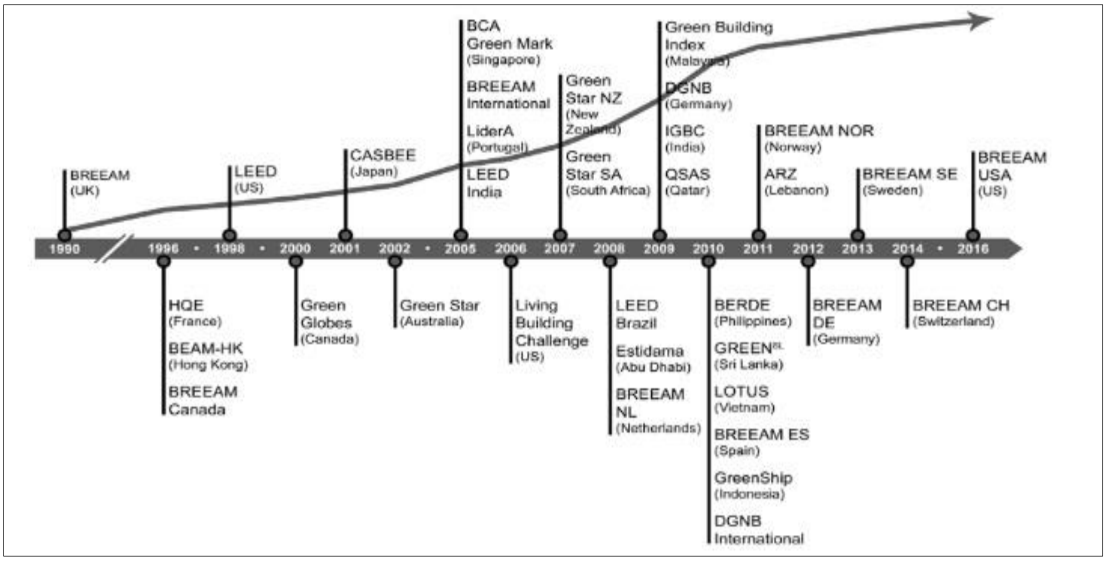

Figure 2.10: Advancement of Criteria for Rating Green Buildings

Source: (Khoshbakht et al., 2018)

2.6.1 BREEAM

The Building Research Establishment Environmental Assessment Method, also known as “BREEAM”, was developed by the BRE and served as a template for the design of sustainability evaluation instruments all over the world, such as the Green Star in Australia and the “HK-BEAM” in Hong Kong (Venou, 2014).

“BREEAM” is the world's biggest environmental evaluation and inspection framework for structures. Since 1990, it has been used in more than (425,000) facilities with BREEAM evaluation tools accredited, and about two million have been allowed for review. This framework is used in more than fifty nations (Umdu et al., 2021).

“BREEAM” is an extensive system for the measurement and definition of buildings. Within this system, which is used to provide recommendations for the best practices in the construction sector, “BREEAM” has a broad framework, as shown in figure (2.11)

“BREEAM” evaluates the energy performance of buildings in the following locations:

- Management: The regulation of general management, the oversight of site management, and matters pertaining to procedure.
- Energy: concerns over the environment and the cost of running energy.

- Pollution: taking into account both air and water contamination.
- Health and wellbeing: factors to consider for both indoor and outdoor health and wellbeing.
- Transport: carbon owing to transportation.
- Land use, as indicated by the green and brown areas of the region.
- Ecology: the preservation of the ecological advantage and the enhancement of the place.
- Materials: environmental impacts associated with the use of various construction materials.
- Water: the quantity and quality of water that is consumed.
- Innovation.

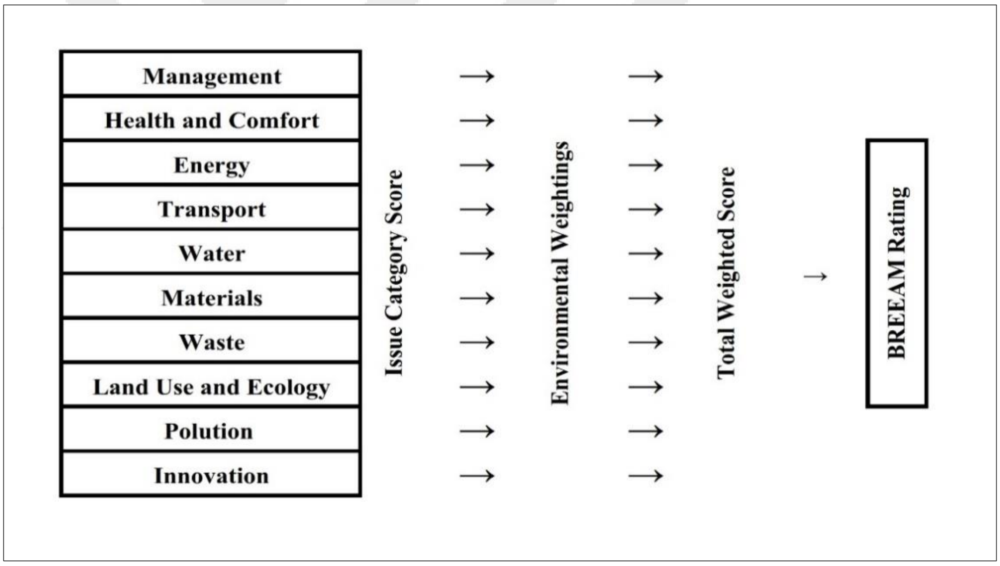

Figure 2.11: BREEAM Scoring Estimate of UK

Source: (Suzer ,2019)

The “BREEAM” application requires an examination of the above categories in terms of practice and results, which allows for the award of credits in the 10 grades (Suzer,2019), a method to measure the “BREEAM” values of Great Britain as demonstrated in (Figure 2.10).

Each category has its own unique set of prerequisites, which are outlined in table (2.2), and the contributions can either be qualities or products derived from the aforementioned parameters. During the course of the national advisory process that was carried out in the UK (Schwartz et al., 2013), the weightings were developed.

These characteristics are added up in order to produce a cumulative ranking that can be strong, very strong, or exceptional. The level of this ranking is determined by the cumulative total.

Table 2.2: Credits Weighting of BREEAM

Criteria	Weightings %	Attributes
Management	12	10
Health and Comfort	15	14
Energy	19	21
Transport	8	10
Water	6	6
Materials	12.5	12
Waste	7.5	7
Land Use and Ecology	10	10
Pollution	10	12
Innovation	10	10

Source: (Schwartz et al., 2013)

2.6.2 DGNB

Means "German Sustainable Building Council" in its native language. The “DGNB” is a non-profit organization in Stuttgart which have been working to promote livable cities and structures since its inception in 2007. To put it simply, this means constructing our surroundings with forethought. To foster an appropriate awareness of quality as a basis for accountable and sustainable engagement in the building and estate industry is central to our mission (Hamedani et al., 2012).

In addition to its efforts in Germany, but also throughout the rest of worldwide, the “DGNB” works to advance environmentally responsible construction practices through a number of different means, including the following:

- The “DGNB” has grown to become Europe's largest organization for sustainable construction thanks to the dedication and support of its about 2,000 participants.
- The different elements that define sustainable consideration, construction, and building management can be translated into practical implementation

through qualifications of sustainable constructions, building the inside, and areas.

- Facilitating comprehension of the prerequisites for green construction by providing access to the “DGNB” Academy's offerings.
- By use of the “DGNB” Navigator, a web-based resource that provides details on a wide range of eco-friendly building materials.
- By engaging in R&D efforts, as well as encouraging a continuous awareness of the concerns concerning sustainability in the building industry, we may make strides forward in this area.

The DGNB's guiding principles are based on an all-encompassing view of sustainability that takes into account ecological, financial, and social considerations. Our end goal takes into account both the environment and the economy. Therefore, the DGNB views sustainability as being associated with high quality and long-term success (Del Rosario et al., 2021).

By creating a system of accreditation that can be used as a planning and optimization tool to assist all parties engaged in the construction process in adopting holistic green effectiveness, the DGNB has made green construction more feasible, measurable, and equitable. Sustainable projects are assessed by using a battery of certification standards that are tailored to specific types of construction and design strategies, as shown in figure (2.12).

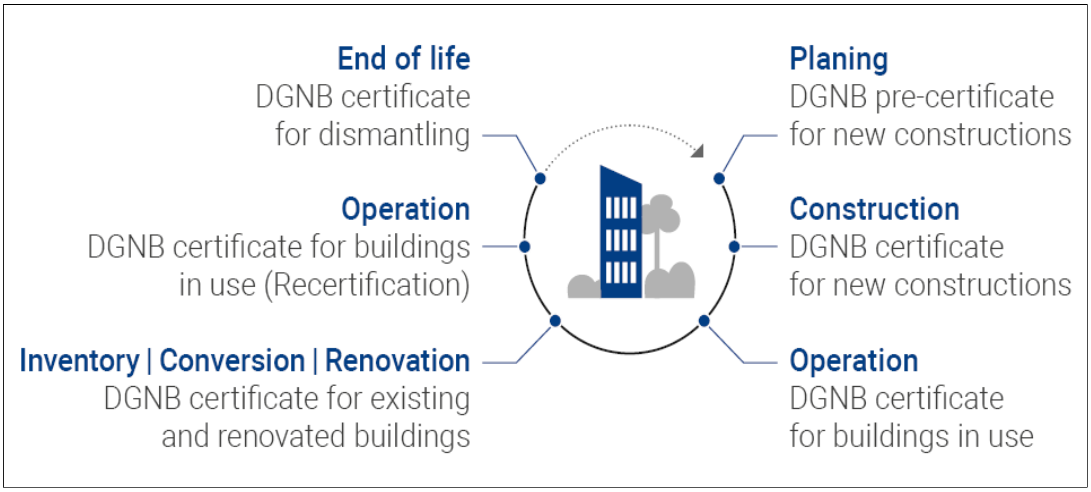

Figure 2.12: Process of DGNB

Source: (Del Rosario et al., 2021)

2.6.3 LEED

According to Zimmerman and Wu et al. (2016), this was initiated in the year 1998 by the United States Green Building Council (USGBC), along with various other parties involved. Their goal was to stimulate demand for environmentally friendly structures. In terms of the US Green Building Council (USGBC), the Leadership in Energy and Environmental Design (LEED) rating system is the second most popularly utilized sustainability evaluation tool in the entire world. It has a total of 20,000 projects that have been certified and registered under the "LEED" rating system.

During the actual construction of the building, the members of the design team will be the ones in charge of determining how far along the "LEED" certification path their project has progressed without the assistance of specialized consultants. It has a strong basis in scientific research, and its use can be directly related to its demand (He et al., 2018).

The LEED evaluation consists of three stages, which are as follows:

- Pre-requirements: the criteria that need to be met before the proposal can be reviewed.
- Core qualities are those for which credit is awarded for meeting or exceeding the requirements of the first five criteria.
- Innovation credits: performance credits that are now being provided; significant credits that have been distributed in the past.

According to He et al. (2018), in order to provide a systematic, simple framework to evaluate overall building performance and to achieve sustainable development goals, the "LEED" evaluation was created through a consistency process involving a key actor. The various sustainability classes are evenly weighted, different points are taken into account, and the credits allocated to each form are joined together.

The evaluation criteria are outlined in table (2.3), which may be found here.

Table 2.3: Division of LEED Points

Criteria	Attributes
Sustainable Location	26
Quality of Water	10
Environmental and Energy	35
Products and Materials	14
Interior Quality of Climate	15
Innovation	6
Regional Priority	4

Source: (He et al., 2018)

The construction sector was able to increase its abilities and understanding of SD with the use of these evaluation methodologies. However, Neama et al. (2012) suggest that the "BREEAM" evaluation range is greater and that its standards are harder to comply with the "LEED" criteria. This means that the "BREEAM" technique, in comparison to "LEED", is a lot more thorough method.

2.6.4 GREEN STAR

Green Star is an assessment system that was first introduced in 2003 by the Sustainable Building Council of Australian. It has now gained recognition on a global scale and is responsible for establishing the benchmark for healthy, flexible, and beneficial buildings and settings. Green Star was designed specifically for the climate of Australia, which is why it has already awarded certification to thousands of environmentally responsible fitouts, buildings, residences, and communities all around the nation (Roderick et al., 2009).

- Decreasing the negative effects of greenhouse gases.
- Improving both our health and the general standard of our lives.
- Rebuilding and conserving the ecosystems and uniqueness of our planet is a priority.
- Increasing the level of resilience in communities, constructions, and fitting.
- Creating a more sustainable industry and transforming the marketplace.

Additionally, there are four different Green Star assessment tools, and together they offer a way of certification for the planning and building of buildings, as well as for their operations, fitting, and societies. The “Sustainable Building Council of Australia (GBCA)” is responsible for the development of these tools, which are still undergoing further development despite having been created with extensive input from both the construction sector and government agencies as shown in figure (2.13).

Figure 2.13: Performance of GREEN STAR

Source: (Roderick et al., 2009)

2.6.5 SBTooL

The third-party utilizes the framework for building efficiency assessment that is provided by the “SBTooL” concept. This allows the third party to develop evaluation systems for a variety of distinct geographical criteria and facility kinds. Additionally, the rating system toolbox may be something that is taken into consideration. Before the results of the SBTool can be interpreted in any meaningful way, the primary focus of the tool is on the idea of tailoring a grading system to specific regional needs.

According to Kamino et al. (2018), the system has a typical structure that identifies local context conditions and establishes great weights and benchmarks in local non-commercial organizations. The “SBTool” sustainable building approach was established as part of an international initiative to create a more environmentally friendly construction environment. This initiative involved the involvement of over 20 different governments.

Gonçalves et al. (2020), the tool has been designed so that countries can construct their own local rating systems to correct local climate circumstances and languages. This has been made possible by the development of the technology. It is beneficial to users in a variety of areas and nations who are taking part in this evaluation process since it assists them in representing diverse goals, technologies, and cultural traditions and values.

Because of this, national groups have the ability to improve their standards and weightings by employing a variety of methodologies, such as the analytical hierarchy system, which is illustrated in table (2.4) (Saraiva et al., 2019).

Table 2.4: SBTooL Environmental Credits

Criteria	Weightings (%)
Location Choosing, and Project Managing	7.6
Energy and Products Utilization	21
Environmental Factors	25.2
Interior Quality of Climate	21
Quality of Services	15.1
Elements of Socioeconomic	5
Elements of Cultural and behavioural	5

Source: (Saraiva et al., 2019)

2.6.6 HQE

It is a benchmark for green construction everywhere; it also takes into account local considerations that may vary from nation to nation or even municipality to municipality. In fact, the worldwide building environmental evaluation methodology incorporates both universally applicable standards and a degree of flexibility to accommodate locally-specific certification norms. Non-residential constructions (warehouses, stores, hotels, etc.), multi-family and single-family dwellings, and entire communities can all get “HQE” authorization, as can urban development and design. Focusing on health, relaxation, and the quality of the interior environment, it strives to achieve ecologically friendly goals (Cauchard et al., 2013).

It is possible to obtain “HQE” authorization for a variety of building types, including residential, financial reasons, managerial, or service facilities that are now being construction, as well as buildings that are already in production and urban design and development initiatives. On the foundation of performance measurements, it encompasses the entirety of a building's lifecycle, beginning with the design process and continuing all the way until its final completion. At each of the project's main phases, an impartial third party Inspectors will evaluate whether or not the project's objectives have been met (Wu et al., 2021).

The energy, environment, wellness, and comfort are the four pillars upon which the certification is built as shown in figure (2.14). On a scale ranging from 0 to 4 stars, an evaluation is performed for each topic. The total number of stars collected across all four categories contribute to the final score for the project.

	Themes	Targets
1	ENERGY	Energy
2	ENVIRONMENT	Site, Components, Worksite, Water, Waste, Maintenance.
3	HEALTH	Spaces quality, Air quality, Water quality.
4	COMFORT	Hygrothermal comfort, Acoustic comfort, Visual comfort, Olfactory comfort

Figure 2.14: Rating of HQE

Source: (Wu et al. ,2021)

2.6.7 CASBEE

The “Comprehensive Assessment System for Built Environment Efficiency” is Japan's green construction management system. Its rating instrument employs a weighting system that enables the positioning of environmental concerns in the context of a conditional environment. The “CASBEE” was developed in Japan.

“CASBEE” is an evaluation instrument that was developed by the government of Japan and is administered by the Ministry of Building, Infrastructure, and Transportation. Its purpose is to evaluate the total environmental performance of a building (Sharifi et al., 2012).

The 80 different “CASBEE” sub-criteria are broken down into four categories: energy conservation, resource efficiency, the local environment, and the indoor environment. These four categories make up the four primary components of "CASBEE".

In addition to this, these groupings have been reorganized into two primary groups known as Q (quality) and L (loading) (Sasatani et al., 2015).

Instead of merely applying qualities points combined, the "CASBEE" includes the concept of building environmental efficiency; the execution of its particular plan to achieve the final results is differentiated from the other evaluations by excluding the weighting factors that are used for the classification of the various types of buildings. These other evaluations are focused primarily on the results of a survey of response stakeholders such as designers, occupants of buildings, and customers. The execution of its particular plan to achieve the final results is differentiated from these other evaluations. Following that, an analytical hierarchy evaluation is performed on the responses.

2.7 Designing the Sustainable Building Assessment Tools

There are more than 600 different types of sustainability assessment systems that can be found all over the world; however, according to Ilhan et al. (2016), none of these types of evaluation systems will be successful if they are used in countries in which they were not originally designed to function.

Because of the people for whom it is being made, each instrument has to be adapted specifically to take into account the climate of the area in which it will be used. When attempting to achieve sustainability, it is frequently necessary to provide comparisons of actual individual projects that have been examined by each technique. This sort of direct evaluation of the rating categories present inside each system is not only difficult but also expensive to carry out.

According to Ding (2008), the frameworks of sustainability evaluations can range anywhere from an overall energy efficiency assessment to a performance evaluation that considers multiple dimensions. Therefore, the viability of the building ought to be reviewed for every sub-element, including the services, the system structure, and the construction as a whole; consequently, the requirement for various evaluation and ranking tools has to be evaluated.

These differences between systems have, as a result of the implementation of the Sustainable Building Alliance, led to the formation of common assessment categories and an improvement in the systems' ability to be compared to one another (Ding,2008).

In light of the life cycle assessment (LCA), the United States National Institute of Standards and Technology (NIST) conducted an analysis of the LEED system. As a result of their findings, the LEED system's constrained scientific marker system, which is not a legitimate sustainability evaluation regulation, was discontinued (Suzer, 2019).

LEED is constantly being improved in order to further expand the building's capacity for reducing its impact on the environment. The LEED-NC rating system is currently in use for the design of homes as well as the construction of new structures such as schools, dwellings, hospitals, data centres, and warehouses, among other types of facilities. Additionally, there are LEEDs available for external plans, LEEDs that may be applied to existing structures, and LEEDs that can be applied to new property improvement projects (USGBC, 2016).

BREEAM has developed over the years, where the (BREEAM-NC), a guide with more than 400 pages that may be used for urban, private, residential, and industrial structures, including construction modifications, was initially published on a BREEAM 20 pages long and deals with a variety of issues (Soulti and Leonard, 2016).

This guide may be utilized for urban, private, residential, and industrial structures, including construction modifications. The BREEAM is suitable for use in existing non-residential facilities, as well as in BREEAM communities designed for the sustainable design of new communities' master plans or redevelopment projects; the certification can also be used for the refurbishment of already-existing buildings as long as they meet the international renovation and fit-out technical requirements. Nonetheless, it encourages the adaptation of these instruments in nations that have not yet built their own resources, with a particular focus on environmentally responsible building practices.

2.8 Concepts of Sustainable Building

According to Langston (2008), a concept framework is either a visual or written structure that provides an explanation, either graphically or in the form of a narrative, of the primary things or important concepts that are going to be researched in a research project. In a similar vein, the most important aspect of this research that has to be investigated is the functions that facilities managers have in relation to the components of sustainable buildings.

The project manager has never wavered in their dedication to the administration of the buildings and the services that are associated with them. Even at this late date, he continues to concentrate on the environmental problems posed by buildings (Keeler and Prasad, 2016). Nevertheless, the exact tasks that need to be specified in order to ensure the delivery of buildings that are less detrimental to the environment, improve the health and wellbeing of those who use the building, and give economic gain over the structure's life cycle are not yet known.

The procedures that are involved in the accomplishment of a research goal can be clearly explained using a conceptual framework. This framework should include major findings that are pertinent to the research as well as how these findings relate to address every area of the research in a similar manner; in the process of developing the conceptual structure of this study, research criteria were formulated, a review of the pertinent literature was carried out, and a content analysis of three papers (“BREEAM-NC”, “LEEDNC”, and “ISO 15392”) was performed.

This was carried out to identify the components that are necessary for a structure to be environmentally friendly. In addition to this, a content analysis was conducted in order to determine the roles played by the facilities manager in relation to the components of sustainable buildings. The elements that were identified served as a basis for determining the role that the project manager plays in environmentally friendly buildings. Research is supported and informed by a conceptual framework that defines concepts, hypotheses, expectations, attitudes, and theories (Pan et al., 2015).

It is a commonly held belief that the aforementioned texts define the standards for environmentally friendly structures and provide direction for this study.

The theoretical framework supplies the foundation for the presentation of a specific research issue that drives the research study that is being researched based on the research problem. It contributes to a better comprehension of the research issue (Díaz-López et al., 2019).

The framework is the first step in addressing the question of what constitutes a sustainable building and the role that the facilities manager plays in the process of obtaining sustainable buildings within the context of Iraq.

As was said previously, one of the most significant challenges that the built environment of Iraq is currently facing is poor design, insufficient construction specifications, the use of potentially hazardous building items and materials, and insufficient building maintenance and management. The framework offers a comprehension of the approach that will be used to resolve this issue (Shawkat et al., 2016).

2.9 Project Management's Contribution in Sustainable Construction

A procedure that supports sustainable organization in connection to the whole life management of workplaces in order to promote productivity and support company operations efficiently is referred to as project management (Murtagh et al., 2016).

The "Facilities Management Association of Australia (FMAA)" defines it as a practice that ensures effective operational management of buildings in both public and private organizations and comprises a broad range of activities ranging from strategic, operational planning to daily physical maintenance, cleaning, and the management of environmental efficiency concerns (Talib et al., 2013). The "European Facilities Management Network", also known as "EuroFM", defines facility management as the integration of diverse processes inside an organization with the purpose of maintaining and developing services that support and enhance the effectiveness of the principal activities of the organization. European professionals in the FM industry came up with and settled on this term (Talib et al., 2013).

Moreover, the "International Facility Management Association (IFMA)" and the British Institute of Facilities Management (BIFM), in their own description of FM, involve the assimilation of people in the worksite in addition to other processes. This is demonstrated in the FM model advanced by IFMA and is displayed in figure (2.15).

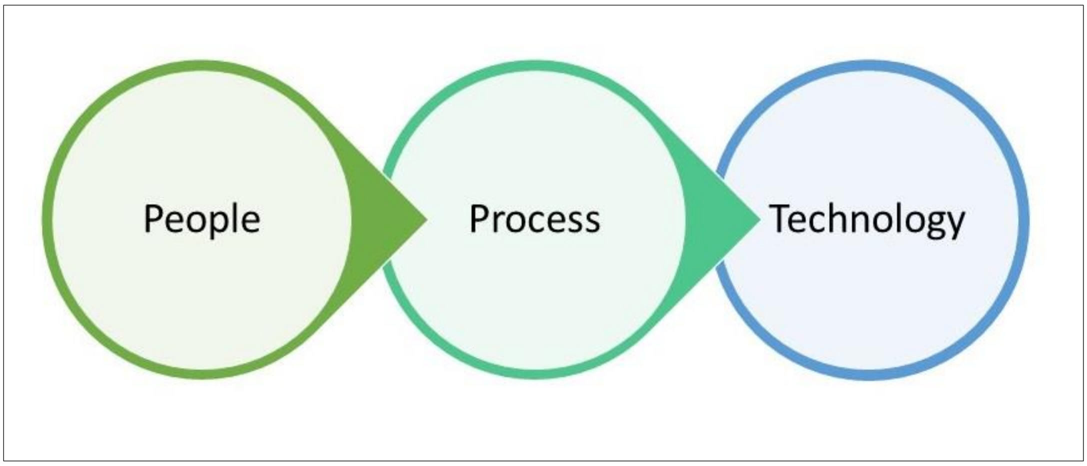

Figure 2.15: People Process Technology

Source: (EuroFM, 2014)

They define it as "the encapsulation of various disciplines to make sure capabilities of the built environment by assimilating people, place, process, and technology" (Talib et al., 2013).

Additionally, they describe it as "the integration of processes within an organization in the built environment to maintain and develop the agreed facilities which support and improve the effectiveness of the organization's primary activities and management of the impact that these processes have upon people and the workplace" (Kibert, 2016).

Project management can be thought of as a profession because its primary focus is on assisting clients in accomplishing their objectives. Moreover, the business and profession place a strong emphasis on the need to maintain positive relationships with clients.

2.10 Planned Future of Green Construction in Iraq

The term "sustainable development" refers to an ongoing movement to lessen the negative effects of human activity on the environment as a whole. Sustainable development relies heavily on green buildings being one of its primary techniques.

The building industry in Iraqi cities is plagued by the inadequacy of building practices and its reliance on traditional approaches, all of which contribute to adverse effects on the environment, increased consumption of electricity and natural materials, and a generally poor human quality of life (Mansor et al., 2020).

The process of transforming towards the implementation of green construction in Iraqi settlements is essential, but it is hindered by a lack of understanding of the most significant issues that stand in the way of this transformation and acceptance. This has prompted research into the most significant issues, with the goal of developing a vision and recommendations for overcoming these challenges.

2.10.1 Green buildings and challenges of implementation

Green construction is a worldwide response to the emerging understanding that humans play a crucial role in accelerating global warming. Over forty percent of all carbon dioxide pollution worldwide might come from buildings; this gas is one of the key suspects in the occurrence of global warming. The United States, Canada, Western Europe, and Japan account for over 80% of global greenhouse gas pollution in 2017. In the not-too-distant future, this situation will have shifted significantly (Khoshbakht et al., 2018).

Using into account the norms of the surrounding belonging, green buildings work for environmental harmony, efficiency in the use of resources, and the satisfaction of the building's occupants. All parties involved in the unified development approach are considered in green structure design. This includes the building shareholders, designers, engineers, specialists, construction organization, material producers, contractors, service technicians, and inhabitants. The key to a successful green building project is using high-quality materials that will boost the owner's return on investment (Abdelfattah, 2020).

During the last twenty years, there has been a dramatic shift in public opinion towards environmentally friendly structures. By providing thought leadership and transforming the market, the World Green Building Council (World GBC) helps to create green buildings and sustainable communities around the world. The goal of the World GBC is to ensure that all buildings and communities are eco-friendly, so that people everywhere can live well now and in future generations.

The four fundamental concepts of eco-friendly construction are as follows:

- Efforts to lessen energy consumption.

- Reducing the severity of emissions and environmental degradation.
- Lessening the waste of energy and the consumption of scarce materials.
- Reducing the risk of internal environmental and health problems.

3. MOTIVATION AND OBSTACLES TO CONSTRUCTION OF GREEN BUILDINGS

3.1 General Review

This chapter presents a complete overview of the conceptual framework, covering essential theories and terminologies linked to sustainability, construction projects, leadership, management approaches, and the relationship between them all.

Management paves the approach for appropriate growth in social, human, and cultural aspects; therefore, there is a strong relationship that exists between management and sustainable development. This is because leadership provides the way for adequate development in these aspects. This inference is applicable to every industry, including the building and construction sector, and there is no exception to this rule. Sustainability is an essential component that has an impact on virtually every aspect of the construction business. This component can be found in the building sector.

The current study is an in-depth investigation on the connection between management in the construction sector (leadership styles and kinds) and environmentally responsible business practices. In order for the writers to achieve such a goal, they first undertake a review of the relevant prior literature in order to discover any pre-existing information. This allows for the research gap to be recognized, as well as the novelty of the work that is now being defined.

According to Zuo and Zhen-Yu Zhao (2014), the term "sustainability" can be seen as an umbrella concept that can be implemented in a diverse set of domains, ranging from agricultural production to production planning in architecture and energy source utilization. The terms social, economic, and environmental sustainability each refer to one of the three fundamental elements or components that make up the concept of sustainability. There are a few key performance indicators that contribute to sustainability, including social justice, economic advancement, and environmental conservation.

3.2 Enhancement of Building Management

Before the last forty years, companies relied on in-house workers for all aspects of facility maintenance, including cleaning and service. There has been no progress made toward developing the BM concept (Chamana et al., 2022).

BM got its origins in the United States and may trace its roots back to the expansion of office administration, particularly in the areas of bringing together big groups of people and computers to fit into office spaces in buildings. BM owes its beginnings to the growth of office administration.

The phrase "facilities management" was coined in the 1960s by a man named Ross Perot in the United States. Perot came up with the concept in an effort to integrate computers into the working environment (FM).

At that time, however, FM expanded its purview to encompass not only systems but also furniture and workplace design (Wiggins, 2010). The transition toward employing systems furniture known as cubicles and the introduction of computer terminals into the office, as well as the necessity for instruction among managers of workplaces on how to manage these and people, contributed to the beginning of the course of FM.

The “Facilities Management Institute (FMI)”, which was established in 1979, eventually offered this direction after it had been established. Prior to this point, there was no organization that specifically aimed to provide information in order to manage the workplace environment (Jernigan, 2012).

In 1980, the “National Facilities Management Association (NFMA)” was established, and in the same year, the “International Facility Management Association (IFMA)” was born to accommodate a rising Canadian membership. Both organizations are in the "facility management" field. “IFMA” is the world's largest and most widely recognized worldwide association for FM professionals, providing support to more than 24,000 members in 94 countries (Jernigan, 2012).

IFMA is also the international association that has the most members. Since that time, facilities management has evolved into a profession capable of tackling difficult and tough jobs, and it has helped contribute to the overall business performance of organizations all over the world (Parra, 2006).

EuroFM was founded in 1990, and the British Institute of Facilities Management (BIFM) was founded in 1993, both of which contributed to the expansion of the FM sector across Europe (Shah, 2007).

“The Association of Facilities Managers (AFM)”, which was established in 1986, and the “Institute of Facilities Management (IFM)”, which was established in 1990, have merged to form the “British Institute of Facilities Management (BIFM)”. These institutions disseminate knowledge on the most recent advancements in FM, assisting members in making better-informed business decisions through improved management (Kamaruzzaman et al., 2018).

FM has been successfully developed and established in other developed countries like “Japan”, “New Zealand”, “Hong Kong”, “Singapore”, “Australia”, and “South Africa”. In these countries, it is acknowledged as an endeavour that, when properly implemented, can result in more efficient management of buildings, the services they provide, and the personnel that is linked with them, all in service to the strategic goals of an organization (Price, 2007).

According to Obaid (2021), the FM industry in Australia is one of the industries that is rapidly increasing, and it has a turnover of more than $60 billion “AUD” each year. The FM markets in Germany and France are both substantial as well. FM is still in its early stages of development in developing nations like Malaysia, Uganda, and Iraq, among others.

FM, in particular within the realm of the public sector, is receiving an increasing amount of attention and priority in Malaysia (Kamaruzzaman et al., 2018). Although though it is not officially recognized, Uganda's FM business has the potential to expand at a rate that is consistent with the country's overall economic growth (Ventovuori et al., 2007).

This is the conclusion that can be drawn from a study that was carried out in order to make projections on the expansion of FM in Uganda. The field of FM is still in its infancy in Iraq, and the country has only just begun to recognize its potential.

3.3 Sustainability Evaluation Tools in Construction

The overall environmental performance of a building needs to be tested before it is completed, where more methods have been created over the years to measure the general sustainable efficiency of a building in helping SD in the current environment.

According to Kamali et al. (2017), these evaluation tools play a necessary role in increasing consciousness and developing the construction industry into increasingly sustainable building procedures across the world.

This leads to sustainable building achievement and is an instrument that motivates the design, service, maintenance, and deconstruction of sustainable buildings. They lead to greater convergence between environment, social, economic, and other parameters for choice (Kiani Mavi et al., 2021).

In order to inspire designers and builders to enhance the efficiency of the building, they have objectively been designed to calculate the effect of a project on sustainable qualities; these assessment instruments have been developed 15 years ago to determine the viability of a building through a variety of parameters (Zavadskas et al., 2018).

Where building evaluation methods perform significant importance in the evaluation of sustainability and in evaluating different levels of sustainable development (Matar et al., 2008).

The collected from 3 categories: Systems for Cumulative Energy Demand (CED), focusing on energy use; Life Cycle Analysis, focusing on the environmental aspect; and System Total Quality Assessment (TQA) (Sabnis and Pranesh (2017).

3.3.1 Systems for cumulative energy demand

Systems Cumulative Energy Demand (CED) has popularly been recognized for evaluating building energy use. However, Tronchin and Fabbri (2008) clarified the partial measures such as energy and emergency do not apply where energy is the most beneficial assignment, which takes a system into a thermal balance, and solar energy is not used directly in a transformation director but is directly available.

These units of measurement, as per Sabnis and Pranesh (2017), are related to thermodynamic concepts of the useful utilization of resources and whilst may also be more suitable for determining the use of heat in buildings than for electricity.

“CED” technologies monitor and analyze the energy usage of buildings, such as heating, ventilation, air conditioning, heating and electricity, and communications (Berardi, 2012).

3.3.2 Net zero energy

The Net zero-energy buildings (ZEB) are domestic or industrial building that needs substantially fewer energy thanks to efficiency features that allow renewable energy balancing. Despite the fascination with the term "zero energy," we need a joint description of what it means or a common understanding (Torcellini et al., 2006).

In terms of energy usage and the climate, buildings have a major impact. Industrial and residential buildings in the United States use about (40%) of critical energy and about (70%) of power (Fichman, 2008).

The energy used by the building partition continues to rise, mostly because of the fact that new buildings are designed faster than old ones. Between 1980 and 2000, the use of electricity in commercial buildings was doubled, and by 2025, another (50) per cent is projected to rise (Fichman, 2008).

Energy consumption will rise in the commercial construction sector before buildings can generate sufficient energy to offset the building's increasing energy demand. In order to do this, the US Department of Energy (DOE) has a strategy for creating a low-budget zero energy commercial building (ZEB) base with technical know-how and capacity by 2025.

Depending on the constraint and metric, the ZEB may be defined in different methods. Depending on project wishes and the principles of the design community and building owner, different meanings can also be preserved. Building owners, for example, are serious about the cost of electricity. Organizations like DOE have broad country numbers and are typically interested in mainstream or source energy. A building designer may also be involved in using energy for energy codes.

Finally, those interested in polluting power plants and fossil fuel combustion should also engage in pollution reduction. Four major concepts: net-zero energy, net-zero energy sources, net-zero energy costs, and net-zero energy pollutions; there are four common definitions (Hernandez and Paul, 2010):

- Net Zero Energy Pollution: A net-zero pollution building produces at minimum as much pollutions-free renewable energy as it uses from pollution-producing energy sources.
- Net-Zero Energy: A Site ZEB creates at least the same amount of energy used on the site in a year.
- Net-Zero Energy Source: A source ZEB creates at least as much energy in a year, when taken into account at the source.

Energy source refers to the primary energy that is used to create and supply the site with energy. The related site-to-source conversion multipliers are used to measure the total energy source for a building. Imported and exported energy.

- Net-Zero Energy Costs: The money that the service provider spends on the cost of ZEB, the power supplier of buildings, is equal to the amount of electricity the owner pays for the energy supplies and the energy used during the year, at least to the amount the building exports to the grid.

3.3.3 Life-cycle analysis

The Life Cycle Analysis (LCA) centres on the SD environmental element and provides construction materials and products with environmental impact evaluation.

These assessment methods include environmental assessment systems such as Environmental Risk Assessment (ERA), Material Flow Accounting (MFA), Input-Output Analysis (IOA), and Life Cycle Assessment (LCA), where LCA is the system more widely used (Kyriaki et al., 2018).

The life cycle assessment (LCA) breaks down the building process into its component parts—basic operations and raw materials—and evaluates the structure's impact on the surrounding environment at every stage of its existence, from construction to demolition and everything in between. Where the capacity to extract or process raw materials, to generate, transport, and distribute raw materials, to use, reuse, maintain, recycle, and finish disposal (Kyriaki et al., 2018). where the capacity to use, reuse, maintain, recycle, and finish disposal.

In addition, life cycle assessment (LCA) evaluates the environmental burden associated with a product, process, or operation by defining and measuring the resources, materials, and wastes created by the environment. In addition to this, it analyzes and assesses the effects that products have on the surrounding environment, as well as identifies and investigates potential solutions to environmental problems (Teixeira, 2016).

The life cycle assessment (LCA) is another international tool for evaluating the impact that goods and buildings have on their surroundings throughout the course of their useful existence.LCA enables engineering experts to examine various building designs based on the effects those designs have on the environment and to implement educated decisions about the materials that are pertinent to those designs.

According to Zabalza et al. (2013), the life cycle assessment (LCA) method makes it possible to evaluate the impact that several building types and structures have on the surrounding environment in a single location.

According to Gerbinet et al. (2014), the LCA consists of four stages that are connected to one another: a description of the objective and scope of the study, an analysis of the life cycle inventory, an evaluation of the influence of the life cycle, and an analysis of the outcome. In accordance with the standards, the definition of the aim and scope is composed of the scoping stage, which is followed by the objective of the project.

The second phase, known as the life-cycle inventory review, entails the measurement of total substance and energy flow input and output within the context of an overall comprehensive lifestyle inventory evaluation. At this phase, the information gathered in the life cycle inventory analysis (substances and flow analysis) is assessed in accordance with its potential effects on the environment. The evaluation of the effects across the entire life cycle, which is the third step. In the conclusion, the fourth phase consists of reviewing the outputs of the life cycle inventory and conducting an evaluation of the life cycle effect cycle (Gerbinet et al., 2014).

This is done in order to extract the effects on the environment and to provide decision-makers with a submission. This is not only due to the functionality of the buildings but also because the life length of the buildings makes it more difficult to use LCA over the entire life cycle; because of the improvements in the life cycle of the building, because of the simplicity of making such modifications, and because of the minimal environmental effect that these modifications have. According to Khasreen (2009), new alternatives need to be developed for virtually every stage of the life cycle of a structure.

The application of life cycle assessment (LCA) in the sphere of construction is a distinct practice that stands in contrast to other industries and is now the most important sector in which LCA is being applied. There is a limitation in the LCA technologies in which it tests the environmental notion of SD without considering the social and economic repercussions (Kyriaki et al., 2018).

In order to remain in compliance with this restriction, Berardi (2012) suggests conducting a combination of LCA and Life Cycle Cost (LCC) assessments. The capacity to measure the costs associated with the construction approach over the entirety of the facility is made possible through the deployment of LCC. LCC is the method that is used to record all of the expenses that are associated with the construction phase as a whole, and these costs are typically brought down to their present value. The reduction of total installation costs makes it feasible to evaluate other building systems and evaluates the present value of a selection of alternative building systems (Smith et al., 2021).

The bulk of open approaches that are utilized for LCC and LCA execution in the building industry are characterized by their restricted application, limited adaptability, and limited accessibility. They require that the improved design and efficiency of the SD result in useful tools for life cycle assessments (LCAs).

The normal practice of implementing fixed criteria for the life-cycle analysis and for life-cycle evaluation stages is restricted to LCA. This is because LCA is the only practice where the operating stage of the longest period building can have significant effects on the environment, resulting in variations that are often greater in this phase than the total effects of materials, design, or the life-time end (Benavides et al., 2017).

3.4 Effects of Construction Materials to Achieve Sustainable Buildings

To achieve a high degree of efficiency for the protection, health, and comfort of the residents of the building as well as to satisfy SD commitments, the designers of the building and the users of the building stress on constructing healthy living and working environments. Because of the ever-increasing growth of the construction business and the continual need to make use of novel technology in the construction industry, inventive methods of selecting building materials are required in order to make the most efficient use of the resources that are now available (Altuma and Ghasemlounia, 2021).

Whereas the building business has been classified as being one of the most of the major users of resources, the construction sector is believed to be one of the industries that consume the most resources overall. It is common known that this sphere is a significant part of the economy in terms of the protection of the natural world and the responsible administration of resources.

In a world where the majority of pollution is caused by human economic activity, we ought to face the facts and look for real solutions rather than wasting time with meaningless gestures that will have only a marginal effect. 64% of the world's carbon pollution can be traced back to energy or activity (the remaining 36% comes from either forestry, agriculture, or destruction); 35% of the world's carbon pollution comes from the manufacturing sector; 31% comes from the building sector; and 27% comes from transportation (Sharma, 2020).

In addition to the use of energy, the construction industry is viewed as a significant contributor to environmental emissions and the largest user of raw materials, consuming 40% of global demand every year and producing an enormous amount of waste (Khoshnava et al., 2020). Energy is consumed during the manufacturing of construction materials, and energy is also consumed during the building process, which uses energy for heating, lighting, control, and ventilation of completed buildings.

3.5 Management of Sustainable Construction Advantages and Specifications

A method of construction is considered sustainable if it makes a creative contribution, safeguards the natural environment, and provides the user or the built with adequate returns. This method of construction requires that industrial materials be always built-in a regular way to encourage efficient manufacture, which means that they frequently use more material than is an absolutely necessary must.

Although these constructions can originally seem complex and boring to implementation, they give advantages defined as follows:

1. Quality of cost
2. Friendly for the environment
3. Dependent on renewable resources
4. Feasible construction
5. The residents' safe ecosystem
6. Regulated resource use and decreased dependence
7. Regulation of emissions
8. Higher development/return

3.5.1 Management of sustainable construction projects

According to Sharma (2020), sustainable construction management emphasizes the selection of sustainable materials at every stage of the construction process, and engineering management plays a vital role in the production of a successful sustainable building.

In many cases, having a project that is managed by professionals is superior to having an expensive or aesthetically beautiful appearing project in all aspects, including quality, performance, and stability. It is possible to classify each building project according to the method, magnitude, location, and availability of the materials. However, the fundamental steps involved in the development of an environmentally friendly building are as follows:

3.5.2 Objective and site evaluation

The first step in sustainable construction management involves defining the aim of meeting with sustainable development and ecological development, construction specifications and design setting, and selecting the relevant site.

However, the chosen site must be situated in an area with appropriate basic services, including schools, a playground, a supermarket, libraries, transport, and communications services, according to the sustainable construction and rating framework.

3.5.3 Choice and evaluation of materials for construction

The main significant and the most challenging mission in sustainable building. The construction materials shall be approved by accredited by approved organizations such as LEED, BREEAM and ISO. Life Cycle Assessment (LCA) is also a method where a designer is chosen to find the best construction material to be compatible with project tasks.

The previous following steps can also be listed:

1. Describing the project's aim
2. Describing the material necessary for the specific design.
3. Describing the low and high-term characteristics of the material chosen
4. Classify the material according to the requirement.
5. Examination of the isolated yield content
6. Choice of material on the basis of the standards of yield, wellbeing, and sustainability and use for construction.

This is done in the following many stages, as shown in the below figure (3.1):

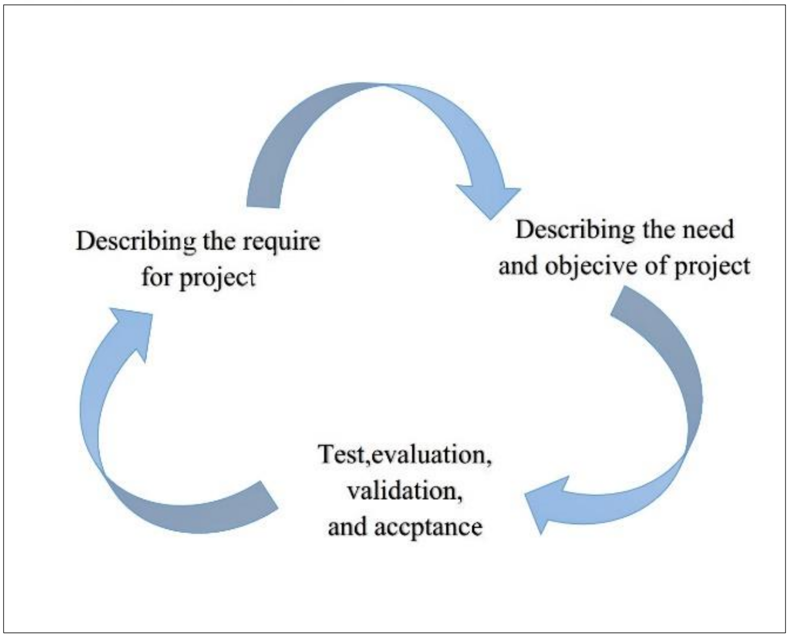

Figure 3.1: Simplified LCA Approach for the Selection of Material

Source: (Altuma and Ghasemlounia, 2021)

3.5.4 Design and Construction

A design study and site review are carried out before the start of any project. It includes feasibility studies, results of site selection analyses, the maintenance of design quality, and changes as needed to achieve the targeted and productive work performed by continuous monitoring, quality control, and ongoing inspection are considered.

3.5.5 Resource management

Resource involves a labour force, equipment, tools, and other materials such as water. The equipment and instrument used often include consuming electricity, costs, and time, although their main objective is to decrease time, so, to get out of this whole issue, well-managed timetables and the methods for effective construction should be strictly followed so as to attain the objective in the expected time and expense.

3.5.6 Energy

Sustainable management is the principle of on-site renewable energies or renewable for each residential building in order to get ahead of the challenges with restricted fuel supplies and energy. Renewable energy supplies are necessary criteria for sustainability certifications such as “LEED” and “BREEAM”.

3.5.7 Project management team and assessment

A professional with specialized knowledge of current procedures or improvements in construction development and management must be involved in the professional team appointed for a sustainable construction project.

The team should also involve a person who is a specialist or at least a trained specialist in sustainable building, attributing additional credit to the rating system to sustainable building qualified professionals for the project.

The principal objective of the stage is to guarantee that the project is carried out efficiently and that each step includes the idea of sustainability to optimize the performance of the project.

3.6 Construction Materials and Sustainability

Construction materials have an important role to play in building sustainability, and they also engage in economic development. The use of construction materials impacts the environment in several ways, primarily because of the heavy use of non-renewable energy and the quantity of waste and contaminants produced by the material life cycle (Altuma and Ghasemlounia, 2021).

In fact, stakeholders of the construction began while comprehending the importance of managing the environmental effects necessitated from the construction sector. Choosing building materials needs to be strengthened to take into account the sustainability properties of materials, and considerations such as cost, availability, and appearance have been better chosen (Khatib, 2016).

Sustainable construction material is compliant with the limits of non-renewable assets, operates according to life cycles and environment interactions, is non-toxic, is energy-friendly and water-efficient, is made of recycled materials, and can also be recycled by itself (Kylili and Paris, 2017).

The production of sustainable items is not inherently sustainable; low-electric glass, for example, is called sustainable as the building heat consumption is minimized; however, floating glass is classified as a sustainable material; it is extremely recyclable compared to low-electric glass and not recyclable or weak.

Sustainability is a method that is not products or commodities, and that does not consist of sustainable materials. We can produce excellent environmental materials; however, if we do cannot use them to allow them to be used in accordance with the concepts of sustainable development, we will collapse (Khatib, 2016).

3.7 Sustainable Building Material Properties

The life cycle of materials is one of the criteria that a lot of properties use to differentiate between sustainable building materials. According to Florez et al. (2013), materials can be considered sustainable if one or more of the following criteria are present in the material:

1. Improving indoor air quality through the elimination of Volatile Organic Compounds (VOC) pollution.

2. Recycled contents generated in whole or in part out of post-industrial or post-consumer waste.
3. Low maintenance conditions and performance.
4. They are made from renewables.
5. The energy needed for the manufacturing and transporting of materials is minimal.
6. Ozone destruction free.
7. There is less toxicity.
8. They are materials from the local region.
9. They are capable of being reused.
10. They have capable of being recycled.
11. They are biologically degradable.
12. Through production or construction cycles, waste generation decreased.
13. They are energy-friendly, and they help minimize operating energy when occupying the building.
14. They help to save water.

The characteristics of sustainable materials might vary depending on the nature of the substance. It is important to evaluate sustainable materials with the knowledge of environmental effects associated with various materials, knowledge of government policies and renewable materials requirements if they exist, knowledge of sustainable materials in regional markets, and knowledge of how are their sustainable aspects.

3.8 Advantages of the Application of Sustainable Materials in Building

Choosing sustainable materials may be one of the hardest things to achieve in a construction project (Florez et al., 2013):

1. A project consists of different items which had to be assessed.
2. Evaluation criteria can differ by material classification and by country of produced.
3. In production operations, there is insufficient knowledge.

4. No approach is agreed on for the uniform evaluation of materials and products.

3.9 Obstacles to Use Sustainable Resources

Obstacles to the use of sustainable construction products and materials could be Siddique (2010):

1. Building professionals who are not conscious of the value of avoiding pollution in the environment from the waste produced by construction industries.
2. The shortage of known sustainable building materials for construction.
3. The shortage of enough environmental knowledge on construction materials to compare alternatives adequately.
4. The shortage of rules and standards which promotes the use of sustainable buildings.

3.10 Concepts of Choosing the Sustainable Construction Materials

The selection of construction materials is generally based on the value of material costs. The definition of sustainable concept means that material selection should take place on a four-set of environmental, operational, economic, and social parameters.

Every one of the main parameters contains a set of sub-parameters, the significance of which can depend on a variety of aspects, such as the kind of strategy of the organization, the kind of projects and their targets, such as water supplies, residential or commercial buildings, roads, and bridges.

3.11 Steps of Sustainable Materials Choice

The selection of sustainable materials can typically be achieved by the following three steps:

3.11.1 Stage of analysis

It comprises collecting documentation on the technical efficiency of the product as well as the effects it has on the environment in order to categorize pertinent information.

3.11.2 Stage of assessment

It entails conducting an analysis of the data gathered on the product and rating it in accordance with the findings. It might be challenging to make a judgment when one is looking at a variety of information for the same objective.

3.11.3 Stage of choosing

The use of an evaluation tool such as an "assessment matrix" for the purpose of gathering the values of each alternative environmental criterion is a component of this step. According to Maraveas (2020), the option with the highest score should be given the highest priority when making a selection.

3.12 Impediments to Sustainable Construction Project Management

Although the created conceptual framework can lead facilities managers in designing sustainable buildings, some factors pertaining to sustainable buildings may impede the facilities manager's role in sustainable buildings from being realized. Inadequate specialized knowledge and ability to understand of smart buildings that can promote innovation in technology by facilities managers, shortage of awareness, and lack of teaching and tools (Hwang et al.,2012) can be categorized as barriers to project management in the achievement of sustainable facility structures.

Tokbolat et al. (2020) agree and argue that a lack of specialized and scientific training for facilities managers inhibits our existing knowledge of project management problems and will surely have an effect on sustainable management as buildings adapt to new technologies. They say this lack of training is a problem because it prevents us from understanding how to manage projects in the most efficient way possible.

According to the findings of the research (Gan et al., 2015), there are a number of factors that work against the implementation of sustainable building practices. Some of these factors include inconsistent financial incentives, a lack of government legislation that encourages the development of sustainable structures, and an approach to construction works that treat sustainability as an afterthought.

While the building industry has been slowly making progress toward greener structures, other fields have been implementing sustainability into their everyday operations and educational curricula for well over a decade (Hwang et al.,2012). While the construction industry has been making gradual strides toward greener structures, other disciplines have been doing so for a longer period of time. When it comes to teaching about sustainable practices, the building industry is quite far behind.

According to Fathalizadeh et al. (2021), a significant barrier to the implementation of environmentally friendly building methods is a lack of appropriate knowledge. They claim that the lack of information or consensus among those who work in the construction industry is what is preventing the implementation of environmentally friendly strategies.

According to Karunasena et al. (2016), the optimism level of building specialists decreases when sustainable construction issues are discussed, even though these professionals are generally confident in their ability to obtain and use knowledge. This is the case even though building specialists demonstrate trust in their ability to deliver understanding.

Gleeson and Thomson (2012) further confirm that a barrier to the construction of sustainable buildings is a shortage of proper training for construction professionals. Yet, over the course of the last 10 years, professional organizations have been attempting to implement sustainable approaches within the context of their respective professional qualification frameworks.

Building specialists who do not have adequate knowledge of sustainability issues, as evidenced by their inadequate training in environmentally responsible building procedures. Even facility managers don't seem to have a good awareness of the difficulties of sustainability.

According to Radebe et al. (2021), one of the obstacles to sustainable Facility management is a shortage of understanding of the concerns surrounding sustainability. They contend that many facilities managers do not appear to comprehend the fundamental information that is required to implement policies related to sustainability, and they believe that in many organizations, sustainability is not a high priority.

They say that this is a common problem. The findings of this research indicate that substantial portions of the projects management industry lack even the most fundamental sustainability regulations and fail to document or communicate their activities to stakeholders and investors based on the experiences of facilities managers who were surveyed for the research.

This suggests that facility managers need to have sufficient information about sustainability challenges in general before being ab Tokbolat et al. (2020) assert that design and construction teams do not have sufficient knowledge on the best current information on technologies and tools used in sustainable construction strategy. This is in relation to the knowledge gap that exists.

According to the findings of their investigation, there was evidence indicating that building experts were unaware of sustainable methods or alternatives that are included in their job requirements. Le to comprehend how to execute it in structures.

Because of this, it is made more challenging for facility managers, as they are required to collaborate with individuals who have either a limited understanding or no understanding whatsoever of the sustainable building approach.

3.13 Implications of Project Management Practice for Sustainable Construction

The position of facilities manager must promote sustainable methods in order to overcome the aforementioned obstacles. It is thought that a rise in sustainable practices among facility managers will enhance their contribution to sustainable buildings. According to Pit et al. (2001), there has been an increase in the awareness among facilities managers that their position as a key to promoting the cause of sustainability is essential. They contend that the trajectory of the field of facility management has shifted as a result of climate change and efforts to cut carbon emissions, despite the fact that FM is typically understood to be a conservative professional.

Häkkinen et al. (2011) identified motorists for sustainable projects management, and these drivers are as follows: legislation, corporate image, organizational ethos, senior management or directors' leadership, pressure from clients, life-cycle cost reduction, and pressure from employees and shareholders on sustainable practices. If these drivers are incorporated into the construction process, it will be easier to produce sustainable structures.

When the arguments for why something is a barrier are turned around to offer answers to a problem, then that thing can become a driver. Hence, obstacles such as a shortage of education and lack of information, perceived higher initial costs, divided incentives, absence of government policies, and building operations as an afterthought can be promoters of sustainable building practices if they are flipped around.

The formulation and execution of appropriate policies by the government are necessary steps in achieving the goals outlined above. At the global level, measures enacted by governments are seen as a primary driver of sustainable construction. As per Taylor (2009), the British government has implemented a significant number of legislative initiatives and measures in order to encourage the property industry to go in a more environmentally friendly direction.

Tokbolat et al. (2020), who makes an argument that strategies are the method that the government uses to steer the construction sector towards sustainability, lend support to this viewpoint by stating that policies are the tool that the government uses to steer the construction sector towards sustainability; this is substantiated in the UK as the government affords and encourages initiatives that motivate the building industry to methodologies that are sustainable.

In addition to this, Ershadi et al. (2021) highlight the significance of the government being actively involved in environmentally responsible building approaches and introducing legislation that will regulate such procedures. They say this is essential for the preservation of the environment. When it comes to implementing and recognizing sustainability specifications, government rules actively discourage the use of construction materials that do not meet minimum requirements and advocate the necessity of openness and accountability. Additionally, these policies actively discourage the use of building materials that do not meet minimum requirements. These rules also include in-depth procedures and detailed overviews, both of which are mandatory for all building professionals to adhere to.

According to Tokbolat et al. (2020), the encouragement of the development of knowledge in new building technologies among building specialists is one of the key drivers toward the construction of sustainable buildings. This is one of the primary drives toward the creation of sustainable buildings. The policies of the government have the potential to assist a greater number of people in enhancing their capabilities in regard to modern technology.

4. RESEARCH METHODOLOGY

4.1 General Introduction

This chapter gives a description and justification of the study design and procedure that have been applied in order to fulfil the goals and aims of the research, as described in the introduction portions of the chapter. These goals and aims were mentioned earlier in the chapter. This chapter's major objective is to study the many different inquiry strategies and research procedures that are currently in use so that the reader can have a better understanding of the multitude of presumptions, paradigms, and methodologies that constitute the foundation of this research.

In addition, this investigation will allow the reader to have a better grasp of the plethora of methods that form the basis of this research. This stage is important because it will provide insight into the benefits and drawbacks of the various points of view, as well as the various ways in which these points of view can be balanced out within the context of this research. The application of a variety of scientific methodologies is what comprises the research technique, and the major goal of the research technique is to identify solutions to issues by doing so. These procedures have been developed in order to increase the likelihood that the information gathered will be reliable and objective in addition to being germane to the problem being investigated.

According to Noaham et al. (2011), the effort of carrying out an investigation is made more complex by the fact that there is now little agreement over how to conceptualize the technique of conducting the study. This makes the task of carrying out an investigation more challenging. On the other hand, one may argue that the process of conducting research is always a compromise between a variety of alternatives and judgments, which are frequently determined by the quantity of resources that are accessible.

Therefore, researchers typically adopt the pragmatic perceptions that there are no hard-and-fast rules in the process of conducting research and that the various study methods and approaches that are accessible and may appear appropriate to an investigation should still be embraced in a flexible manner. This is because researchers believe that there is a high degree of subjectivity in the conduct of research. This perspective is founded on the notion that research is a procedure that is always open to new directions and directions of inquiry.

Therefore, researchers typically adhere to the pragmatic viewpoint that there are no hard-and-fast rules when it comes to conducting research and that the numerous research approaches and approaches that are accessible and that may appear to be suitable to an investigation must nonetheless be adopted in a flexible manner. This is because there are numerous research approaches and approaches that are accessible and that may appear to be suitable to an investigation.

A summary of the research can be found at the beginning of the chapter. This is followed by a discussion of the objectives, primary questions, and secondary questions of the study. An overview of the study design is provided in this section. This section also discusses the research approach, which includes the research viewpoints (philosophies), strategies, methodologies, and procedures of information gathering and data evaluation. The research population, the sampling procedure, the statistical techniques, and the ways of analysis that have been applied throughout this study, as well as the concepts, will all be discussed in the final section of this analysis. In addition, we will discuss the principles underlying each of these topics.

4.2 The Aims and Purposes of Research

The research methodology provides an explanation of the many ways that are used by research to collect data in order to obtain a greater understanding of the overall quality management system and to determine whether or not it is appropriate for all companies to adopt them. This information is used to determine whether or not it is appropriate for all companies to implement them.

In addition, the objective of the study is to evaluate not only the motivations to the construction of green buildings in Iraq but also the obstacles that prevent to the construction of green buildings in Iraq.

This evaluation will be carried out in order to fulfil the additional purpose of the study. According to Lee et al. (2015), the primary data could consist of either quantitative or qualitative information. We shall return to this topic at a later point in time to talk more about it. The various points of view held by researchers regarding the characteristics of The opinions on quantitative research methods and qualitative methods that are held by individuals who regard the two approaches as being wholly distinct from one another and by individuals who incorporate both strategies into research projects are quite different from one another.

On the other hand, an example of what may be deemed qualitative research is the utilization of findings or interviews. Utilizing surveys in conjunction with a variety of different strategies is one illustration of a quantitative method that one might use as an example.

It could be structured and evaluated quantitatively during the process of collecting numerical data or during the process of classifying and coding non-numerical responses presented in numerical form. Alternatively, these processes could take place during the process of collecting numerical data. Another possibility is that this will take occur when we are in the midst of accumulating numerical data. On the other hand, questionnaires can be designed in such a way as to invite open-ended responses, and they can make a contribution to the process of conducting in-depth examinations of individual situations when they are used in this manner.

According to Gallagher (2012), the first time that academics began to question the use of qualitative and quantitative data together in the same study was in the 1980s. These researchers did not provide any justifiable arguments for their worries about the use of qualitative and quantitative data together in the same study. This prompted the first use of the mixed-method methodology.

However, choosing a mixed approach to research methodology enables researchers to be more integrative, versatile, and holistic in their inquiry approaches as they try to answer a number of unique research questions (Brown and Shilton, 2014). This is because taking a mixed approach to research methodology combines qualitative and quantitative research methods.

In addition, this study collected the necessary data by combining quantitative and qualitative data collection methods in the form of a hybrid survey, which the participants self-administered and maintained. This chapter will cover the methodology that was used in the prior analysis that was presented, including knowledge of study design, methods, and more. The format of the questionnaire, including how it is laid up, is also defined. In addition to this, it has demonstrated how the questionnaire's validity and reliability have been ensured.

4.3 Research Design

The research design is a structured overview of how the research study is to be performed. The overall approach is chosen to methodically and logically combine the various components of a study in order to effectively solve the research issue and form a basis for data collection, calculation, and analysis. The research design is also referred to as the research protocol. According to Creswell (2018), the methodology that is chosen to guide research procedures can be qualitative, quantitative, or mixed methodologies. These approaches are guided by certain philosophical theories, design strategies, and study methods. The meaning of a research design is illustrated in figure (4.1).

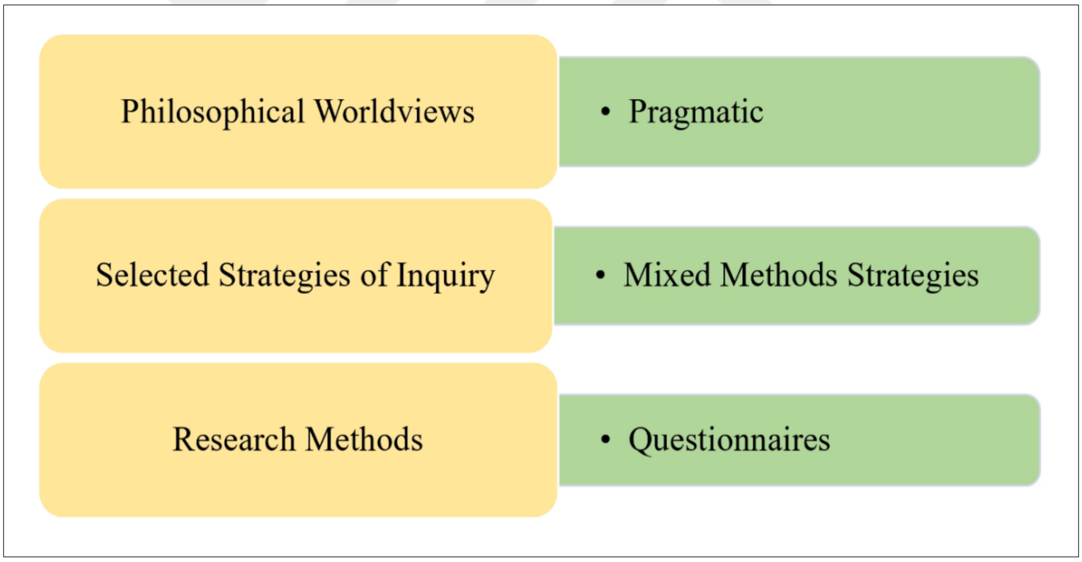

Figure 4.1: Framework for Research Design

Source: (Creswell, 2018)

4.4 Philosophical

According to Creswell (2018), philosophical conceptions can be understood as either the overarching guidelines and understanding of the world or the objective of a study that is being carried out by the researcher.

In a typical research article, the author will make use of the aforementioned theoretical concepts and principles. However, there is a possibility that some individuals will never reach a consensus regarding the necessity of accepting a specific assumption or regarding the function that these hypotheses serve in the investigation process (Mertens, 2015).

According to Creswell (2018), ontology, epistemology, axiology, methodology, and philosophical assumptions of rhetoric are all considered to be types of philosophical assumptions.

According to Gunatilake (2013), figure (4.2) illustrates these philosophical assumptions by focusing on concrete concerns such as what type of research methodology was used in the study. What is the relationship between the person being investigated and the person being examined? What are some of the guiding concepts that this study is based on? What did the actual results of the study show? What exactly does it mean to learn communication?

Ontology is a philosophical assumption concerning the nature of truth in which the investigators accept the multiple actualities of their subjects, and this is proven by the employment of numerous themes utilizing the approach (What is the research process?). Ontology is a term that was coined by the Greek philosopher Aristotle. Tale told for rhetorical effect (What language best describes research?).

Epistemology is a philosophical theory of the interaction between the researcher and the known, as well as the process by which empirical knowledge has been achieved, is known as epistemology.

Axiology is a branch of philosophy that examines the place of ethics in scientific inquiry. A logical theory of the research process and method, the methodology is characterized as inductive by the expertise of the scientists in data collecting.

The methodology is a logical theory of the research process and method.

Rhetoric is the study of language as well as the art of persuading an audience to accept one's point of view.

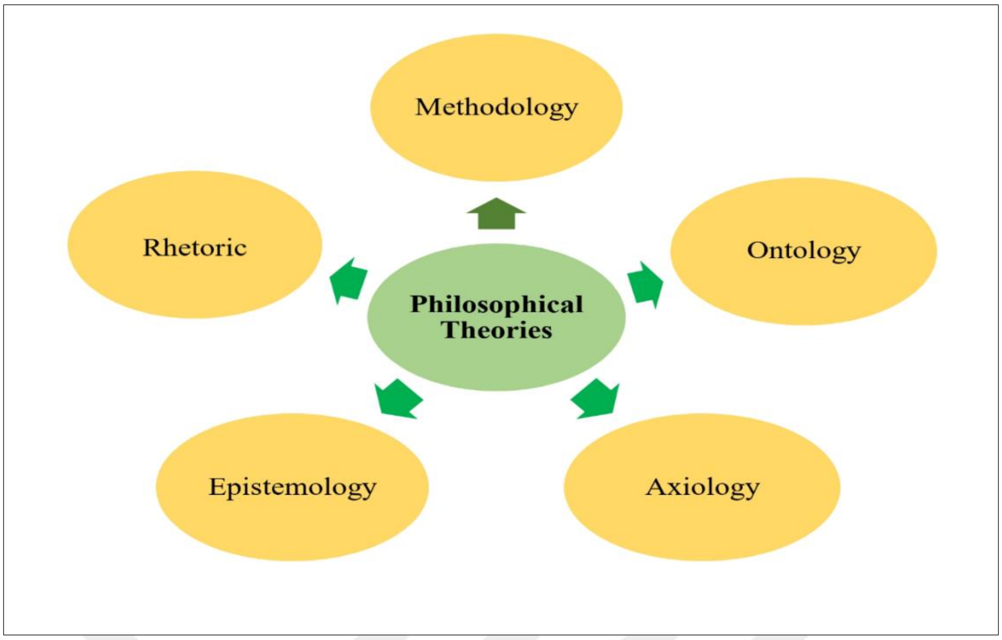

Figure 4.2: Philosophical Theories

Source: Gunatilake, (2013)

4.5 Types of Research

A research plan can be classified as descriptive, correlational, illustrative, or exploratory, depending on the goals of the research being conducted. In light of the objectives of the study, the kind of research that has to be conducted will be determined by the purpose of the study (Neuman, 2014):

- When an effort is made to explain a circumstance, practice, service, or technique in a methodical manner or when attitudes concerning particular difficulties and how to investigate issues are recognized, this type of research is referred to as descriptive research.
- If the purpose of the research is to determine or evaluate the nature of a relationship, interdependence, or partnership, then the research will contain a correlation between numerous aspects of the scenario being investigated.
- The definition of research is explaining why things happen, along with developing, producing, extending, or testing the theory; this is the overarching purpose of research.

This helps to understand why and how two different aspects of a phenomenon are related to one another.

- Research can be considered exploration if the objective of a study is to investigate a subject area in which only a little amount of more research is required or if the aim of the study is to investigate the various avenues open to specialized research and to formulate foundational ideas and questions for further investigation.

The purpose of the study, which is to explain the numerous approaches to green building achievement as well as the problems of implementing this concept in Iraq, makes it a descriptive study in concept. The study is also regarded as an investigation into the method of inquiry. This is due to the fact that the study combines qualitative and quantitative approaches, and the results of this combination are adequate to fulfil the objectives of the study.

4.6 Methodology of Research Selection

The approaches of the analysis adopted by the study are based on the research researcher's philosophical concepts, research design, and fundamental research procedures for gathering, analyzing, and interpreting information, according to Creswell (2018).

Study approaches are defined as the kind of qualitative, quantitative, and mixed techniques that guide the research design processes (Mertens, 2015).

Quantitative research, as per Aliaga and Gunderson (2005), is effective at generating knowledge from a wide range of units in the broadest possible field, but quantitative methods can be very shallow when a topic or idea is to be studied in depth.

The qualitative method is best for a detailed investigation of a study issue. It is a system, which studies subjects in their natural environment, which attempts to explain or perceive a phenomenon with regard to the meanings that people bring to them, where data are inductively analyzed in this method based on details to general concepts, and the researcher interprets the importance of the information (Creswell, 2018).

Qualitative study can define an approach to analysis and try to understand the significance of individuals that are dedicated to social issues, whereas the qualitative study is intended to examine the real circumstances in their time-based and local circumstances (Flick, 2018).

On the other side, mixed methods given quantitative and qualitative benefits. Researchers regarded the selection between the quantitative and qualitative approaches as important. Nevertheless, they are no better than the other because they both have distinct traits and have their strengths and limitations (Mertens, 2015).

4.6.1 Choosing a mixed method

This research makes use of a variety of research methods because its primary objective is to acquire a comprehensive comprehension of the relevance of the idea of sustainable buildings as well as the difficulty of achieving green buildings in the country of Iraq.

According to Creswell (2018), if a practice or idea has to be studied and explained, yet there have only been a small number of studies conducted on it, then a mixed approach is required.

Using a questionnaire investigation and in-depth interviews, Valen and Olsson (2012) conducted a study to determine the extent of the importance of the occupational service management career for the owners of buildings in relation to their buildings in fine, functional, and up-to-date conditions.

This was done in order to determine the extent of the importance of the occupational service management career for the owners of buildings. Due to the low amount of literature available in this area, the research analysis is exploratory and requires explanatory investigations in order to validate the findings. The first method that was offered was the qualitative approach. After that, the qualitative findings were put through a questionnaire so that the quantitative method could validate and generalize them for a population. Finally, the quantitative method was used to assess the findings of the qualitative method.

4.6.2 Selection of research methods

In this section, effective research approaches are discussed by utilizing a mixed methodology for the analysis of this study, which is an appropriate research methodology. According to Denscombe (2010), the search method is the process that is used to obtain information for observation research. This approach can be broken down into four primary categories, which are documentation, interviews, analysis, and questionnaires.

Documentation and questionnaires are two of the strategies that were picked for use in this research project in order to obtain information. The study required an exploratory development strategy, which entailed the collecting of qualitative information first, followed by quantitative data, in the appropriate order. It was the first step of the study, and it consisted of obtaining qualitative information from associated literature and documents. The goal of this step was to collect as much information as possible about environmentally friendly building components.

The gathering of quantitative information constituted the second stage of the research project. The conclusions drawn from the analysis of the acquired documentation were included in the formulation of a questionnaire, which was then distributed to the members of the Iraqi Engineers Association (IEA).

4.6.3 Ethical perspective

According to Creswell (2014), the examination of ethical problems in fieldwork research is an essential component of every research project. Because of this, the researcher is now more conscious of the need to prioritize ethical concerns throughout the research process, beginning with the choice of the subject matter (topic selection) and continuing through the gathering of data, evaluation, and reporting of the findings.

According to Creswell (2007), the examination of ethical issues was required in order to improve the quality of the research, defend prevent inappropriateness, and safeguard both the participants and the organizations that they represented. After ensuring that certain prerequisites were met, the entirety of the research was carried out with strong regard for the participants' privacy and the strictest possible confidentiality.

All of the participants were advised that the information they provided would be held in the strictest confidence possible. This allowed for participants within the population selected for the study to participate voluntarily.

4.7 Framework of Study

A three-stage research framework, such as the one illustrated in figure (4.3), might be used to demonstrate the study approach that was utilized in this particular investigation. A review of the relevant literature and an investigation of the sustainable building documents and the components they contain make up the first stage.

In addition to the literature review and document research that were components of stage one, an emphasis was placed on the difficulty of putting green buildings into practice in Iraq. This was discussed as part of the literature review on green construction.

In the second stage of the investigation, you will conduct a questionnaire investigation, analyze the results, and evaluate additional documents. In the third stage, we will validate and scrutinize the findings of the research in further detail.

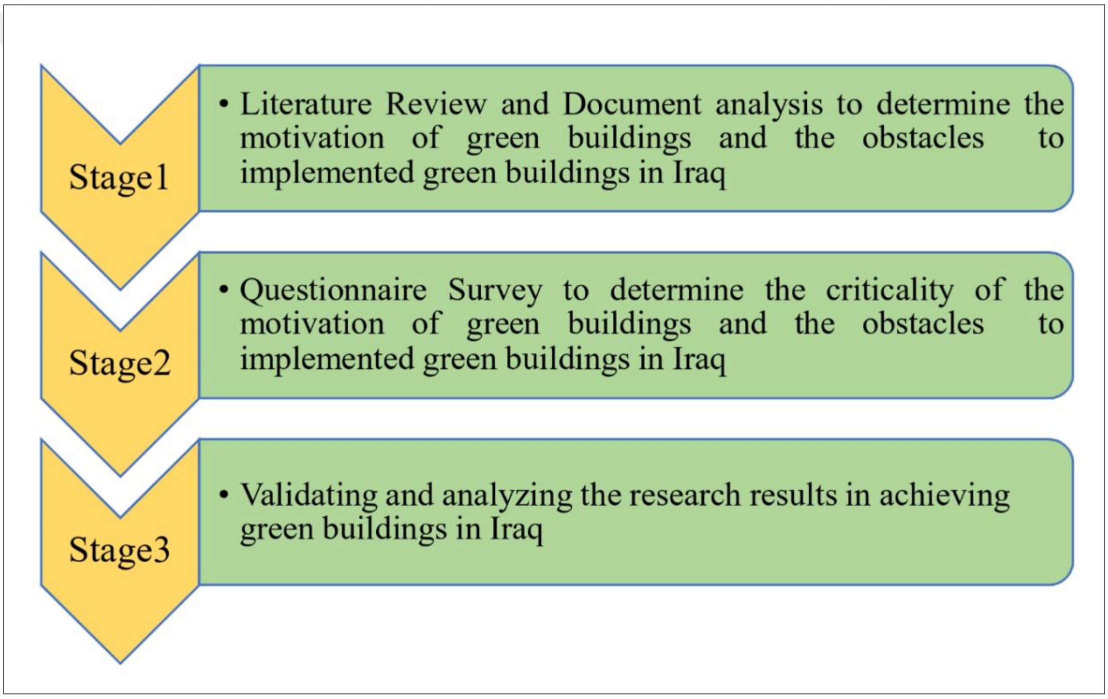

Figure 4.3: Framework of Research Stages

Source: Author

4.7.1 Stage I

The purpose of the literature review included in the study was to create a robust theoretical structure for the area of research as well as to support the aims and purposes of the investigation. After the findings of the study were determined, the literature review moved on to the latter stages of the research procedure.

According to Creswell (2018), conducting a review of the relevant literature positions for a study helps to clarify the information gaps, offers a framework for proving the value of the study, and, as a result, offers an explanation for the issue statement.

The literature review supplied the study addressing the theoretical framework for the motivations to the construction of the green building in Iraq, but also the obstacles that prevent to the construction of green buildings in Iraq. This study was presented as part of the study.

Denscombe (2014) proposes that such an approach aims at arriving at a result based on the suggested information of a subject depending on a detailed and impartial examination of studies that were carried out on the subject. This review was carried out on the topic of the proposed information. This method was helpful, as it allowed for the identification of a large number of publications on the subject of the study; however, these articles needed to recognize and define the motivations to the construction of the green building in Iraq also the obstacles that prevent to the construction of the green building in Iraq.

In the course of the research, we looked through a variety of publications, such as books, seminars, websites, and databases.

We also read a number of scholarly journals, such as the Journal of Building and Environment, the Journal of Construction, Engineering and Management, and the Journal of overall quality management development.

4.7.1.1 Documents finding

The initial results of the first step show that the study has highlighted on the summarization to (24) motivations for the construction of green buildings in Iraq and (18) obstacles that prevent to the construction of green buildings in Iraq.These motivations have been classified into five ingredients were, which represented the economic, social, environmental, organizational, and market targets, as shown in tables (4.1) and (4.2).

4.7.1.2 Re-Cording

For the purpose of using the SPSS program for data assessment, codes have been given to the scales for the perspective of participants on the critical significance of the motivations to construct green buildings in Iraq, as well as the barriers that prevent to the construction of green buildings in Iraq. These codes were also allocated to the levels for the opinion of participants on the degree of criticality of the motives to construct green buildings in Iraq.

Also, to data assessment, re-coded were assigned for the questions from (1 to 24) of respondent's opinions on these motivations to the construction of the green building in Iraq to code (T1 to T24), also re-coded obstacles that prevent to the construction of the green building in Iraq questions from (1 to 18) to code (O1 to O18).

Table 4.1: Motivation to Construction of Green Building

1- Economic Targets	Code
Green construction projects save money and time on permitting and approval processes since they need minimum time and documentation.	T1
Green constructions might receive tax breaks and utility company incentives.	T2
The number of customers requesting green construction projects has increased.	T3
2- Social Targets	
The increased interior quality found in green constructions has positive effects on the health of the building's residents.	T4
The health, happiness, and contentment of building residents are all enhanced in green constructions.	T5
Green constructions enhance the protection and security of residents.	T6
Green constructions contribute to the quality of living for their inhabitants.	T7
3- Environmental Targets	
Green construction methods lessen manmade structures' destructive effects on the natural environment.	T8
Green constructions aid in limiting climate change.	T9
Green construction improves the quality of both the air and the water.	T10
Green construction reduces the need for raw materials, which helps preserves natural habitats.	T11
Green construction is the result of policy shifts and regulatory adjustments that protect the environment.	T12
4- Organizational Targets	
Green constructions are one example of responsible business practices.	T13
Green construction practices are an integral aspect of strategy management and risk analysis for major corporations.	T14
With the help of green constructions, organizations have improved their standing in the minds of the general population.	T15
Green constructions have the ability to entice personnel who are youthful and have a high level of education.	T16
Green constructions enable construction companies to undertake new initiatives by generating value in a market that is sustainable.	T17
Green constructions simplify the management of monetary, financial, and market risks.	T18

Table 4.1: (Cont.) Motivation to Construction of Green Building

4- Organizational Targets	Code
Green constructions lead to the development of new offerings and activities that are more energy productive, which helps grow profits.	T19
Green constructions simplify the company's advertising responsibilities.	T20
Green constructions make it possible to create businesses in foreign nations and to export green building expertise.	T21
5- Market Targets	
The construction sector benefits from green construction's use of creativity techniques, materials, and innovations.	T22
The market for green buildings is receiving a growing amount of media coverage.	T23
At large-scale conventions, eco-friendly construction is gaining more and more attention.	T24

Table 4.2: The Obstacles that Prevent to Construction of Green Building

Obstacles	Code
The return on investment for green constructions is lower.	O1
The time required for payback of starting green construction costs is too lengthy.	O2
The initial construction expenses of green buildings are significantly higher than traditional building prices.	O3
The costs of functioning, servicing, and repair for green constructions are typically greater.	O4
The cost of green technology and materials is too expensive.	O5
The provision of financial incentives by governments is not sufficient to propel the green construction industry.	O6
The building industry is resistant to innovation and development.	O7
There are insufficient investors for the development of green constructions.	O8
There is a lack of coordination amongst construction companies that might benefit the green construction industry.	O9
The upper management does not view green construction as a priority.	O10
The majority of construction firms do not have the financial stability to take on green development projects.	O11
The majority of construction firms do not have the financial stability to take on green development projects.	O12
There is a lack of expertise among construction companies.	O13
There is a shortage of market consensus regarding significant green requirements.	O14
There are insufficient green construction consultants and educational programs.	O15
There are not sufficient resources or documents available due to the fact that green construction expertise (technology, materials) is relatively new.	O16
There is a deficiency in the number of experts and workers who possess the appropriate level of experience.	O17
The researches on the cost-benefit of environmentally friendly building materials are insufficient.	O18

4.7.2 Stage II

In order to provide a quantitative or mathematical explanation of the patterns, behaviours, or perspectives of an entire community by examining a sample of that group, researchers have developed a questionnaire survey (Creswell, 2018).

At this stage in the research process, as depicted in figure (4.4), the focus shifts to the creation and processing of the survey questionnaire as well as the analysis of the results of the survey.

The purpose of the questionnaire is to evaluate the practical motivations to the construction of green buildings in Iraq, also the obstacles that prevent to the construction of green buildings in Iraq.

In the context of information analysis, a questionnaire is a written series of questions designed to precisely acquire details from people and gather details that can be used for analysis. The design of questionnaires needs to be rethought so that they may be finished quickly and independently without any assistance. They can be challenging because respondents are unable to express themselves in their own words, and the researcher may not always have the opportunity to independently check the veracity of the responses. However, these are fairly easy to organize, and since all of the participants are forced to answer roughly the same questions, and the responses are picked at random from the recordings, it is appropriate for quantitative analysis (Denscombe,2014).

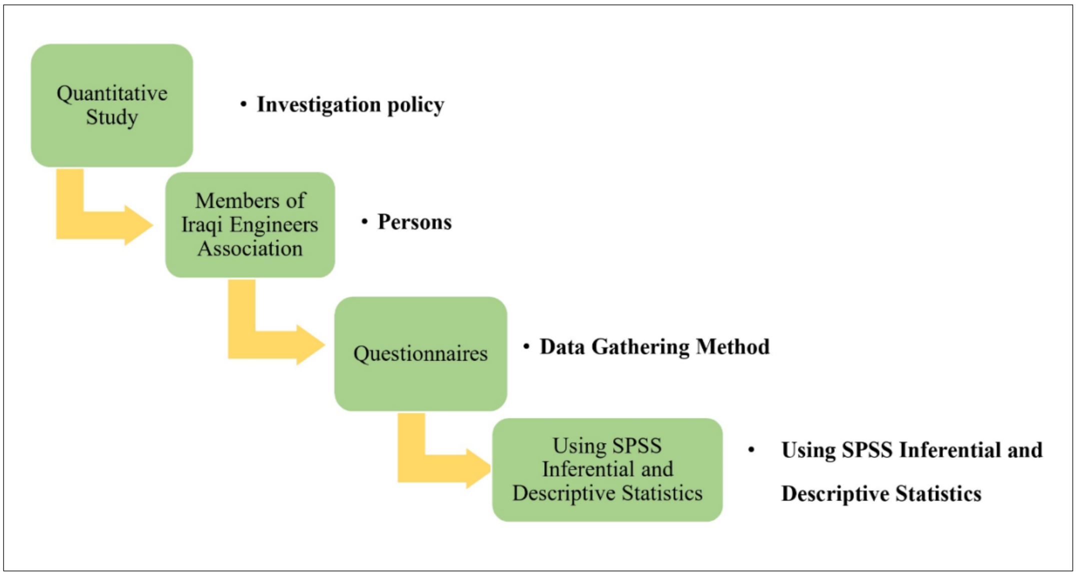

Figure 4.4: Steps of Questionnaire Survey

Source: Author

4.7.2.1 Questionnaires sample

The questionnaire study includes a quantitative approach specifically to the use of the sample primarily, which selects individuals, choosing a number for several and generalizing findings that might represent a wider population.

According to Bryman (2016), the degree to which a specimen is a community depends on specimen volume, the basic design of choice processes, and the specimen structure, where the specimen volume is the number of persons from the community through which the investigator gets data, the specimen design or sampling the strategy be referred to the basic plan choice process, where specimen structure is a list representing persons in a community.

The questionnaires were targeted at (152) registered members of engineering specialists who work in the fields of building construction. The participants were contacted by printing the questionnaire and distributing it in papers, social media numbers, and email addresses obtained from the register of the Iraqi engineering specialists, as stated above.

Where participants have been required to answer the questionnaires and send them back through the same receipting method, and then questionnaires (131) have been returned after giving them a specific duration (30) days.

4.7.2.2 Questionnaires design

The questionnaires should be designed to gather data that could be used for evaluation, provide a list of questions, and must ask people for data on identified research matters (Denscombe, 2014). where four key criteria must be met while questionnaires are designed:

- Theoretical awareness of the study is conducted and obtained by analyzing submitted literature or other qualitative study methods that may function as a pilot approach.
- The validity of the questionnaire, how the question tests what it has been designed to test, and the reliability of the questions, whether these are consistent or relevant.
- Experience in writing a questionnaire and the utilization of a broad variety of questionnaires published.

- Knowledge of the target demographic.

A sample of the questionnaire is included in Appendix A.

The questionnaire includes a group of specific questions designed to gather the knowledge that will assist in achieving the aims and objectives of the study. Specific questions are designed with answers that only permit the answers to match into categories defined by the researcher in advance.

The questionnaire also included the scales defined as measurement levels, which are a method for arranging information in the measurement of indicators into the nominal and ordinal level, and also scales to determine the intensity, direction, amount, or power of a variable measuring in quantitative data.

Scales include Likert, Thurstone, the social distance of Borgadus, semantic differential, numerical ranking, and the scale of Guttman. They are utilized by social scholars to provide strong data quality, high precision and reliability, compare data sets, and improve data collection and analysis (Neuman,2014).

The scale of measurements utilized for this study is nominal and ordinal (numerical and Likert) measurement scales. The nominal measurement scale is used in section 1 of the questionnaire; it's required from the respondent to select the speciality of his/her occupation and years of experience.

Section 2 (part 1 and part 2) deals with issues by using the ordinary measurement scale (Likert scale), Where they included a 5-point Likert scale, which requires respondents to indicate to what extent they agree or disagree about the effects and motivations to the construction of the green building in Iraq, and the obstacles that prevent to the construction of the green building in Iraq.

where;

No.5=Strongly Agree,

No.4=Agree,

No.3= Neutral,

No.2= Disagree, and

No.1= Strongly disagree.

Due to its simplicity, flexibility, and reliability, the Likert scale is the most widely used form of scaling (Neuman, 2014).

4.7.3 Stage 3

The response ratio for the data collection is beneficial in assessing the efficiency of the questionnaires returned in the study. Table (4.3) displays the distribution of the questionnaire for the survey method. (152) questionnaires were distributed directly, either by printed papers or by sent questionnaire link (google format) through the social media numbers and email addresses, and then (131) completed questionnaires were then returned, which resulted in (86 %) of participants.

Table 4.3: Distribution of Questionnaire

Questionnaire	No.
The questionnaires that were handed out personally	25
The questionnaires sent by social media numbers	112
The questionnaires were sent by email	15
The overall number of returned completed questionnaires	152

4.8 Reliability

When it comes to quantitative studies, a reliability test gives essential information about and an assessment of the internal coherence of responses between the questions in the questionnaire study. This information and assessment can then be used to draw conclusions. Cronbach's Alpha is the approach that is utilized the most frequently to test the inter-item dependability and internal coherence of questionnaire responses (Pallant, 2020).

Other ways are available for assessing the reliability of the data obtained from questionnaire surveys.

When utilizing Cronbach's Alpha, the degree of acceptance on an evaluation of the internally reliability of the data collected on the questionnaire study can range anywhere from (0) to (1.0). A score of 0 indicates a result that is fully unreliable, while a score of 1.0 indicates a result that is perfectly reliable.

Applying Cronbach's Alpha factor, the critical level that is required to define the acceptable degree of internal dependability is (0.7) (Pallant, 2020).

The reliability test is used to assess the consistency of the selected scale, and the alpha in Cronbach is the most popular reliability test, as shown in equation (4.1).

The reliability test was carried out to demonstrate the reliability of the scales to determine what motivations for the construction of the green building in Iraq and the obstacles that prevent the construction of the green building in Iraq;

$$\alpha = \frac{n}{(n-1)}\left[1 - \frac{\sum_{i=1}^{n} \sigma_{yi}^2}{\sigma_x^2}\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \ldots\ldots\ldots \textbf{(4.1)}$$

Where;

α = alpha Cronbach

n = refers to the number of scale items

σ_{yi}^2 = refer to the variance associated with the item i

σ_x^2 = refer to the variance associated with observed total scores

Where table (4.4) indicates that all values are more than (0.70) value, it's acceptable for Cronbach’s alpha value, meaning that the scales are reliable for this analysis.

Table 4.4: The Cronbach's Alpha Values

Components	**No. of Items**	**Value**
Motivation to Construction of Green Building	24	0.929
The Obstacles that Prevent to Construction of Green Buildings	18	0.896

The author utilized the internal-consistency approach by calculating the reliability coefficient (Cronbach alpha) for all subjects in the study, excluding the example questions' features. The coefficient of reliability was computed for the dimensions of the investigation.

First elements: Motivation for the construction of green buildings.

Second element: The obstacles that prevent to the construction of green buildings.

4.9 Results and Finding

This part discusses the findings of the research study that was carried out inside the construction sector in Iraq and gives the main information. In order to accomplish the goals of the research and get the desired results, the findings were obtained from a variety of various types of evidence. The most important piece of verification came from filling out questionnaires.

In addition to that, the researcher obtained several findings. The results have been triangulated using these pieces of data. This strategy affords the possibility to examine one-of-a-kind problems that have surfaced as a result of the findings of the data collecting that were not anticipated in the previous research. In addition, we give a critical evaluation of the research methods as well as the limits of the study's findings.The methodology for doing the assessment, as well as the explanation of the findings, have been organized in a manner that is mostly based on the framework of the questionnaire survey tool.

4.9.1 Background information

A total of (152) questionnaires were distributed in all, and (131) participants filled out the questionnaire. At the outset, the participants were requested to supply some background information, including their work title, years of experience, and the highest level of qualification.

4.9.1.1 Engineering specializations

The research was conducted at building companies, including government organizations and commercial consulting companies. The organizations represented the many engineering specializations, which are detailed in table (4.5).

Table 4.5: Questionnaire Distribution Regarding to Engineering Specializations

Questionnaire	**No.**
Civil Engineering	86
Architectural Engineering	29
Mechanical Engineering	9
Electrical Engineering	6
Other Specialization	1
The total number of completed questionnaires returned	131

The findings of this survey indicate that (65.7 %)of respondents have a background in civil engineering, which is the highest percentage of engineers currently working in the field of building construction. The findings also indicate that (22.1 %) of respondents have a background in architectural engineering, (6.9 %) of respondents have a background in mechanical engineering, and (4.6 %) of respondents have a background in electrical engineering, while (0.7 %) have other specializations, as shown in figure (4.5).

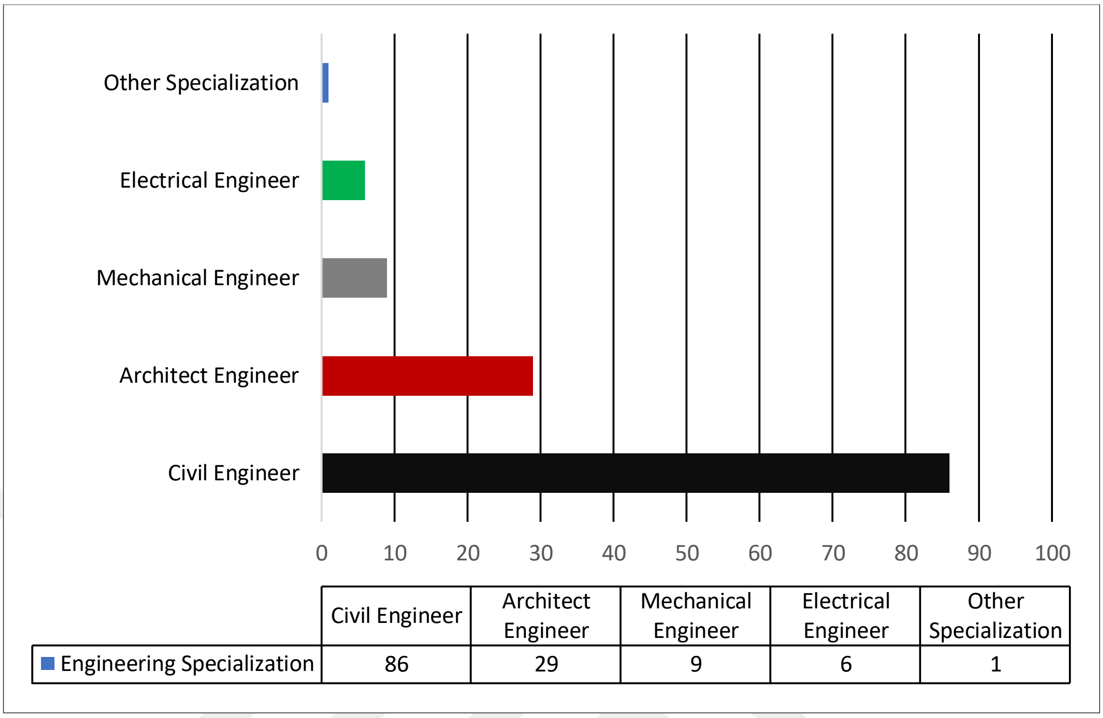

Figure 4.5: Engineering Specializations

4.9.1.2 Engineering occupations

The researcher provided the decision to include such engineering specialization levels for two reasons: first, to gain comprehensive information and evident opinions about the motivation for the construction of green buildings and the obstacles that prevent to the construction of the green building, and second, to consider the implementation of green buildings is a comprehensive strategy that includes engineering occupations as support and management employees, as shown in table (4.6).

Table 4.6: Questionnaire Distribution Regarding to Engineering Occupations

Questionnaire	**No.**
Top Management	77
Middle Management	36
Senior Management	15
Supervisor	3
The total number of completed questionnaires returned	131

The study shows questionnaire distribution regarding to engineering occupations of the different participants as per figure (4.6), where (58.8 %) of participants with occupations top management, (27.4 %) of participants with occupations of middle management, (11.5 %) with occupations senior management, and (2.3 %) with supervisor occupations.

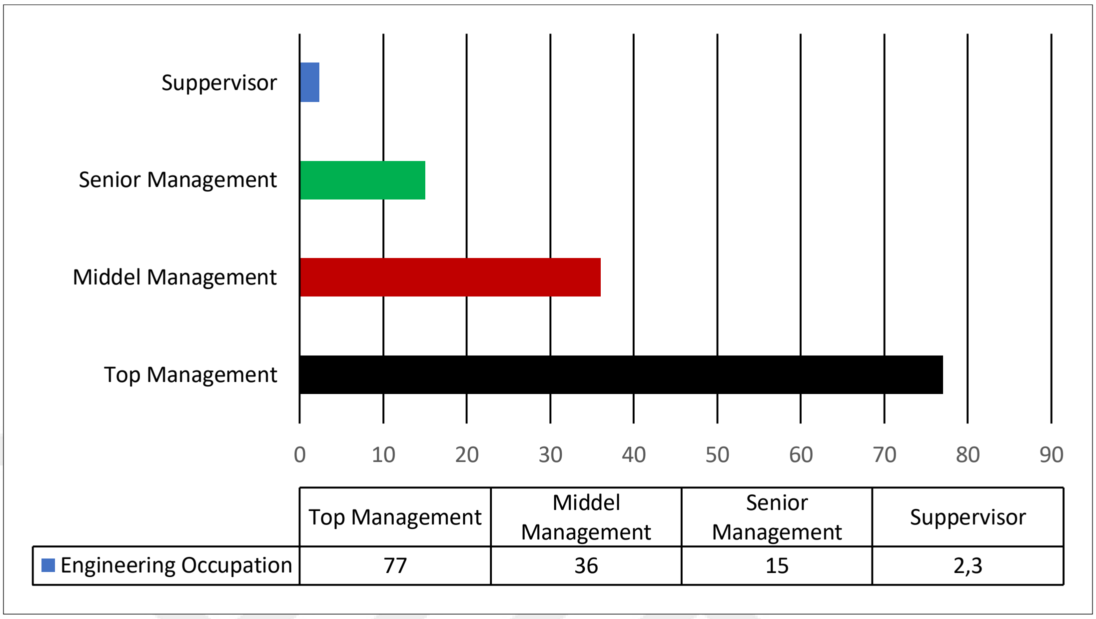

Figure 4.6: Engineering Occupations

4.9.1.3 Years of Experience

As can be seen in table (4.7), the overwhelming of these engineering specializations with different levels of engineering occupations were who possessed sufficient knowledge and had anywhere from less than 5 years to more than 11 years of experience.

Table 4.7: Questionnaire Distribution Regarding to Years of Experience

Questionnaire	No.
Less than 5 years	90
5 to 10 years	32
more than 11 years	9
The total number of completed questionnaires returned	131

The study shows the years of experience of the different participants as per figure (4.7), where (68.7 %) of participants have Less than 5 years of professional experience, (24.4 %) of participants from 5 to 10 years of working experience, and (6.9 %) have more than 11 years of professional experience.

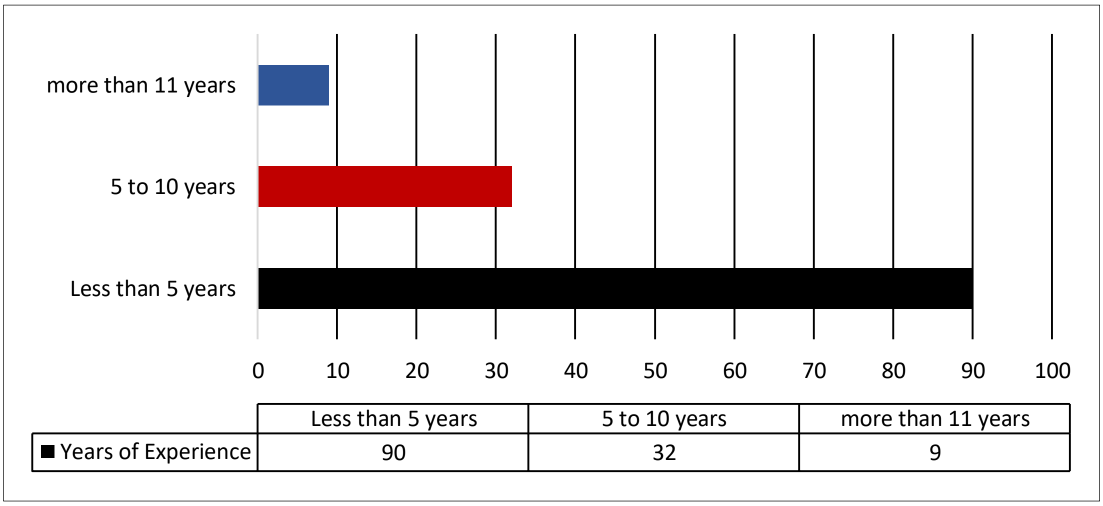

Figure 4.7: Years of Experience

4.9.1.4 Education background

The research was conducted within different levels of education to gain comprehensive information and evident opinions about the motivation for the construction of green buildings and the obstacles that prevent to the construction of green buildings at construction companies, which are detailed in table (4.8).

Table 4.8: Questionnaire Distribution Regarding to Education Background

Questionnaire	No.
Diploma (Engineering Institute Graduate)	1
Bachelor's Degree	93
Master's Degree	25
Doctor’s Degree	12
The total number of completed questionnaires returned	131

The study shows the years of experience of the different participants as per figure (4.8), where (0.6 %) of participants had a Diploma education, and (71.1 %) Bachelor's Degree education, while Master's Degree within (19.1 %) and (9.2 %) with Doctor’s Degree.

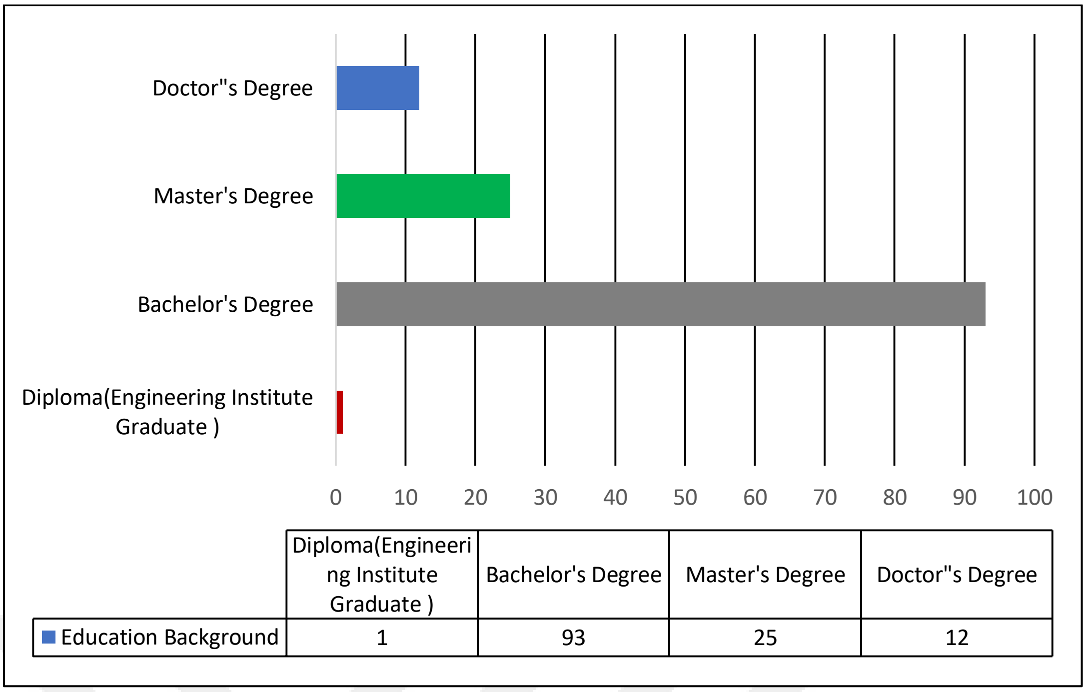

Figure 4.8: Education Background

4.9.2 Motivation to construction of green building

After completing the preliminary steps necessary to input the collected data into the SPSS program, the study proceeded to evaluate the data and verify that any errors had been properly accounted for. Verifying that the method used to submit data was accurate was a necessary procedure that had to be performed regularly. When analyzing the results of the survey, both a descriptive and a differential approach were taken using SPSS.

According to Calkins (2005), descriptive statistics typically define or identify a collection of data elements and attempt to deduce information obtained by sampling by graphically presenting the information or explaining its key patterns and how it is distributed when inferential statistics are presented. Descriptive and inferential statistics are both presented in this article.

These motivations have been classified into five ingredients were, which represented the economic, social, environmental, organizational, and market targets

4.9.2.1 Economic target

Where table (4.9) describes the level of motivation for the construction of green buildings, it shows T3 “The number of customers requesting green construction projects has increased” as the maximum value of a ranking 1st.

This is followed by T2, " Green constructions might receive tax breaks and utility company incentives", as 2nd rank.

T2 " Green construction projects save money and time on permitting and approval processes since they need minimum time and documentation" ranked 3rd .

Table 4.9: Economic Target

Code	Mean		Std.D.	Variance	Sum	Grade
	St.	**Std. E.**				
T1	4.05	0.080	0.910	0.829	530	3rd
T2	4.32	0.079	0.988	0.809	554	2nd
T3	4.28	0.063	0.715	0.512	561	**1st**

4.9.2.2 Social target

The table (4.10) describes the level of motivation for the construction of green buildings. It shows T7, “Green constructions contribute to the quality living for their inhabitants”, as the maximum value of a ranking 1st.

This is followed by T5, " The health, happiness, and contentment of building residents are all enhanced in green constructions", as 2nd rank.

T5 " Green construction projects save money and time on permitting and approval processes since they need minimum time and documentation" ranked 3rd rank but with standard deviation (0.816).

T6 " Green constructions enhance the protection and security of residents" ranked 4th rank.

Table 4.10: Social Target

Code	Mean		Std.D.	Variance	Sum	Grade
	St.	**Std. E.**				
T4	4.28	0.071	0.816	0.666	548	3rd
T5	4.18	0.067	0.763	0.582	548	2nd
T6	4.18	0.069	0.789	0.623	547	4th
T7	4.3	0.067	0.772	0.595	563	**1st**

4.9.2.3 Environmental target

Where table (4.11) describes the level of motivation for the construction of green buildings, it shows T9, “Green constructions aid in limiting climate change”, as the maximum value of a ranking 1st.

This is followed by T11, " The health, happiness, and contentment of building residents are all enhanced in green constructions", as 2nd rank.

T12, "Green construction reduces the need for raw materials, which helps preserves natural habitats", ranked 3rd rank but with a standard deviation (0.816).

T8 "Green construction methods lessen manmade structures' destructive effects on the natural environment" ranked 4th rank.

Table 4.11: Environmental Target

Code	Mean		Std.D.	Variance	Sum	Grade
	St.	Std. E.				
T8	4.21	0.068	0.782	0.611	551	4th
T9	4.37	0.068	0.777	0.603	572	**1st**
T10	4.13	0.070	0.798	0.637	541	5th
T11	4.32	0.064	0.737	0.543	566	2nd
T12	4.22	0.072	0.825	0.681	553	3rd

4.9.2.4 Organizational target

Where table (4.12) describes the level of the motivations for the construction of green buildings, it shows T21, “Green constructions make it possible to create businesses in foreign nations and to export green building expertise”, as the maximum value of a ranking 1st.

This is followed by T17, "The construction sector benefits from green constructions' use of creativity techniques, materials, and innovations", as 2nd rank.

T18, " Green constructions simplify the management of monetary, financial, and market risks", ranked 3rd rank but with standard deviation (0.816), but with standard deviation (0.817).

T14 " Green construction practices are an integral aspect of strategy management and risk analysis for major corporations" ranked 4th rank.

T16 " Green constructions have the ability to entice personnel who are youthful and have a high level of education" ranked 5th rank but with standard deviation (0.816).

Table 4.12: Organizational Target

Code	Mean		Std.D.	Variance	Sum	Grade
	St.	Std. E.				
T13	4.22	0.075	0.853	0.728	553	6th
T14	4.24	0.073	0.830	0.690	555	4th
T15	4.05	0.080	0.910	0.829	530	9th
T16	4.23	0.079	0.899	0.809	554	5th
T17	4.28	0.063	0.715	0.512	561	2nd
T18	4.28	0.071	0.817	0.666	561	3rd
T19	4.18	0.067	0.763	0.582	548	7th
T20	4.18	0.069	0.789	0.623	547	8th
T21	4.3	0.067	0.772	595.000	563	**1st**

4.9.2.5 Market target

Regarding to the fifth target, where table (4.13) describes the level of motivation for the construction of green buildings.

It shows T23, “The market for green buildings is receiving a growing amount of media coverage”, as the maximum value of a ranking 1st.

This is followed by T24, " At large-scale conventions, eco-friendly construction is gaining more and more attention", as 2nd rank.

T22 " The construction sector benefits from green constructions' use of creativity techniques, materials, and innovations" ranked 3rd rank.

Table 4.13: Market Target

Code	Mean		Std.D.	Variance	Sum	Grade
	St.	Std. E.				
T22	4.210	0.068	0.782	0.611	551	3rd
T23	4.370	0.068	0.777	0.603	572	1st
T24	4.230	0.079	0.899	0.809	554	2nd

4.9.3 The Obstacles that Prevent to Construction of Green Buildings

The obstacles that must be overcome in order to construct green buildings have been brought to light in Iraq. The information provided by participants was analyzed by employing the formula for calculating the sum of the mean grades; the results were used to rank the obstacles to achieving green construction.The obstacles that prevent to the construction of green buildings in Iraq are seen in the table (4.14), where the results revealed (18) challenges to sustainable building. The first nine the as the maximum value with a ranking index are:

O8 “There are insufficient investors for the development of green constructions” as 1st rank. O6 “The provision of financial incentives by governments is not sufficient to propel the green construction industry” as 2nd rank.

O10 “The upper management does not view green construction as a priority” as 3rd rank.

O11 “The majority of construction firms do not have the financial stability to take on green development projects” as 4th rank.

O12 “Public notability and the lack of government financial support for the financing of sustainable buildings” ranked 5th.

While O17, “There is a deficiency in the number of experts and workers who possess the appropriate level of experience.” ranked as 8th.

Table 4.14: Ranks of the Obstacles that Prevent to Construction of Green Building

Code	**Mean**		**Std.D.**	**Variance**	**Sum**	**Grade**
	St.	**Std. E.**				
O1	4.11	0.073	0.834	0.696	538	16th
O2	4.21	0.077	0.877	0.769	552	9th
O3	4.27	0.072	0.823	0.678	560	6th
O4	4.18	0.072	0.823	0.674	548	10th
O5	4.31	0.083	0.948	0.898	541	15th
O6	4.33	0.071	0.808	0.653	567	2nd
O7	4.15	0.083	0.948	0.900	544	14th
O8	4.39	0.070	0.800	0.640	575	**1st**
O9	4.18	0.066	0.759	0.577	547	13th
O10	4.32	0.070	0.797	0.635	566	3rd
O11	4.29	0.065	0.739	0.546	562	4th
O12	4.27	0.071	0.814	0.662	560	5th
O13	4.27	0.072	0.823	0.678	560	7th
O14	4.18	0.096	1.094	1.197	548	12th
O15	4.11	0.084	0.963	0.927	538	17th
O16	4.25	0.078	0.889	0.790	557	8th
O17	4.07	0.088	1.009	1.018	533	18th
O18	4.18	0.096	1.094	1.197	548	11th

4.9.4 Validation from the Motivations to Construction of Green Building

The questionnaire was implemented to investigate whether or not registered members of the Iraqi Engineers Association (IEA) and those working in buildings construction fields are aware of the essential motivations for the construction of green buildings in Iraq in Iraq. The survey questionnaire was distributed to a total of 131 respondents.

The findings indicate that engineers are now working in the construction of buildings, and these engineers are able to assess how significant the contribution of the (24) components of green construction has been to the development of green buildings in Iraq.

This suggests that engineers are informed of sustainable construction attributes, despite the fact that their levels of experience may vary.

This section contains a report on the findings that emerged from the data received from building specialists by means of a questionnaire. The data were collected from those specialists. In order to strengthen the research project's internal validity, a number of distinct documentation sources, including a questionnaire, a factual review, archival materials, and direct evaluations, were utilized all throughout the process of data collection. This was done with the intention of increasing the project's overall quality.

It became out that the respondents to the questionnaire, all of whom were experts in the field of construction, had an inadequate level of grasp of the objective of motivations for the construction of green buildings in Iraq. Participants in the questionnaire research who were categorized as being primarily involved in the implementation of building projects in Iraq arrived at the same result as the professionals did.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

5.1.1 Introduction

The design and construction sector has also created green construction practices in order to reduce the negative impact that structures have on the surrounding environment. Buildings have been singled out as a major contribution in a number of research studies as an important factor in the use of huge quantities of energy and water as well as the intensive use of land.

Several national governments have enacted legislation to encourage sustainable building practices, which has resulted in the development of environmentally friendly structures.

It is unfortunate that sustainability is not emphasized in the design instruction for construction endeavors in Iraq; this is evident from Iraq's present environment, which is not sustainable. There is a lack of verification to recognize environmentally friendly construction elements in Iraq; as a result, environmental, economic, and social consequences assessment, life cycle assessment, and life cycle cost evaluation are not given the attention they deserve. In addition, there is a lack of attention paid to finished projects or the materials that have been employed.

The main goal of this study is to highlight the motivation and obstacles to the construction of green buildings in Iraq and at the same time spread the green building construction concepts among building specialists in Iraq. The study highlighted the research into indicating how important the referred motivation and obstacles are as per the scientific standards in achieving the concept and ensuring the implementation of sustainable buildings in Iraq. This will be accomplished by highlighting the research into pointing to how important the mentioned motivation and obstacles are.

The purpose of this study is to determine whether or not engineers who work in the building construction areas in Iraq are aware of the fundamental components that go into creating sustainable structures, as well as to determine the obstacles that stand in the way of creating environmentally friendly structures in Iraq. The aforementioned goals and objectives have been accomplished by following the methodology of the study outlined below, which consists of three stages.

The first step was to conduct an in-depth review of SD literature and the way it has affected the building industry, which ultimately led to the development of sustainable building practices.

The standards such as BREEAM-NC, LEED-NC, and ISO 15392 were evaluated during the literature review, which resulted in the collection of twenty-four justifications for the use of environmentally friendly building practices and the creation of a historical understanding of the building and its parts.

In the second part of the research project, a questionnaire was distributed to 131 individuals who were either associated with the Iraqi Engineers Association or worked in disciplines related to the construction of structures. The purpose of this step was to learn what these individuals believed to be essential for a structure.

Validating the construction of a management system with the goal of achieving environmentally friendly buildings in Iraq is part of the third step in this process.

5.1.2 Conclusion of research

This study summarized the primary findings of the investigation as follows: this chapter presented sustainable building development due to the effect of sustainable development (SD) on the building industry and informing the environmental, social, economic, and management parts of the construction industry. the function of sustainable development (SD) in the construction industries and as initiators of sustainable constructions (SC) at chapter 2 this chapter.

This chapter provides an explanation of why these aspects were established in the construction industry and why they became standard operating procedure (SC practice).

However, SC is insufficient on its own because it is merely a technique that must be performed to achieve a final goal, which is the development of sustainable structures. The culmination of the SC plan is the development of sustainable buildings, which also includes the construction of evaluation tools for sustainable buildings.

What constitutes a green building have presented in chapter 3, this chapter explored the numerous meanings of green building and detailed the motives and challenges to construction of green building in Iraq in the scope of the research as a secure building infrastructure, conceived of and developed in the earliest stages of life, with a focus on ecological values, social justice, and the importance of the quality of the life cycle in the process of producing a sense of community.

The concept of sustainable building components has been constructed using the environmental, social, economic, and management aspects of sustainable development described in chapter 3 of the SD. While these components are incorporated into the planning phase of the building's life cycle, participants have been asked to identify areas where there are additional opportunities for attaining environmentally friendly construction as well as difficulties in creating environmentally friendly structures in Iraq.

5.1.3 The Implications of Green Building on the Construction Sector

Sustainability development (SD), the progress toward a prosperous economy and a healthy natural environment, is widely recognized as a means to address pressing global issues and provide for those in need.

It serves the demands of its residents both now and in the future by fostering economic expansion without compromising environmental quality or depleting natural resources. This allows it to do so in both the present and the future. Because of the increased awareness of the detrimental effects that buildings have on the environment, the building sector in particular has adopted SD evaluation. This is due to the fact that SD assessment was developed.

During the course of the building process, the construction industry is responsible for a number of points that contribute to pollution. During the construction process, as well as while the structure is in use, carbon dioxide and other types of pollution are produced, and the construction phase also involves the usage of a great deal of potentially hazardous chemical compounds.

There is a significant increase in the use of fossil fuels, nuclear power, hydropower, and wind energy in the construction industry. While serving as a place for people to reside, mingle, and conduct business, these structures may also be operated as long-term assets.

The construction industry can be improved by incorporating the environmental, social, and financial elements of SD. In order to put these three components into action, however, the research has revealed that a fourth factor, the management dimensions of SD, is required.

By incorporating these four facets of SD, we have seen a shift toward ecologically responsible building practices, specifically the development of non-hazardous materials and their widespread application.

The same logic can be used to the production of building supplies, business procedures, and waste management in an effort to combat environmental degradation with minimal energy consumption. Sustainable structures are designed to reduce negative impacts on the surrounding environment while simultaneously improving the quality of life for occupants.

Green building is a process that incorporates principles of sustainable development into the design, construction, operation, and eventual deconstruction of structures.

To be effective, this mechanism must not only provide the demand for shelter and comfort, but also serve as the final destination for the expansion of buildings in a sustainable manner.

The progress made toward SD in the building industry can now be evaluated thanks to sustainable building practices.

5.1.4 Green building in Iraq

The Iraqi green construction Sector is still in its infancy; despite its current limited size, its expansion is anticipated in the near future. In today's world, there are a growing number of building owners who are seeking environmentally conscious construction practices for new constructions. In order to accomplish green building development, the conclusions of the thesis were aimed at figuring out the potential correlations between respondents' perspectives and the actual situation of green construction initiatives.

The conclusion of this thesis demonstrates that, from the perspective of those who participated in the questionnaire, the construction industry avoids constructing green buildings for three main causes:

1. The construction contracting and tendering procedure prioritizes saving money and reducing the amount of time it takes over maximizing the performance of the structure.
2. The provision of financial incentives by governments is not sufficient to propel the green building industry.
3. The design and construction of buildings are not held to a higher standard because regulations do not require this.

The lack of insurance regulations, the high initial cost, the insufficient experience of building firms, the difficulty in locating environmentally friendly materials, and the obstacles to the system and result creativity are, in order of significance, the other most critical obstacles to the implementation of sustainable practices. These costs are high for both the technological advances and the material itself.

It is often owing to the relative infancy of the business, the nature of the development sector, and a shortage of management frameworks, which are all factors that impede the expansion of the green building marketplace. Education, backing from the government, and research into green construction technologies can remove a significant number of these obstacles.

It has been brought to people's attention that there is not enough support from the government in the form of monetary incentives, taxation abatements, and policy instruments.

The remarks of those questioned make it abundantly evident that they want the government of Iraq to establish required laws, policies, and rules for green constructions or incentives and to bring energy-efficiency regulation and code revisions so that consumer demand may be generated.

An additional role that the government can play is to sponsor education and development initiatives for building experts interested in green buildings, as well as work on developing procedures for building accreditation. In addition, structures that make use of materials that are damaging to the environment, such as fossil fuels, should be subject to a tax, while environmentally friendly structures should be rewarded.

The government has the ability to publish the cost savings of demonstrative initiatives over the long term, which will allow for the creation of a more competitive market.

In addition, respondents expressed a need for additional cost-benefit analyses to be conducted on this subject in order to address concerns around initial cost and perceptions. There is a need for further data and knowledge to support the justifications of sustainable construction on initial cost; annual energy and other expenses; user health, efficiency, and fulfilment; environmental consequences; and additional social and corporate effects.

Strategies for calculating the real costs of constructing environmentally friendly buildings throughout the course of their whole life cycles should be developed by researchers and then further developed. Enhancing one's understanding of the financial gains that may be derived from increased productivity will be of tremendous assistance in the creation of an environmentally responsible design.

Building stakeholders will become more aware of the benefits of environmentally friendly buildings, which will result in a rise in the number of environmentally friendly buildings. It is important for renters, insurance firms, and banks to have an understanding of the advantages and economic value offered by green buildings before there can be a movement in demand in the marketplace.

The belief that owners and the general public will become interested in environmentally friendly buildings when they are made aware of the possible cost savings that can be realized from the entire life cycle viewpoint is another theory that is held by the respondents.

Because any additional costs for the project will have the greatest impact on the customers, it is imperative that any educational initiatives and monetary incentives be directed squarely at prospective customers or, to put it another way, the general population.

The drawbacks of conventional structures are well-known, while the advantages of environmentally friendly buildings have been uncovered. The majority of respondents believe that environmentally friendly construction will become the standard in the years to come. In the future, there should be additional instances of environmentally friendly buildings, objectives should be established for sustainability, and recommendations can be developed.

5.1.5 Constraints of research

The primary purposes and targets of this thesis have been accomplished, and it has exhibited an in-depth investigation of the factors that motivate and hinder the planning and building of environmentally friendly buildings. However, there are a few problems with the thesis.

To begin, there are not a sufficient amount of green buildings that have been finished and have full data to evaluate the green running cost with the financing and operating expenses associated with traditional building projects. This is a significant limitation.

Because of their relatively recent construction, the majority of the data needed to analyze the efficiency of today's green constructions was not accessible. All of the information on cost savings from operations was obtained from an analytical report on energy management.

Nevertheless, the validity and accuracy of the energy models that are used to calculate energy savings are still up for debate. In addition, a sizable data set of green construction projects originating from a variety of geographic areas and climatic circumstances ought to be compiled in order to facilitate the drawing of generalizations devoid of any element of mystery. The execution of surveys or interviews with a bigger number of marketplace actors beyond would additionally render it possible to carry out an investigation that is more thorough and in-depth.

5.1.6 Additional research

It is necessary to do additional study in the following categories in order to gain a better knowledge of the green building revolution in Iraq and to make improvements to it. The actual functioning of the buildings after they have been occupied should be evaluated first and primarily so that the real operating information of green buildings may be evaluated to the functioning data of other buildings, whether those other constructions are green or traditional.

It is essential to monitor and analyze building efficiency in order to determine the 'environmental effects and energy productivity' of construction over the course of its entire life cycle, as well as to convince and motivate policymakers as well as other participants in the construction industry by providing them with feedback that is both logical and practical.

Second, in order to demonstrate the efficacy and advantages of particular green construction techniques, it is necessary to conduct studies that are both exhaustive and unambiguous and that centre on a single green strategy. A study of the financial rewards and hazards (both over time and short-term) associated with each approach is possible, given that these strategies have a solid and reliable statistical base. Additionally, there is a requirement for more research and improvement in terms of the procedure and the supplies.

Thirdly, the utilization of an integrated design methodology can be examined, and the low starting cost of environmentally friendly architecture can be demonstrated.

It is possible to do additional research on the fact that governments have been establishing a variety of policies and laws to encourage sustainable development across various regions of the world, and as a result, these incentives provided by governments are able to be explored. In addition to buildings, however, other types of infrastructure, such as transportation networks, can be investigated and studied to determine what actions can be taken to advance the cause of sustainability in the construction industry.

In conclusion, there is a significant need for increased public understanding of the advantages of green buildings. It is envisaged that people will start to adopt sustainable practices in their own homes as they learn more about green construction in the general public sphere. In order to make this a reality, it is possible to conduct a survey to ascertain their level of expertise and the level of demand. Additionally, this assists in identifying the requirements and goals for residential construction.

In a nutshell, the findings of this study give the government with useful information that can be used to develop environmentally friendly communities, as well as the knowledge that can help enterprises and construction businesses become stronger competitors in the marketplace. The highlighted drivers of interest in green building advancement can be included in the organizational strategy of an entity.

Regardless, a shift is occurring, and in the not-too-distant future, every structure will be built in an environmentally conscious manner.

5.2 Recommendation

This part makes an effort to paint a picture of the present challenges facing the green construction marketplace in Iraq and proposes a few potential answers to those challenges as well as some potential strategies for overcoming those challenges. Following that is a discussion of the current situation of the green building industry as well as projections for the future of green construction.

5.2.1 Solution for obstacles

During the course of the questionnaire surveys, participants provided a variety of options and approached that enhance the field of green construction in response to a question that inquired about the most important tactics to increase the benefits associated with green buildings. The following are the tactics that are most frequently mentioned in the literature:

1. Planning effectively is more essential than being environmentally conscious.
2. In order to persuade entrepreneurs and government officials, a life-cycle analysis of environmentally friendly buildings should be performed.

Considering the data that was collected, we will investigate environmentally friendly technologies, materials, and potential solutions.

3. By thoroughly investigating the monetary repercussions of environmentally responsible architecture, we can make green constructions more adaptable.

Throughout the planning phase of the project, it is important to select feasible choices as much as practicable from an economic standpoint.

4. It goes against the logic of sustainability to produce building supplies in Iraq out of imported materials in order for those products to be used as sustainable resources.

In addition, imported materials drive up prices, which has a negative impact on the overall effect.

5. It is important to make sure that material manufacturers may easily obtain any necessary technical data.
6. Buildings that are environmentally friendly should have an integrated structure, and the fundamental architectural characteristics of the structure

should be determined by taking into account the weather, the position of the sun, and the inclination of the construction.

7. Different design choices will result in different costs for a green building. If reducing energy consumption is the goal, then the first investment will require a greater financial outlay to accommodate Iraq's market circumstances.

However, because of the very high cost of an amount of energy, the return of payback may be relatively quick. When it comes to the choice of materials, there is a large initial expense and no return on investment, but this decision makes a significant impact on the health of the people who live and work in the building.

Furthermore, a building information system should be utilized for tracking these different systems. It looks as though money is being spent constantly here. When calculating the life cycle evaluation of environmentally friendly buildings, it is important to take design principles into consideration. An energy-efficiency approach can be an important factor in impressing and persuading clients by providing evidence of cost savings.

8. The government ought to stipulate a few fundamental necessities in the form of obligatory requirements and criteria.

9. The level of public knowledge ought to be raised. Everyone ought to be knowledgeable about conserving resources in the built environment.

Education and information should be provided to the building's proprietors, general contractors, vendors, buyers, and residents. In particular, the advantages of green buildings with regard to energy efficiency and the environment should be highlighted.

10. It is important to determine what the building actually requires. After that, consideration ought to be given to the use of the requirements.

Including the concept of environmentally friendly architecture from the very start of the project. An early determination that the project is going to be green will result in lower startup costs. Selecting appropriate tactics in accordance with the constraints of the project and locating solutions that are efficient despite their limited scope.

11. Building large and significant projects in an environmentally responsible manner can provide a foundation.
12. The policies of the government ought to be reorganized in a manner that encourages of green building development.

Using tax regulations in both the short- and long-term make green constructions a more beneficial investment.

13. Effectiveness in the use of energy and a high standard for the environment inside. At the same time, it is extremely essential to provide the people who live in the building with a pleasant environment.
14. Schemes offering incentives, raising awareness among investors, initiatives with a long-term focus, and the creation of locally developed technologies.
15. A national construction evaluation and certification system that takes into account Iraq's local and regional ecological, topographical, and environmental characteristics ought to be developed as an alternative to the use of certification methods from other countries.

Because certification tools offer helpful information and direction for the general public on the topic of environmentally friendly buildings across the globe, in addition to this, the manufacturing of environmentally friendly materials in Iraq will be a significant factor in the rise in the number of green construction projects.

16. The green approach ought to be incorporated into both the company's official policy and the quality requirements that are in place.
17. In order to make the topic of green building more demanding and regular, individuals and organizations should promote the ideals of green living.

In addition to educational activities, the media are playing a significant part in this. In order to raise public awareness, it ought to talk about topics like the utilization of newly developed construction materials and the advantages they offer.

5.2.2 Recommendations for building specialists

Where the study strongly recommends that the recommendations below be taken into consideration;

1. The work of all participants of the construction project team who have detailed knowledge of the operational activities and efficiency of a building.

Where it proposed managing problems of sustainability as part of everyday building operations, sharing expertise in the sustainability of a building and building efficiency from the perspective of building customers to guarantee that buildings implement green building requirements and also to ensure maximum effectiveness.

2. The project designers must consider in the design stage the advantages of applying the monitoring of buildings and energy efficiency problems in the building implementation to produce good buildings early enough.
3. To contribute effectively to design, the project manager must work with the buildings and sustainable energy management and waste management specialist, the management of waste, the provision of comfort, etc.
4. The architects and construction designers who are responsible for the structural design of the building must work together to have the aesthetic of the building and how it works sustainably.
5. The electrical and mechanical designers, engineers who are responsible for the designing of building facilities for power, heat, cooling, water supply, etc., must work together to obtain a better understanding of a structure's sustainable performance.
6. The owner/customer should be aware of what a green building is and what needs to be created.
7. The government requires to establish policies that include a green building qualification environment.

The government must establish policies that promote the development, construction, and operation of buildings that are sustainable in the building industry.

8. The government must provide funding for developers to sustainably borrow money at affordable rates to facilitate the construction of green buildings.

This is especially relevant in a developing country such as Iraq, which currently practices sustainable construction to a minimal degree.

5.2.3 Recommendations to future study

Information shortages are now the biggest obstacle to the specification of the processes of sustainable development in residential construction; while several qualification courses, training, and development workshops have been initiated by the building industry to educate construction specialists in sustainable methods, the effects of these steps on the fields are insignificant.

So to research the application of knowledge is recommended;

1. There is more scientific research that can be done within the environmental, social, economic, and management dimensions of green buildings to recognize more ingredients.
2. There is more scientific research that can be done to recognize the roles of designers and construction specialists in achieving green buildings.
3. Create a framework through the description of the green buildings ingredients and use it as a guideline for the specialists working in the fields of building construction for achieving green buildings in Iraq.
4. It is important to create a strong framework for the wide implementation of the building industry, including all development practitioners, to achieve green building construction practices.
5. The study recommends additional research to evaluate the opinions of engineers, construction specialists and building users in Iraq on what they consider as green buildings.

It is expected these recommendations to encourage an increase in knowledge and understanding between all industry specialists of green buildings and to support the SD objective in Iraq.

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RESUME

Education:

- 03/6/2011 Starting course of English language at British council in Malaysia
- 01/10/2018 Graduated Bachelor's Degree From The Technical University of Civil Engineering of Bucharest Romania

Courses Attended:

- The Execution of the projects programming in the frame of the comprehensive planning.
- The advanced foundations, administration, financial and legal concepts.

Languages:

- Arabic (Native) English (Excellent)