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ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

MOTIVATION FOR MANAGEMENT OF SUSTAINABLE BUILDING IN IRAQ

MASTER's THESIS

Bushra Anaam Abbas ABBAS

Engineering Management Department

Engineering Management Master in English Program

AUGUST 2023

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Thesis Advisor: Assoc. Prof. Dr. Redvan GHASEMLOUNIA

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İSTANBUL GEDİK ÜNİVERSİTESİ
LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ MÜDÜRLÜĞÜ

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Enstitümüz, Engineering Management Department İngilizce Tezli Yüksek Lisans Programı (211281010) numaralı öğrencisi Bushra Anaam Abbas ABBAS'In "Motivation for Management of Sustainable Building in Iraq" adlı tez çalışması Enstitümüz Yönetim Kurulunun 29/08/2023 tarihinde oluşturulan jüri tarafından *Oy Birliği* ile Yüksek Lisans tezi olarak *Kabul* edilmiştir.

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DECLARATION

I, Bushra Anaam Abbas Abbas, thus declare that the thesis titled "Motivation for Management of Sustainable in Iraq" is an original piece of work that I have done in order to be awarded the master's degree in Engineering Management. I further certify that this thesis, or any section of it, has not been published and provided for any other graduation or study paper in any other university or institution. this applies to any and all parts of the thesis.

Bushra Anaam Abbas ABBAS

DEDICATION

I would like to dedicate the findings of my research to all organizations and businesses working in the field of construction and contracting that are looking to develop their executive and administrative work through the application of the most recent technologies in the world for the purpose of implementing and completing their projects and obtaining the economic value they seek.

PREFACE

I would like to extend my thanks and gratitude to my supervisors Dr. Radwan Ghasemlounia, for his support and valuable guidance and advice that helped me accomplish my research.

August 2023 Bushra Anaam Abbas ABBAS

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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 Method
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
SBTooL	: Sustainable Building Tool
SD	: Sustainable Development
STARS	: United States Assessment and the Rating System
USGBC	: United States Green Building Council

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ABSTRACT

The building industry is an important place to apply more environmentally conscious methods, and " Sustainable Buildings" play a vital role in this process. Even though there is currently a movement in the construction industry of Iraq toward the implementation of environmentally friendly processes, not a lot of research has been done to investigate the factors that motivate the market as well as the significant obstacles that stand in the way of the movement toward sustainable construction. This is despite the fact that there is currently a shift taking place in the construction sector of Iraq toward the application of green procedures.

The goal of this research is to provide a contribution to the current body of information concerning the construction of environmentally friendly buildings in Iraq and to fill a gap that has been found in the existing body of research. The findings will be helpful to both the government and market specialists in the process of growing the green construction industry.

The majority of the material that is presented in this study came from a thorough survey questionnaire that was constructed following an exhaustive evaluation of the relevant literature. This review was carried out before the survey questionnaire was even created. The questionnaire is filled out by individuals who either have an expertise of the topic at hand or who are actively participating in green construction activities.

For the goal of doing an analysis of the data that was obtained, a variety of different statistical methodologies are applied, and the findings are reviewed in great detail. In keeping with this, in addition to the aforementioned questionnaire survey, explanations are offered about the economic concerns, problems encountered, and lessons learnt.

The findings will contribute to a better understanding of the true requirements for the development of environmentally friendly structures within the Iraqi construction industry. In conclusion, there are certain recommendations made that should be taken into consideration by the government as well as by academics in order to steer the construction industry toward more environmentally friendly methods.

Keywords: *Sustainable Construction, Sustainability, Iraq construction Industry, Sustainable Design.*

IRAK'TA SÜRDÜRÜLEBİLİR BİNA YÖNETİMİ İÇİN MOTİVASYON

ÖZET

Yapı sektörü çevreye daha duyarlı yöntemler uygulamak için önemli bir yer ve bu süreçte "Sürdürülebilir Binalar" hayati bir rol oynuyor. Şu anda Irak inşaat sektöründe çevre dostu süreçlerin uygulanmasına yönelik bir hareket olsa da, piyasayı motive eden faktörlerin yanı sıra bu sürecin önündeki önemli engellerin araştırılması için çok fazla araştırma yapılmamıştır. sürdürülebilir inşaata doğru hareket. Bu, şu anda Irak'ın inşaat sektöründe yeşil prosedürlerin uygulanmasına doğru bir kayma olmasına rağmen.

Bu araştırmanın amacı, Irak'ta çevre dostu binaların inşasına ilişkin mevcut bilgilere bir katkı sağlamak ve mevcut araştırmalarda bulunan bir boşluğu doldurmaktır. Bulgular, yeşil inşaat endüstrisini büyütme sürecinde hem hükümete hem de piyasa uzmanlarına yardımcı olacaktır.

Bu çalışmada sunulan malzemenin çoğu, ilgili literatürün kapsamlı bir değerlendirmesinin ardından oluşturulan kapsamlı bir anketten geldi. Bu inceleme, anket soru formu oluşturulmadan önce yapılmıştır. Anket, konuyla ilgili uzmanlığı olan veya yeşil inşaat faaliyetlerine aktif olarak katılan kişiler tarafından doldurulmaktadır.

Elde edilen verilerin analizini yapmak amacıyla, çeşitli farklı istatistiksel metodolojiler uygulanmakta ve bulgular ayrıntılı olarak gözden geçirilmektedir. Bu doğrultuda, söz konusu anket çalışmasına ek olarak, ekonomik kaygılar, karşılaşılan sorunlar ve çıkarılan dersler hakkında açıklamalar sunulmaktadır.

Bulgular, Irak inşaat endüstrisinde çevre dostu yapıların geliştirilmesi için gerçek gereksinimlerin daha iyi anlaşılmasına katkıda bulunacaktır. Sonuç olarak, inşaat sektörünün daha çevre dostu yöntemlere yönlendirilmesi için akademisyenler kadar hükümet tarafından da dikkate alınması gereken bazı öneriler bulunmaktadır.

Anahtar Sözcükler: *Sürdürülebilir İnşaat, Sürdürülebilirlik, Irak inşaat Endüstrisi, Sürdürülebilir Tasarım*

1. INTRODUCTION

1.1 General Introduction

The cost of energy keeps going up despite the fact that there are fewer and fewer fossil resources available on a global scale. In response, countries all around the world are acting by adopting policy tools that are in line with the green movement. Organizations in all spheres of society, including commerce, transportation, and industry, have begun the process of formulating and integrating environmentally friendly practices into their operations in order to protect the natural world and improve the standard of living of future generations. This is being done in order to preserve the natural world.

The "cradle-to-grave" operations of the building sector have a significant impact on worldwide environmental implications. These include the depletion of earth's resources and adverse consequences, waste materials, pollution of the contamination, and so on. This is especially true for housing and buildings, which are very expensive in terms of resources.

Because of this, it is the responsibility of the construction industry to decrease the negative social and environmental effects it has and to boost the constructive contributions it provides to both the economy and the natural world. It has the potential to be the most important contributor from a single industry towards achieving green prosperity.

The residential construction sector accounts for a sizeable percentage of the overall construction market. The buildings in which people live, work, and play have a considerable influence on the environment in which they are located, and this influence extends to the placement, execution, construction, maintenance, and final removal of the buildings. Carbon dioxide is the most important greenhouse gas, and buildings are a major source of its emission because of the combustion of natural gas, petroleum oil, and power. This has an effect on the overall temperature of the planet. At current time, there is a large quantity of research and publications in the published

literature that discuss the effects that building activities have on the environment, the usage of energy, the rate of global warming, and the health of people.

In Iraq, the environmentally conscious building industry is just getting off the ground. As a consequence of this, those who work in the construction business need a deeper grasp in order to put sustainable plans into effect. On the one hand, there is a growing interest in environmentally friendly buildings, but on the other, there is a dearth of information that is both important and practical about environmentally friendly structures. There hasn't been a lot of research done in Iraq that focuses on identifying the elements that drive or inhibit the construction of environmentally friendly structures.

This thesis intends to fill the void that has been left in the field of green building by investigating and gaining an understanding of the true impact that sustainability difficulties have in actual practice.

1.2 Sustainable Development

Therefore, efforts to improve the SD drove construction practitioners to make efforts to reject activities that were damaging to the environment ecologically. This was done in order to improve the SD. According to the findings of the study (Baird et al., 2012), it has sparked sustainable development, which can be defined as the establishment of particular components of a sustainable building design that are centered on resources that are both productive and friendly to the environment. Because of this, sustainable development is now more commonly referred to using the abbreviation "SC."

SC might be utilized as a guarantee to generate structures in which the concepts of SD are incorporated into the building process and sustainable buildings are always constructed. This would ensure that sustainable buildings are always created. Because of this, utilizing SC as an option would become possible.

In addition to this, it is of the utmost importance to extract, from the design of environmentally friendly buildings, the accomplishment of a more ecologically friendly urban environment.

According to Mickaityte et al. (2008), sustainable buildings are those that reduce the amount of energy and water supplies they use, cut down on undesirable outputs such

as carbon dioxide emissions, and improve the health of both the people who live in the building and the broader public as a whole.

Not only does the development of sustainable buildings include their construction, but it also includes their design, operation, and even their eventual demolition.

Before a structure can be considered really sustainable, it must first be developed with conservation measures taken into mind before the construction processes begin. Additionally, the structure must have some kind of impact on the environment while it is being built.

However, because this stage of the building life cycle is the most advanced, the operational process does, in fact, have the most substantial impact on the environment (Wang and Adeli, 2014). This is owing to the fact that this stage is the most sophisticated.

Sustainable structures are those that reduce the negative impacts that these activities have on the environment surrounding the building while also providing an ambiance within the building that is more welcoming to those who enter it.

According to Dutil et al. (2011), these are the kinds of structures that make it feasible for building users to improve both their well-being and their degree of comfort while also maximizing the financial rewards to which they are entitled.

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, behavioral 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 Sustainable Building in Iraq

The development of ecological systems that can maintain themselves on their own is a primary goal in Iraq, as it is in a number of other countries. This is the most important goal that building practitioners and developers strive for as they work toward fulfilling the SD standards together with a high level of protection and comfortable pleasure in their projects.

Because businesses are aware that the environmental, economic, and social components of SD have developed measures that might be advantageous and preferred by the community in respective proportions, they have produced measures such as the selection of non-deleterious and renewable building materials. This is because businesses know that SD has generated measures that might be advantageous and chosen by the community.

The protection of renewable resources, the upkeep of unharmed ecosystems, and the control of the effects that growing economies have on the natural world are all components of the environmental element. The activities that make up the economic component include things like economic development, support with resource management, decreased consumption of non-renewable resources, and prevention of depletion of sustainable resources.

The social component handles concern such as the reduction of poverty, the enhancement of productivity at an adequate population level, and the provision of social services such as enhanced health and quality of life for individuals. Other issues that are addressed include the enhancement of productivity at a sufficient population level.

It is necessary that habitats be preserved in a state that allows following generations to make the most of the resources they contain. People are dependent on their environments for both their protection and their fundamental survival, therefore it is essential that environments be conserved in this state. On the other hand, human

beings have never taken the appropriate steps to assure that its existence would endure.

It was obvious that human actions were contributing to the deterioration of the environment of the world, and consequently, it was obvious that sustainable development was something that was required. This includes projects for both the actual construction of buildings and the advancement of technology.

Buildings are to blame for the consumption of large quantities of fuel, water, and earth, and as a result, they are the primary contributor to the majority of the environmental issues that plague the globe today. According to Holmberg and Sandbrook (2019), the operations of the construction sector have provided evidence of this impact that construction has had on the deterioration of the natural environment.

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 growth in the number of eco-friendly building projects all over the world, as well as the prospect of sustainable building development in Iraq, has brought about the requirement to find responses to the following two important questions:

1- What are the most significant barriers to the push toward green building in the Iraqi construction trade, as well as the opportunities that exist to overcome such barriers?

2- What kinds of solutions can be put into place to make it simpler for sustainable construction methods to be extensively adopted across the constructed environment of Iraq?

There are a significant number of arguments in favor of designing buildings that are friendly to the environment, but there are also a huge number of arguments in favor of not doing so. The questions that were presented previously will be addressed through the use of a questionnaire survey that will serve as the aim of this research. Learning from those who are actually working in the field can be the most effective technique for gaining a deeper knowledge of the elements that drive and impede success in the sector, as well as for guiding the sector in the direction of an agenda that emphasizes sustainability. This is because learning from those who are really working in the field can be the most effective method for learning from those who are actually working in the field.

In addition, several instances of green building projects that have been finished in Iraq are presented, together with a discussion of the financial considerations, difficulties faced, and insights learned. In their efforts to progress the green construction industry, government authorities as well as market actors will find the conclusions of this study to be useful.

1.5 Research and Development Strategy

The research strategy that was implemented for the purpose of this investigation can be illustrated via the utilization of a research framework that is comprised of three stages:

The first step is conducting a thorough analysis of the relevant body of literature as well as a research into the sustainable building documents and the components that they contain.

During the first stage of the project, in addition to conducting research on the relevant literature and studying the relevant documents, an emphasis was made on the challenge of putting sustainable building practices into practice in Iraq. In the context of the research on environmentally friendly buildings, this topic was discussed.

The findings from the content review are analyzed in greater depth in the second stage, which is the analysis of questionnaires. This stage is done to conduct a more in-depth examination of the findings. The findings of the research will be subjected to additional scrutiny and verification when we move on to the third step.

Residents of the building have also expressed their discontent with the building's lack of vital facilities, such as properly operating air ventilation and trustworthy instructions for rubbish management. Both of these issues have been brought to the attention of the building's administration.

As a result, the development of management techniques and concepts for environmentally friendly construction concepts is the primary emphasis of this research. This is achieved by supplying professionals in the building construction sector, such as architects and engineers, with a definition of the components that make up a sustainable structure. This assures the design of buildings that provide the people who utilize them with a comfortable and environmentally friendly environment.

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 their role in the design process and ending it in construction. This is due to the fact that the construction phase takes up the majority of their time throughout the lifetime, both at the beginning and the end.

In Iraq, the incorporation of the expertise of specialized specialists and engineers into the building construction process has the potential to make a major contribution toward the creation of environmentally friendly structures. Utilizing one's skills and knowledge in the field of building construction is one way to achieve this goal.

2. SUSTAINABLILITY AND GREEN CONSTRUCTION

In order to investigate the increasing momentum of the sustainable building industry all over the world, a comprehensive literature assessment was carried out. To begin, the notion of sustainability and green construction is broken down into its component parts: integrated design process, evaluation criteria, and strategies for implementing sustainable practices. After that, a concise history of the sustainable architecture movement in Iraq is laid forth. This chapter concludes with a comprehensive search of previously published studies and research that focuses on the drivers of the green construction movement as well as the obstacles that stand in their way.

2.1 General Introduction

As it was realized that "global warming" was a problem, the term "sustainability" has entered the scene. The term "sustainability" was first defined in 1987 by the International Commission on Environment and Society as "fulfilling the requirements of the present without compromising the ability of future generations to meet their own needs." The "triple bottom line" is the term used to describe the goal of achieving an equilibrium between social and economic improvement as well as environmental sustainability (Figure 2.1).

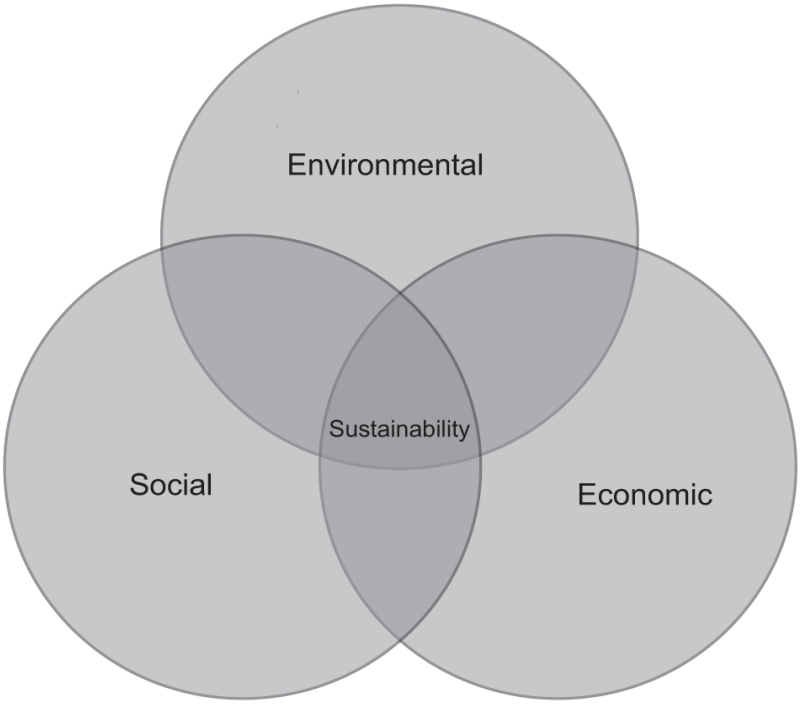

Figure 2.1: Environmental, Economic, and Social Impact Analysis in Sustainable Development

Source: (Rogers et al., 2012)

Under the scope of this thesis, sustainable development was addressed in relation to green building constructing. A structure goes through four primary stages: the design phase, the construction phase, the operational and servicing phase, and the destruction phase. As shown in Figure 2.2, sustainable building entails shifting away from processes that result in pollution and the consumption of non-renewable resources in favor 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. The building processes should be evaluated during any of these three steps so that a greater understanding can be gained regarding how the design, construction, operation, and disposal of a structure can have an effect on the wider environment (Munaro et al., 2020).

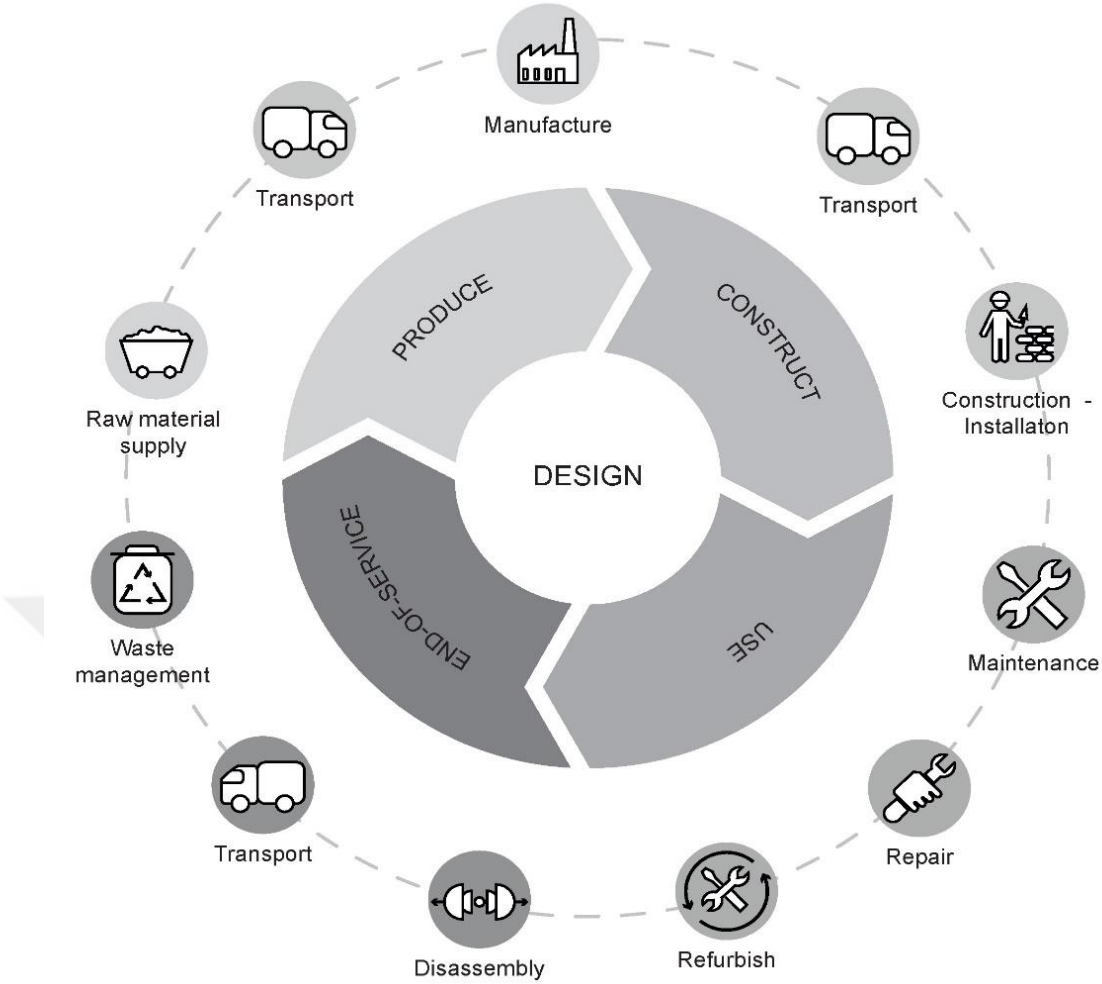

Figure 2.2: The Life Cycle of Sustainable Construction

Source: (Munaro et al., 2020)

At this research, the description of a sustainable building is discussed in terms of its qualities, aims, and applied ways to limit the negative effects of constructions on the environment and individual wellbeing as shown in Table (2.1). while also a number of phrases that are interchangeable, including "high-performance building," "environmentally friendly building," "sustainable building," and "energy-efficient building." Within the context of this thesis, the phrases "green building" and "sustainable building" are utilized in a similar and interchangeable manner.

Table 2.1: Green Construction Description

Characteristics	Objective	Strategies
have little influence on environment.	preserving natural resources, having a low impact on the ecology of the site, lowering emissions of greenhouse gases, stymieing the progression of environmental change, and lowering the influence of urban heat islands.	Less waste, more recycling, more productive use of land, and more green space.
have a better indoor environmental condition for residents.	Superior comfort, Residents well-being, Residents health, and enhanced productivity of Residents.	Choice of non-hazardous construction materials (low VOC volatile organic compound) a higher level of thermal comfort that can be controlled, increased exposure to natural light, an expanded perspective of the surrounding environment, increased circulation of fresh air Lighting apparatus that is quite effective.
have little financial effect	Demand for less energy and water, which will result in savings Productivity gains achieved by staff members, Simple risk management, and support for the regional economy.	Reusing and recycling grey water, Mechanical systems with a high level of efficiency, Rain water management, and related terms local production of energy from renewable sources, Choice of long-lasting, regionally sourced materials, Better image.
have a stimulating impact on innovative endeavors	The creation of modern jobs is directly correlated to the development of new technologies.	Integration of different activities and systems, the introduction of novel substances and technological processes, Construction management system (IT technology).

Because each sustainable concept is built according to its individual specific needs, diverse climatic circumstances, geographic factors, environmental and social requirements, and the utilization of various construction materials, every project resulting in its own distinctive green solutions. Defining "integrated design process" is an absolute requirement in order to finish the description of "green building." In order to obtain a building that is environmentally, economically, and socially

sustainable, it is necessary to address each of the green construction strategies that are outlined in the table that is located above. These strategies should be tackled in an integrated manner. The Integrated Development Process is a method used in the design phase to identify and address any issues that may have a major bearing on the project's long-term sustainable effectiveness (Pearlmutter et al., 2020).

Substantial levels of building efficiency can be attained through the use of an integrated design process that fosters synergy between disciplines and between technologies. Lowering the size of the building's mechanical structure is one way to cut costs in this area when coupled with a high efficiency building envelope, such as stronger windows and better insulated (Çimen et al. 2021).

Mechanical engineers, construction engineers, architects, etc., should all collaborate during each stage of design to generate synergies and uncover other possibilities. Each design choice must be grounded on a thorough evaluation of its costs and benefits (Pearlmutter et al., 2020). As Chen et al., (2012) pointed out, however, integrated design 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 to be done and enhancing the quality of connectivity and data used to notify it.

As per Yudelson (2008), the most important aspects of the integrated design methodology are as follows:

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 duration for input and modifications before committing to the ultimate design conception.
6. Include everyone in the project as much as possible.

It is vital to have prior knowledge of the conventional design process in order to comprehend the integrated design process. The traditional technique has very few

opportunities for optimization, which frequently results in complications in the later phases of the process (Çimen et al. ,2021). On the other hand, as can be seen in Figure (2.3), integrative design offers a diverse selection of opportunities for optimization right from the start of the plan approach.

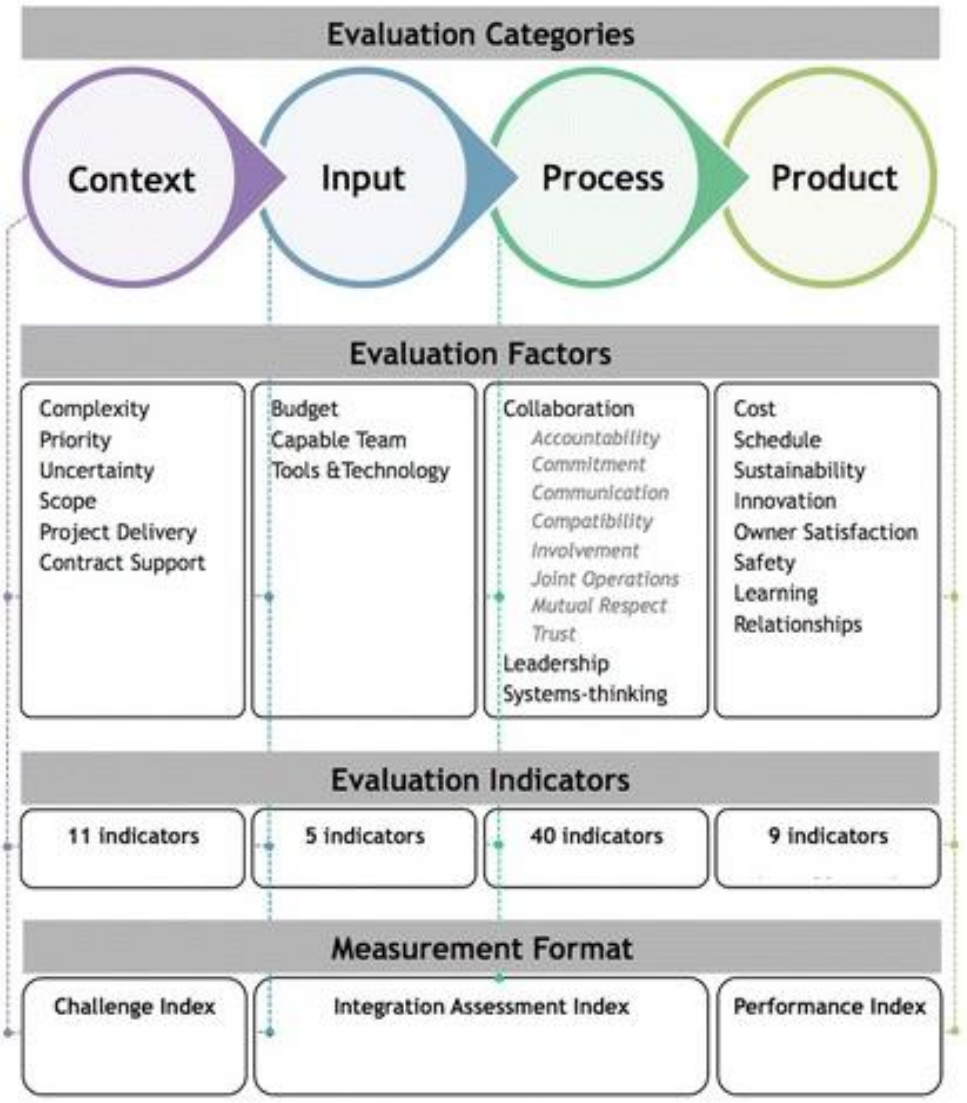

Figure 2.3: Possibilities for Integrated Design Teams Decline with Time

Source: (Çimen et al. ,2021)

Another important aspect of suitable buildings is the presence of certification programs or grading tools, which are used to evaluate the performance of the building in question and to enhance green building practices and tactics.

These rating systems are always being improved over time in response to developments in technology, expertise, and market trends. “BREEAM”, which stands for “Building Research Establishment's Environmental Assessment Method”,

was developed in the” United Kingdom in 1990”. Other examples of rating systems include” CASBEE”, which stands for “Comprehensive Assessment System for Building Environmental Efficiency”, which was developed in Japan in 2001, and “LEED”, which was advanced in the “United States in 1998”. All of these different rating techniques allow for the sharing of industry experience, which in turn speeds up the trend toward greener building practices.

2.2 Sustainable Building Project in Iraq

It is plain to see that the rate of expansion of the green construction movement is accelerating in every region of the world. In point of fact, "green building" or "sustainable methods" have a lengthy history because they were formed in response to an energy crisis as well as a movement to safeguard the environment. As a result, there is a rapid process of change occurring in the built environment of Iraq, and interest in environmentally friendly structures is quickly increasing.

From the perspective of design at this point in time, many of the ideas contained within the phrase "green building" have already been studied for construction projects and put into practice. The history of these ideas goes back further than 5000 years.

In the course of an investigation into methods for creating energy-efficient constructions in a heated and dry region of Iraq, conventional houses and modern houses have been contrasted and contrasted with one another in concepts of design requirements such as choice of area, way away between buildings, alignment, building envelope, and form (Ismael et al., 2019). According to the findings of the study, the inside temperature of traditional homes is significantly lower than that of modern homes during the hot summer months.

2.3 Benefits of Green Buildings

The green building revolution is causing a transformation in the building industry, which is resulting in an increase in this sector's market share (Hwang et al., 2013). Despite the fact that the strategies and ideas are already in existence, as Raghavaiah et al. (2019) pointed out, the challenge is in moving beyond the comfort zone of "business as usual" and daring to be innovative.

A literature search was conducted in order to explore the present level of research on the challenges and opportunities faced by projects involving green construction.

2.3.1 Economic benefits

There are considerable economic benefits associated with environmentally friendly buildings, including lower direct capital costs, lower operating costs, lower total costs over the building's life cycle, increased workforce productivity, and increased property values for building participants. The following is a synopsis of some of the published research that are pertinent to the topic and that have sought to quantify the financial benefits of green buildings.

According to Kats (2013), who conducted the first thorough research of the expenses and financial advantages of green buildings, investing an additional two percent of budget estimating yields life cycle advantages that are ten times more than the initial expenditure.

There are financial advantages that result from decreased consumption of energy, water, and trash; decreased expenses associated with management and maintenance; and improved occupant productivity and health. For illustration, the initial upfront expenditure of $100,000 to add green building technologies into a project that costs $5 million would produce savings of $1 million over the anticipated life of the structure, which is 20 years (Kats, 2013).

In 2004, the “General Services Administration (GSA)” conducted another study in which they analyzed and compared “12 LEED” certified buildings located throughout the United States. The findings point to the fact that environmentally friendly buildings have much lower operating costs and superior energy efficiency.

“Davis Langdon”, an international cost assessment company, produced a report in October 2004 comparing the construction costs of 138 buildings (library, laboratories, etc.) throughout the United States, including 93 that were not designed to LEED standards and 45 that were seeking LEED certification. There was no economically significant difference in overall expenses between sustainable and conventional structures, the study found. In 2006, the same conclusions can be drawn from a reanalysis of this research.

A further study that attempted to quantify the benefits of sustainable buildings showed that manufacturing efficiency increased by approximately 25% and power consumption fell by approximately 30% on a square foot basis in the new facility that was created in a green style (Ries et al., 2006).

Buildings that are environmentally friendly have three positive effects on the capital value of the building as a result of an enhanced working environment, decreased building operating expenses, and reduced infrastructure maintenance costs. These three advantages are represented in Figure (2.4). The next paragraphs provide an explanation of a few research that confirmed the increased worth of environmentally friendly structures.

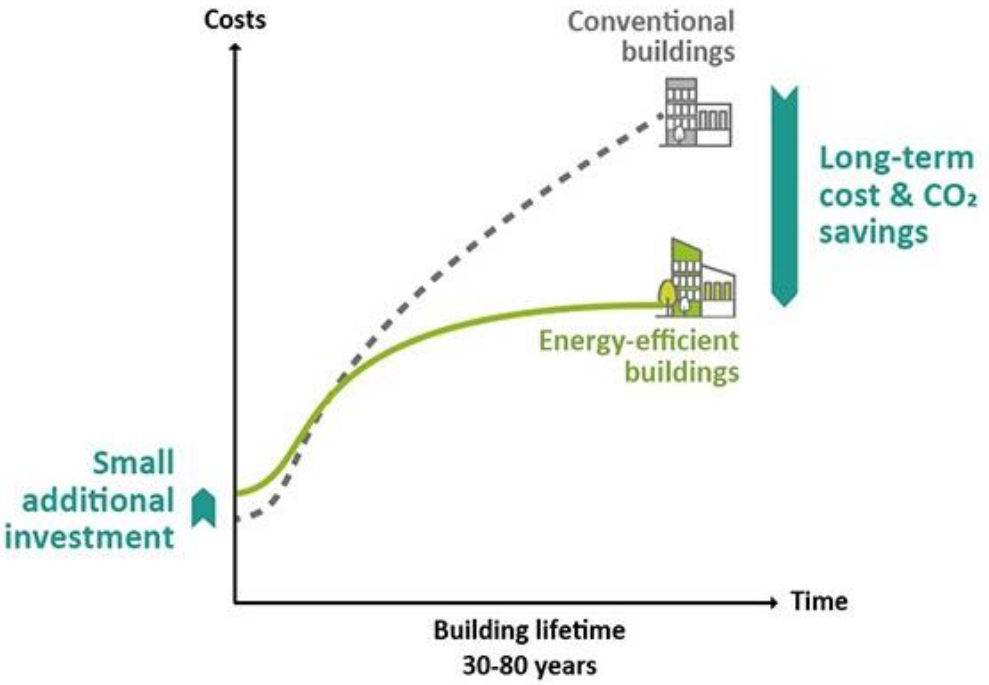

Figure 2.4: The Value Effect of Environmentally Appropriate Structures

Source: (Boyd, 2005)

Buildings with green features increase rental and sale transaction prices per net square meter by about 21 and 26 percent, respectively, according to a recent study by Pearlmutter et al. (2020). Rents are approximately seven percent to seventeen percent higher for Energy-Star labeled and LEED certified properties, respectively, according to the original findings of another study that examined the relationship between energy-efficient design and the leasing and revenues markets for commercial property.

Pearlmutter et al. 2020 examined the relationship between energy-efficient building and the residential real estate leasing and revenue markets.

Fuerst and McAllister (2010) analyzed the effect of environmental certification on the value of commercial real estate assets in a separate study. Compared to non-certified buildings in the same metro area, they found that 292 Energy Star-certified buildings and 30 "LEED" certified structures command a premium of 10% and 31%, respectively. When compared to conventional structures, these eco-friendly structures have a lot going for them.

2.3.2 Social benefits

There is a developing body of information, as well as several case analyses, that demonstrate the advantages that daylighting, healthy ventilation, and enhanced air quality have for green construction. All of these advantages lead to increased worker productivity and improvements in their health, as well as a decrease in absenteeism and illness. An extensive survey on the subject of air conditioned environmental quality was used as the basis for an article that compared the levels of satisfaction level in green and non-green office buildings regarding the quality of the indoor environment.

According to the findings, occupants of green buildings are, on average, more content with the level of thermal relaxation and air quality present in 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 found in no green building structures (Abbaszadeh et al., 2006).

According to the findings of another study that Victoria and Kador Group (2008) had commissioned, environmentally friendly workplaces have a significant beneficial effect on the efficiency and satisfaction of staff members.

According to the findings of a third study (Leaman et al., 2007), from the point of view of the building’s residents, the quality buildings in Australia were outperformed on a sustained basis by the best sustainable construction.

Nevertheless, when Paul and Taylor (2007) compared the perceived comfort levels of people working in a green campus building with those of people working in two

conventional campus buildings, they found no indication to support the notion that sustainable buildings are more agreeable.

Despite this, there are still issues, questions, and challenges associated with this subject due to the absence of a convincing conceptual framework for assessing human outcomes and relating them to design elements. According to Pivo (2010), the intricacy of the issue prevents researchers from properly investigating social elements of sustainable structures.

The findings of the statistical study confirmed that practitioners in the green building industry in Canada are uncertain about the advantages of green construction in terms of efficiency and health, and they do not understand how to assess these benefits. When it comes to the turnover rates of tenants and the selling anticipations, these things are so very significant.

According to Pivo (2010), this means that they have a significant and observable effect on the economy.

Sun et al., (2009) investigation into how the structure of buildings and the quality of the interior environment affect the prevalence of respiratory illnesses, the severity of "allergy" and "asthma" illnesses, and the productivity of workers provides compelling evidence for this claim. Profits are assessed in Table (2.2) as a result of this improved health and efficiency.

Table 2.2: The Estimated Theoretical Gains in Efficiency Result from Enhancing Interior Environments

Factors Contributing to Increased Efficiency	**Possible Health Advantages Annually**	**Estimated Yearly Savings or Efficiency Increase in the United States, (1996 $)**
Decreased of Respiratory Disease	Between 6 and 37 million cases of the flu and other common colds were averted.	"$6-$14 billion"
Decreased instances of asthma and allergic reactions	53 million people who suffer from allergies and 16 million people who have asthma had an 18% to 25% improvement in their symptoms.	"$1-$4 billion"

Source: (Sun et al., 2019)

Table 2.2: (Cont.) The Estimated Theoretical Gains in Efficiency Result from Enhancing Interior Environments

Factors Contributing to Increased Efficiency	**Possible Health Advantages Annually**	**Estimated Yearly Savings or Efficiency Increase in the United States, (1996 $)**
Decreased incidence of sick housing syndrome symptoms.	20% to 50% decrease in the amount of cases of sick building syndrome, which affects the health of about 15 million workers and is regularly observed at workplace.	"$10-$30 billion"
Alterations made to the lighting and temperature of the working environment led to improvements in worker productivity.	Not appropriate in any way.	"$20-$160 billion"

Source: (Sun et al., 2019)

2.3.3 Environmental benefits

As can be seen in Figure (2.5), the mining of materials used in the construction of buildings has a variety of negative impacts on the surrounding environment. The activity sequence begins with the mining and production of raw materials, continues with the provision of resources such as energy, water, and industrial machinery, and concludes with the destruction of structures and the disposal of trash.

To evaluate the environmental effects of buildings in three primary areas—building facilities, construction materials, and location—there is a system called "BEPAS (Building Environmental Performance Analysis System)" that was established according to the life cycle evaluation framework. "BEPAS" is an acronym for "Building Environmental Performance Analysis". This system determined that the functioning phase of a structure is responsible for the greatest proportion of the total environmental consequences. During this period, an enormous amount of pollutants will be released, and a significant amount of natural resources will be utilized.

Warming of the planet is the first consequence of all of these consequences, which is then followed by the exhaustion of fossil fuels, the depletion of water resources, and the acidification of the oceans (Van et al., 2014). As a result, the construction of

environmentally friendly buildings has the potential to mitigate these unfavorable consequences and inspire activity within the industry.

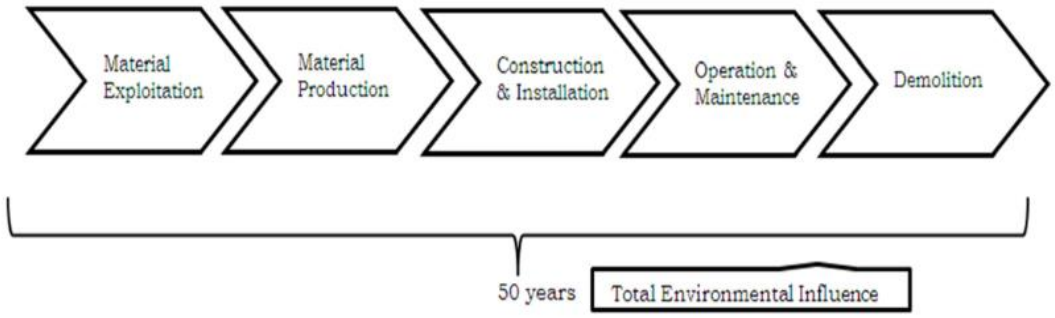

Figure 2.5: The Life-Cycle That Is Taken Into Consideration in the Research on Environmental Effect Evaluation

Source: (Van et al., 2014)

2.3.4 Organizational benefits

Sustainable procedures and strategies development causes shifts in organizational management, procedures, and values. Gast et al., (2006) argued that corporations will make green buildings the norm within the next five to ten years, and so sustainable is becoming more than just trendy.

Heerwagen (2010) used the balance scorecard framework to describe the potential connections between sustainable design and organizational success in terms of financial, business process, client relationships, and human resource improvement.

It is possible for organizations to incorporate environmentally friendly ideas into their overall strategic planning. According to Van et al., (2014).'s interpretation, the essence of sustainable strategy is that innovators can acquire a sustainable competitive benefit by contributing to environmental preservation, ecological adaptability, and social accountability. Buildings that are energy efficient and environmentally friendly will also contribute to the establishment of an image of environmental consciousness.

2.3.5 Market benefits

The most recent trend reveals that there has been an improvement in the number of environmentally conscious buildings all around the world. Building certification systems are becoming developed and put into practice in an increasing number of countries around the world. This trend ushers in newly developed methods and

practices that are more environmentally friendly. The physical aspect of construction as well as the social and economic situations of a construction firm have a significant impact on the nature and pace of innovation in the construction industry, making it significantly distinct from the nature and pace of development in other sectors.

The participation of both producers and suppliers is required in order to accomplish this breakthrough in the construction sector. It's possible that they'll develop their understanding either on their own or with the help of “R&D” agencies, and then offer it to construction companies and design specialists. The demand from customers and their willingness to pay for “GB” is another factor that may contribute to its growing popularity. At the moment, purchasers are not willing to pay more for green buildings, despite the fact that these buildings have higher construction and environmental performance advantages, lower operational costs (Dalirazar et al., 2022).

2.4 Obstacles Green Buildings

The problem facing the construction industry is to translate the advantages of environmentally friendly practices into projects in a way that customers can understand and support.

2.4.1 Economic obstacles

Regarding how the government might assist in the promotion of environmentally friendly buildings, there is still some room for debate. This is due to the fact that governments at all levels play a critical part in the process of promoting and putting into practice green construction plans all over the world. There have been a lot of studies done to try to figure out the best method for the government to help.

Also because government ought to increase its efforts to make public buildings environmentally friendly, safe, and healthy, all while reducing their negative influence on the environment and offering good financial value (Oduyemi, et al., 2017).

There is a possibility that people are under the impression that the beginning costs of environmentally friendly constructions are more. Because of this, a large number of research have focused on the control of initial costs for environmentally friendly

structures. (2005) demonstrated that there is a small environmentally friendly premium of 2.42% in overall advancement cost and that the overall construction cost of research papers range from 18% below each 9% above the expenses for equivalent conventional affordable homes. The study on the expenses and advantages of green affordable homes was published in 2005. It indicates that initial costs could be brought down to a lower level.

Several researchers are even of the opinion that there will be no need for any further costs in the not too distant future. According to Fullerton and Wenbo (2010), there is potential for initial construction costs as well as ongoing operational costs of a facility to be reduced if high-technology and low-technology solutions are blended appropriately. Figure (2.5) illustrates that if you save even more energy, you can "tunnel through the cost barrier," meaning that your costs will go down while your return on investment will go up. Insulation that is sufficiently thick and windows that are adequately functional, for instance, can avoid the requirement for a furnace, which represents an expenditure of more money than the expense of those efficiency improvements (Teotónio, 2021).

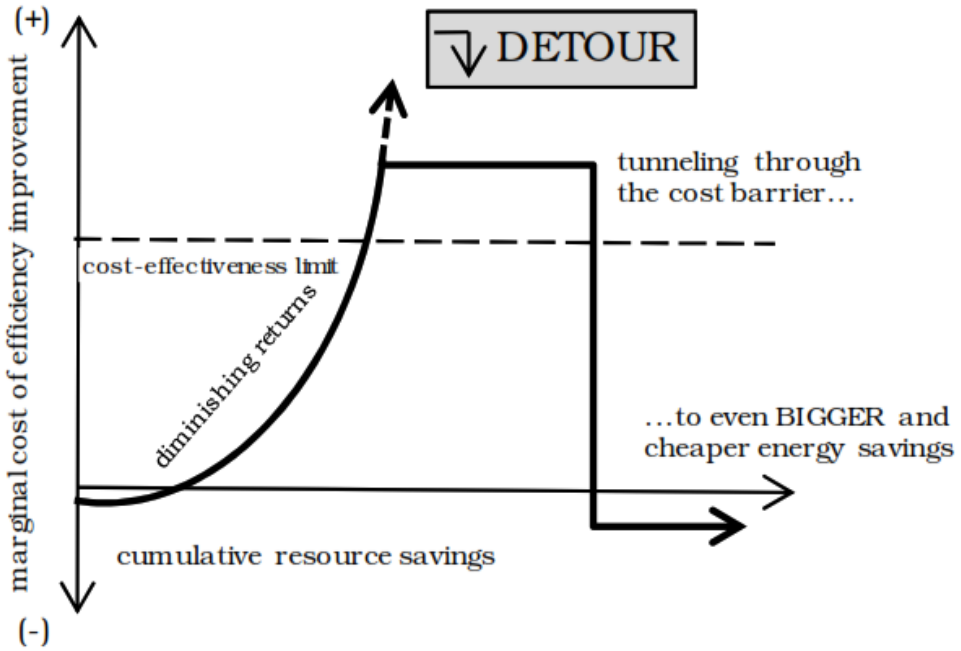

Figure 2.6: Break Through the Obstacle of Expense

Source: (Teotónio, 2021)

Some major techniques to tackle the challenge of "high first cost" can include the following:

1. Starting early on by setting goals that are both explicit and quantifiable.
2. Choose a team with competence in environmentally responsible design and forming an integrated team.
3. Employing an integrated design methodology, the primary advantage of an integrated design approach is its capacity to generate higher-performance outcomes without raising overall construction costs.
4. Seeking inducements and financial help from the government or other utilizes

2.4.2 Educational obstacles

Because of the vast amounts of material and energy that are spent throughout the course of a building's existence, life-cycle thinking is essential to the realization of the sustainable construction idea. The goal of a life cycle evaluation, also known as a cost evaluation, is to determine how much money will be spent over the course of a building's realized lifespan in order to facilitate the formulation of an informed decision and the fulfillment of a client's long-term requirements by taking into account potential developments.

On the other hand, the life-cycle costing technique is not widely employed since there is not yet a well-defined methodology, there is a shortage of data, and there is a lack of understanding. This can be demonstrated by a survey that was conducted 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 the health and efficiency advantages of green buildings. According to the findings of the study, practitioners proceeded to cite high cost premiums as the primary obstacle to investing in environmentally friendly practices. Furthermore, the majority of specialists lacked knowledge regarding the size and impact of efficiency and health advantages, as well as the most effective method to measure these factors (Dwaikat et al., 2016).

Table (2.3) displays a set of possible sustainability key productivity indicators that were developed by Pearlmutter et al., (2020). These indicators were based on object features, as well as environmental efficiency, economic efficiency, and social efficiency. The fulfillment of needed performance while having a minimal influence on the surrounding environment will be evaluated with the assistance of these indications.

Another educational hurdle may be the requirement for more well-established documents and education programs in order to effect real and permanent modifications to the course of sustainability in a sector that is expanding at such a fast rate.

Table 2.3: Potential Environmental Key Performance Criteria

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

Table 2.3: (Cont.) Potential Environmental Key Performance Criteria

Requirements	Indications for the evaluation of existing structures
Social efficiency	
Health of the residents and clients	The manifestation of Sick Building Syndrome/BRI. The presence of black mold.
Health of the occupants'/users' satisfaction and well-being.	User/occupant pleasure.
Protection for residents	Amount of accidents connected to construction
Efficiency of indoor air	Aromatic freshness the concentration of particular substances (TVOC). Radon content concentration
The contentment and well-being of neighbors	Disruption caused by construction and building occupancy.
Cultural efficiency	Existing historic protections

Source: (Pearlmutter et al., 2020)

This is due to the fact that the majority of the metrics that response to quality, efficiency, and the impact of the environment continue to be subjective, making them difficult to measure and, as a result, difficult to award. In order to accomplish an assessment of all of these elements together, there should be requirements and specifications that are well-balanced, including policies for the environment and society.

2.4.3 Market obstacles

At this time, it would appear that the Iraqi construction sector is unaware of the possible benefits that could help change the market and client demand. Because of this, the selection of the winning bid is straightforward in principle: it will be the offer that is either the most financially beneficial or has the shortest construction time. Aside from cost and delivery time, the evaluation of quality, efficiency, and environmental impact should also include consideration of sustainability concerns.

The lack of availability of technology and environmentally friendly materials are two additional factors that can hinder market growth. Choosing what to buy and who to acquire it from are both essential decisions that need to be made when it comes to the procurement of construction materials and technology. It is necessary to have quantitative environmental life-cycle product knowledge in order to use sustainable raw materials that are made from recycled or agricultural waste and do not have any

toxic or other emissions that contribute to the health of building occupants. These materials can be made from waste products.

In the course of the research project "Breaking Through the Barriers: Challenges and Solutions to Code Approval of Green Building," code officials were questioned about the factors that contributed to the rejection of applications for green products, materials, systems, and designs. The findings demonstrated that there exist roadblocks in the form of building codes that prevent the approval of environmentally friendly building options. The supporting information for alternatives that accompany plans are considered to be a technical challenge, whereas a contradiction with the intention of the code is considered to be a non-technical limitation (Chan et. al., 2002).

In addition, there is the possibility of resistance to the adoption of new technologies due to the fact that they need a procedure of changes, are difficult to implement, operate, and integrate into the building, as well as having the potential for dangers and expenditures that were not anticipated. Because of the intricate nature of the construction industry's supply chain, the many actors in the industry have distinct focuses of interest and points of view on numerous topics. Because of this, the requirements for sustainability are more difficult to implement. The necessity of having an integrated design team is stressed in this context since having such a team makes it possible for all of the concerned parties to communicate with one another.

2.4.4 Organizational obstacles

At the moment, building organizations in Iraq, including both consultants and contractors, have a limited amount of expertise and experience regarding this matter. This results in schedule delays and high starting costs for the projects, which in turn impedes the expansion of the green building sector. This issue raises the question of what should be done to generate new knowledge, cultivate existing knowledge, put new knowledge to use, and disseminate existing knowledge among specialists in order to motivate construction businesses to reform their management strategies.

While environmental challenges affect business, and business affects environmental preservation and quality, companies should increase their understanding of sustainability and be wary of financing and taking risks in today 's highly demanding and uncertain business climate (Zhang et al., 2021).

2.5 Total Quality Assessment System

The total quality assessment system (TQA) aims at three elements: the environmental and energy pollution factors; investment economic factors and equity, and social needs such as the accessibility and quality of the areas. The system aims to achieve a total system for sustainable development of buildings. Moreover, Multi-Criterion systems are called TQA (Cai and Zhu, 2015).

"Multi-criterion" systems include the "Building Research Establishment Environmental Assessment Method (BREEAM)" developed in the UK, the "Leadership in Energy and Environmental Design (LEED)" developed in the US, "Comprehensive Assessment System for Built Environment Efficiency (CASBEE)" developed in Japan, "Sustainable Building Tool (SBTOOl)", "Green Building Index (GBI)" developed in Malaysia, Hong Kong the "Building Environmental Assessment Method" developed in Hong Kong, the "Australian Building Greenhouse Rating (ABGR)", the "Green Home Evaluation Manual (GHEM)", the Chinese Three Star, the "US Assessment and the Rating System (STARS)", and the "South African Sustainable Building Assessment Tool (SBAT)" (Shi et al., 2012;).

While frameworks assist to identify sustainable construction requirements, where these multi-criterion frameworks are composed of several specifications that quantify the sustainability of a building (Carmody et al., 2009).

Each method weights a guaranteed number of points available over the total evaluation. TQA with respect to sustainability is the compilation of results from the evaluated parameters and states that the system's summing process is important because it assigns rankings to elements that have been positively assessed. It is generally understandable and can be implemented in steps for each criterion, allowing a building to be assessed at different stages from design to design and, moreover, over the entire construction as correctly as possible (Berardi, 2012).

The three main types of Multi-criteria are recommended by Srinivasan et al. (2014), which are: evaluation frameworks, evaluation of research tools, and metrics. The evaluation frameworks are interconnected and standardized evaluation models that provide tools for a comparison of a variety of project alternatives. The evaluation of research tools helps to analyze and provide potential solutions for specific problems

during the construction of a house, these instruments are divided into tools for reduction and non-reduction (Srinivasan et al., 2014).

A cost-benefit analysis was used to assess output by minimizing the challenging structure according to fewer variables and combining its properties, these simplistic methods involving non-reductionist instruments involve a multi-criteria analysis that involves partly subjective analytical equivalents (Henrichson and Rinaldi, 2014).

Performance indicators as per Srinivasan et al. (2014) to evaluate the sustainability of the building that includes the Ecological Level (like the Environmental Impact), the Building Level (like Zero Energy), and the Building Environmental Level (like LEED, BREEAM, and GREEN GLOBES, SBTOOl, GBI, SBAT, and so on).

2.5.1 BREEAM

The BREEAM is mean a "Building Research Establishment Environmental Assessment Method", was created by the "BRE" and is a template used for the design of sustainability evaluation instruments worldwide, such as the Green Star in Australia and the HK-BEAM in Hong Kong (Ding, 2008).

In more than (425,000) facilities with "BREEAM" evaluation tools accredited and about two million authorized for evaluation in greater than fifty countries as of 1990, "BREEAM" is the world's widest environmental evaluation and inspection framework for structures (Yuhui, 2013).

"BREEAM" has an extensive building measurement and definition system (BREEAM, 2012), in which guidelines are set for best practice in the building industry, "BREEAM" has a broad structure. In the following places, "BREEAM" tests the efficiency of buildings:

- Management: Regulation for general management, site management overseeing, and procedural matters.
- Energy: issues of pollution and running energy.
- Pollution: consideration of air and water pollutions.
- Health and well-being: health and well-being considerations indoors and outdoors.
- Transport: carbon due to transportation.
- Land usage: places of the green and brown region.

- Ecology: protection of the ecological benefit and site improvement.
- Materials: impacts of environmental-related to construction materials.
- Water: water quality and consumption.
- Innovation.

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 (Pitt et al., 2009), a method to measure the BREEAM values of "Great Britain" as demonstrated in Figure (2.7).

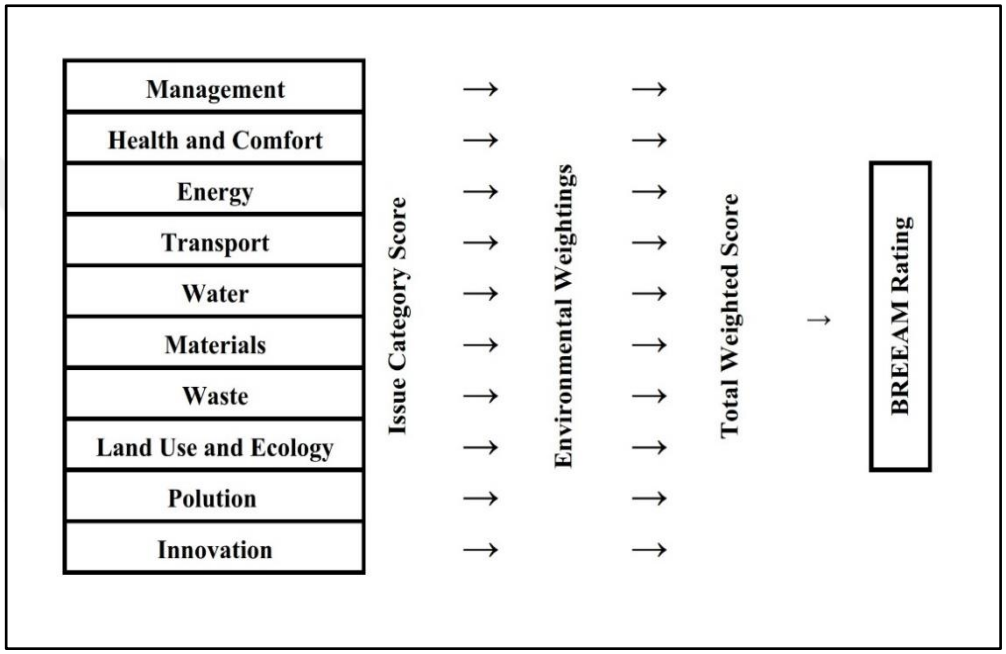

Figure 2.7: BREEAM Scoring Estimate of UK

Source: (Pitt et al., 2009)

Each category has different requirements, as shown in Table (2.4), where the contributions may be attributes or produced on the basis of such parameters. The weightings were developed during the national advisory process in the UK (Pitt et al., 2009). These attributes are accumulated in order to generate a level cumulative ranking on a level of strong, very strong, or excellent.

Table 2.4: Credits Weighting of BREEAM

Criteria	Weightings %	Attributes
Organizational	12	10
Health and Comfort	15	14
Energy	19	21
Parking and Transport	8	10
Resource of Water	6	6
Raw Materials	12.5	12
Amount of Waste	7.5	7
Capacity of Land Use and Ecology	10	10
Type of Pollution	10	12
Innovation	10	10

Source: (Sev, 2011)

2.5.2 LEED

This was founded in 1998, by the United States Green Building Council (USGBC), with several parties involved, to turn to a demand for green buildings (Zimmerman and Kibert 2007). Regarding USGBC, LEED is the second most commonly used sustainability assessment tool in the world with (20,000) projects that were approved and registered, where LEED that accounts for energy and environmental design leadership.

Members of the design team will control the progress of their project toward a LEED rating without the need for specialization of consultants during the project itself. It is well-founded in science and is linked to its demand.

LEED evaluation consists of three phases:

- Pre-requirements: the specifications to be achieved once the proposal can be evaluated.
- Core attributes: credits provided to meet or exceed the criteria of the 5 first criteria.
- Innovation credits: performance credits offered; key credits issued in the past.

Alyamia and Rezgui (2012) describe in order to provide a systematic, simple framework to evaluate overall the building performance and to achieve the sustainable development goals, the LEED evaluation was created through a consistency process involving a key actor, the different sustainability classes are

evenly the weighted and different points are taken into account, and the credits allocated to each form are joined together.

The Table (2.5) showing the evaluation attributes.

Table 2.5: 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: (LEED, 2011)

These evaluation methods helped develop SD skills and understanding in the construction industry. However, Alyamia and Rezgui (2012) indicates that the "BREEAM" evaluation range is broader and that its standards are more complex to follow with the LEED criteria, which means that the BREEAM comparing with LEED is a much more complete technique.

2.5.3 SBTOOL

The concept of SBTOOL has a framework for building efficiency assessment which is utilized by the third side, to create evaluation systems for a number of different regional criteria and facility types, and the rating system toolbox may also be considered.

The SBTOOl is concentrated on the concept of adapting a rating system to local requirements before its findings can make sense. The system, therefore, has a typical structure to identify local context conditions and establish excellent weights and benchmarks in local non-commercial organizations (Larsoon, and Macias, 2012).

Through the global effort for a sustainable construction environment, SBTOOl was developed by the collaboration of over 20 the governments as the sustainable building method. The tool has been developed so that countries can create their own local rating systems to fix local climatic conditions and languages (Larsson, 2014).

It helps users in various regions and countries participating in this assessment process to represent the different goals, technology, building tradition and cultural values.

This is why national groups can boost their benchmarks and weightings using different methods such as the analytical hierarchy system as shown in Table (2.6) (Knollenberg et al, 2014).

Table 2.6: 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 behavioral	5

Source: (Knollenberg et al., 2016)

2.5.4 CASBEE

The CASBEE is Japan's green construction management system, and it represents the "Comprehensive Assessment System for Built Environment Efficiency", where the rating instrument uses a weighting system that allows for the positioning of environmental concerns in the sense of a conditional environment.

CASBEE is an assessment tool introduced by Japan's state, established under the Building, Infrastructure, and Transportation Ministry to evaluate the overall environmental performance of a facility (CASBEE, 2011).

The four main elements of CASBEE consist of the 80 sub-criteria for energy conservation, resource efficiency, the local environment, and the indoor environment.

In addition, these groups are re-classified into two main groups: Q (quality), and L (loading) (Horvat and Fazio, 2005).

Rather than simply applying attributes points combined, the CASBEE integrates the concept of building environmental efficiency, Excluding the weighting factors for the classification of different kinds of buildings, the execution of its particular plan to

achieve the final results is differentiated from the other evaluations, where those are focused primarily on the results of a survey of response stakeholders like designers, occupants of buildings, and customers. The answers are then evaluated by analytical hierarchy.

2.6 Designing the Sustainable Building Assessment Tools

More than 600 sustainability evaluation systems available worldwide, but neither of such systems will prosper effectively if they have been utilized in nations where they were not initially intended to operate (Saunders, 2008).

Because of who it is being built, each tool must be customized according to take into account the local climate. To attain sustainability, Comparisons of actual person projects evaluated by each strategy often need to be communicated Such direct assessment of the rating categories within each system isn't really easy and at the same time expensive. Frameworks of sustainability evaluations vary from overall energy efficiency assessment towards multi-dimensional performance evaluation (Berardi, 2012).

Therefore, the viability of the building should be evaluated for any sub-element, like the services, the system structure, and the construction as a whole; therefore, the need for different evaluation and ranking tools must be evaluated (Langston, 2008).

Following the implementation of the Sustainable Building Alliance, these variations between systems have led to the establishment of common assessment categories and the improvement of comparability between systems (Berardi, 2012).

Although the resources for sustainable building evaluation tools have increased, Seles involving researchers such as Rumsey, McLellan (2005), Schendler, and Udall have been criticized for engaging in their evaluation process (2005).

The US National Institute of Standards and Technology (NIST) analyzed the LEED system in the light of LCA; they put an end to its confined scientific marker system that is not a credible sustainability evaluation regulation (Suzer, 2019).

LEED is increasingly being enhanced to develop the building's sustainability efficiency.

LEED-NC is currently in operation for the design of housing, the construction of new buildings for schools, residences, hospitals, data centers, warehouses, etc. LEEDs for external plans, LEEDs to current buildings, and LEEDs to new property improvement projects are also available (USGBC, 2016).

Over the years BREEAM have developed, where the (BREEAM-NC), a guide with more than 400 pages that may be utilized for urban, private, residential, and industrial structures,

Including construction modifications, was originally published on a BREEAM 20 pages long and deals with a variety of issues (Soulti and Leonard, 2016).

The BREEAM is available for current non-residential facilities and the BREEAM communities planned for the sustainable design of new communities' master plans or redevelopment projects. BREEAM is also eligible for rehabilitation of existing buildings with the international renovation and fit-out technical requirements (BREEAM, 2016). However, it promotes the adaptation of these instruments in countries that have not yet built their own resources, attention to sustainable buildings.

3. SUSTAINABLE BUILDING REFERENCE FRAMEWORK

3.1 General Introduction

This chapter presents a complete overview of the conceptual framework, covering essential theories and terminologies linked to sustainability, the 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 Ylmaz and Bakaş (2015), 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 Concepts of Sustainable Building

According to Miles and Huberman (1994), 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 (Noor and Pitt, 2009). 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 (Maxwell, 2013). It is a commonly held belief that the aforementioned texts define the standards for environmentally friendly structures and provide direction for this study.

As per Dini et al. (2001), 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 (Mertens, 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.

3.3 Project Management's Contribution in Sustainable Construction

A procedure that supports sustainable organization in connection to the whole lifetime management of workplaces in order to promote productivity and support company operations efficiently is referred to as projects management (SAFMA, 2012).

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 (FMAA, 2014).

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 (EuroFM, 2014).

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 (3.1).

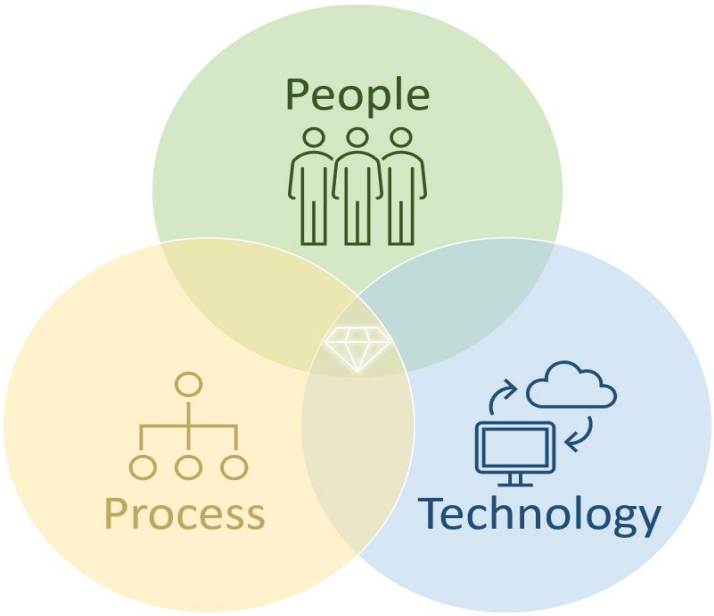

Figure 3.1: People Process Technology

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" (IFMA, 2014).

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" (BIFM, 2014).

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 of maintaining positive relationships with clients.

3.4 The Improvement of Facilities Management

Before the last forty years, companies relied on in-house workers for all aspects of facility maintenance, including cleaning and service. There had been no progress made toward developing the FM concept (Atkin and Brooks, 2005).

FM 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. FM 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 has 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 (IFMA, 2014).

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 (IFMA, 2014). 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 (Alexander, 2003).

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 (Wiggins, 2010).

FM has been successfully developed and established in other developed countries like as “Japan”, “New Zealand”, “Hong Kong”, “Singapore”, “Australia”, and “South Africa”. In these countries, it is acknowledged as an endeavor that, when properly implemented, can result in a 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 (Kamaruzzaman and Zawawi, 2010).

According to Shah (2007), 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 and Zawawi, 2010). 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 (Natukunda, 2013).

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.

3.5 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 sustainable general efficiency of a building in helping SD in the current environment.

According to Carmody et al., (2009) 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 (Roufechaei et al., 2014).

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 (AlWaer and Kirk, 2012).

Where building evaluation methods perform significant importance in the evaluation of sustainability and in evaluating different levels of sustainable development. The collected of 3 categories: Systems for Cumulative Energy Demand (CED) focusing on energy use, Life Cycle Analysis focused on the environmental aspect, and System Total Quality Assessment (TQA) (Lazar and Chithra, 2020).

3.5.1 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 Marszal et al., (2011) 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, 2011).

3.5.2 Net zero energy

The Net zero-energy buildings (ZEB) are a domestic or industrial building that needs substantially fewer energy thanks to efficiency features that allow renewable energy balancing. Despite the fascination of 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 (EIA, 2005).

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 is doubled and by 2025, another (50) percent is projected to rise (EIA, 2005).

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 the 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 (Petersburg et al., 2006).

- Net Zero Energy Pollution: A net-zero pollution building produced 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.

3.5.3 Life-cycle analysis

The Life Cycle Analysis (LCA) centers 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 (Hauschild et al., 2018).

The LCA separates the construction of basic operations and raw materials and measures the environmental effects of the building from the cradle to the grave over the life cycle. where the capacity to extract or process raw materials, to generate, transport and distribute raw materials, to use, reuse, maintain, recycle and finish disposal (Hauschild et al., 2018).

In addition, by defining and quantifying resources, materials, and wastes produced by the environment, "LCA" also assesses the environmental burden associated with a product, process, or operation. It also measures the environmental impacts of goods and recognizes and evaluates ways to change the environment (Klöpffer, 2020).

"LCA" is also an international instrument for assessing the effect of products and structures on the environment during their lives.

"LCA" allows engineering experts to analyze various building designs on the basis of the environmental effects and to implement educated decisions about the relevant materials. The "LCA" enables assessment of the environmental effect of various

building structures in a single area and different building types in different geographical areas (Zabalza et al., 2013).

The “LCA” includes four interconnected steps, due to Weißenbergera: description of aim and scope; analysis of life cycle inventory, evaluation of the effect of the life cycle; and analysis of the outcome. The objective and the scoping stage constitute the definition of the aim and scope in accordance with standards.

The second phase, the life-cycle inventory review, involves the quantification of whole substance and energy flow input and output in a generally thorough lifestyle inventory assessment. At this point, the information obtained in the life cycle inventory analysis (substances and flow analysis) is analyzed in accordance with its possible environmental impacts. The third phase, the life cycle effect assessment. And at the end, the fourth phase includes the review of life cycle inventory outcomes and the evaluation of the life cycle effect cycle to extract environmental effects and to offer submission of decision-makers (Weißenbergera, 2014).

This is not only because of the functionality of the buildings but 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 the making such modifications and the minimal environmental effect of these modifications. For almost all phases of the building life cycle, therefore, new alternatives must be created (Khasreen, 2009).

The application of “LCA” in the field of construction is a particular practice in contrast with other sectors and is currently the main important sector of “LCA” application.

There is a constraint “LCA” technologies, in which it tests the environmental concept of SD without acknowledging social and economic impacts (Hauschild et al., 2018).

Berardi (2012) recommends a mixture of LCA and “Life Cycle Cost (LCC)” analyses in order to comply with this restriction. The utilization of “LCC” is the capacity to measure the expenses related to the construction method for the whole facility.

“LCC” is the means by which costs of the whole construction phase are recorded and these costs are usually reduced to their present value. Reducing entire installation

costs makes it possible to compare alternative building systems and compares a selection of alternative systems' current value (Hodges, 2005).

Restricted application, limited versatility, and limited accessibility are the majority of open methods used for “LCC” and “LCA” execution in the building industry. They demand that the enhanced design and efficiency of the SD lead to effective tools for “LCAs”.

The normal practice of implementing fixed criteria for the life-cycle analysis and for life cycle evaluation stages is restricted to “LCA”, 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 life-time end (Dyckhoff and Kasah, 2014).

3.6 Impact of Building Materials to Create Sustainable Structures

Building designers and building users insist on developing healthy living and working environments to achieve a high degree of efficiency for the protection, health, and comfort of the residents and to satisfy SD commitments. With the increasing growth in the industry of Construction and the ongoing need to make use of innovative technology in the construction industry creative ways of choosing building materials are required to achieve the best use of resources present. The industry of Construction considered as one of the most resource consumers, Where the construction industry has been described as the most of the biggest users of resources. It is acknowledged that this field is an important sector for the conservation of the environment and sustainable management of resources.

We should to face the reality and seeking practical approaches not token motions that have very small impacts, where the most pollution is produced from economic activities. 64% of global Carbon pollution is attributed to energy or activity (remaining is from forestry, agriculture or destruction); 35% is from the manufacturing, 31% from buildings and 27% from transportation (Olivetti and Jonathan, 2018)

Energy is used in the construction industry from the time raw materials are mined to the time finished buildings are heated, lit, controlled, and ventilated. The building sector is also the largest user of raw materials, accounting for 40% of annual global

demand, and is an important contributor to environmental pollutants (Yahya and Halim, 2010).

3.7 Management Benefits and Requirements for Sustainable Building Management

The term "sustainable construction" refers to a method of building that contributes creatively, safeguards the environment as a whole, and provides sufficient benefits to the individual who uses or the built. This method requires that industrial supplies be always built-in on an ongoing basis that promotes and efficient production, implying that they frequently use more resources than is strictly required. In spite of the fact that these constructions can initially appear to be difficult and tedious to apply, they provide advantages that can be summarized as follows:

1. The ratio of price to quality
2. Protective of the natural environment
3. Reliant on non-depletable sources of energy
4. A building that is feasible
5. The protected environment for the locals
6. Controlled consumption of resources and less reliance on them
7. The control and management of emissions
8. Greater potential for growth and return

3.8 Management of Sustainable Construction Projects

According to Olivierti and Jonathan (2018), sustainability construction management places an emphasis on the selection of sustainable materials at each stage of the construction process, and engineering management performs a significant role in the establishment of a sustainable building that is successful. 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, efficiency, 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:

3.8.1 Objective reasons and analysis of the location

Establishing a purpose that satisfies the needs of both sustainable and environmental development, as well as construction standards and design settings, as well as selecting the appropriate location, is the first stage in sustainable construction planning.

According to the guidelines for sustainable building and rating, the location that has been chosen for the building must, however, be in an area that already has sufficient basic amenities, such as schools, a playing field, shops, libraries, transportation offerings, and communication facilities.

3.8.2 Select and assessment of materials for construction

The task that is both the most important and the most difficult to accomplish in sustainable building. It is required that the building materials be accredited by recognized organizations like LEED, BREEAM, and ISO before they may be used. The Life Cycle Assessment (LCA) is another way, in which a designer is selected to determine the most suitable building material to be consistent with the tasks associated with the project.

The following steps, which came before them, can also be listed:

1. Outlining the goals of the project

2. A description of the materials that are required for the particular design.

3. Providing an explanation of the short-term and long-term properties.

4. Determine how the content should be classified based on the requirements.

5. An investigation on the total amount of the isolated yield

6. The selection of a material for use in construction based on criteria relating to yield, wellbeing, and the capacity for long-term sustainability. This is accomplished through the several steps that are outlined in the following Figure (3.2):

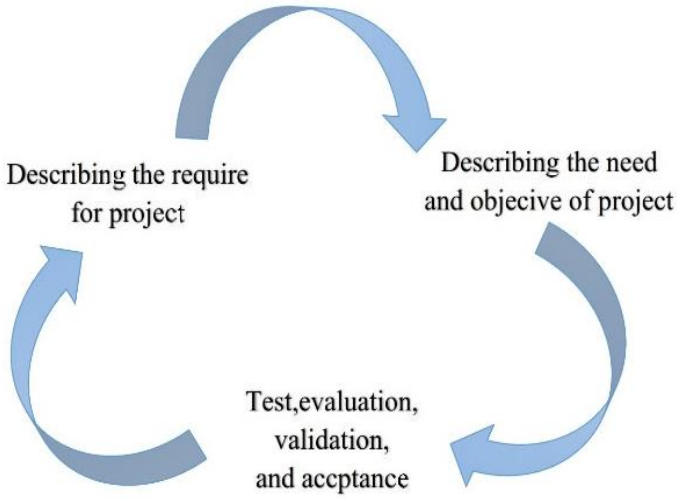

Figure 3.2: Simplified LCA Approach for Selection of Material

Source: (Olivetti and Jonathan, 2018)

3.8.3 Planning and implementation

Before beginning any construction work, a design study as well as a site review are required to be completed. It takes into consideration constant monitoring, quality assurance, and ongoing inspections, and it involves feasibility analyses, the findings of site selection assessments, maintaining of design quality, and adjustments as necessary to achieve the desired and productive task.

3.8.4 Property management

Resources can be anything from human labor to machinery to water. It is important to strictly adhere to organized schedules and the procedures for effective construction in order to achieve the goal in the anticipated period and costly, as the tools and instruments used often involve consuming lighting, expenses, and time, despite their main objective being to decrease period of time.

3.8.5 Energy

As a way to avoid problems associated with depleting fuel and energy resources, sustainable management advocates installing renewable energy sources in every single home. Sustainability certifications like “LEED” and “BREEAM” require access to alternative energy sources.

3.8.6 Project staff for project leadership and evaluation

In order for a construction project to be considered sustainable, the team of professionals that is selected for the project must include at least one expert who possesses specialized understanding on current practices or advancements in building construction and operation.

Additionally, there should be an individual on the team who is either a specialist in sustainable construction or at the minimum a trained specialist in this field. This will allow the grading system to award additional points to sustainable construction qualified specialists who are working on the project.

The primary purpose of this stage is to ensure that the project is executed effectively and that each phase incorporates the concept of sustainability in order to maximize the project's overall effectiveness.

3.9 Construction Materials and Sustainability

Ingredients used in construction not only contribute to economic growth, but also to the long-term viability of a building. Because of the large amounts of non-renewable energy required and the waste and toxins created throughout the course of the material's cycle, construction has a number of negative effects on the environment (Olivetti and Jonathan, 2018).

In truth, construction industry stakeholders have known from the get-go how crucial it is to mitigate the environmental impacts of their industry. Historically, factors like price, availability, and aesthetics have been prioritized over long-term durability and adaptability in the selection of building materials (Asif et al., 2007).

To be considered sustainable, a building material must be non-toxic, energy- and water-efficient, created from recycled materials, comply with regulations governing the use of non-renewable assets, operate in accordance with life cycle and environment interactions, and be recyclable in and of itself (Huang et al., 2020).

Low-electric glass, for example, is considered sustainable because it reduces a building's need for heating fuel; however, floating glass is also considered sustainable because it is highly recyclable and much stronger than low-electric glass.

Sustainability is a process, not a product, commodity, or even a material that can be considered sustainable in and of itself. Although we may be capable of creating high-quality environmental materials, our civilization will fall if we are unable to utilize them in ways that are consistent with sustainable development principles (Asif et al., 2007).

3.10 Sustainable Construction Material Properties

The life cycle of the material is used to categorize sustainable construction materials in many distinct qualities. According to Hosseinijou et al. (2014), materials can be considered sustainable if one or more of the following criteria are present in the material:

1.Improving the quality of the air inside by reducing the amount of pollutants caused by volatile organic compounds (VOC).

2. Contents that have been recycled and were created in whole or in part from garbage that was derived from either post-industrial or post-consumer sources.

3. Conditions and performance that require little to no upkeep.

4. They are derived from sources that can be replenished.

5.The amount of energy required for the production of goods and the transportation of materials is relatively low.

6. Ozone destruction free.

7. The level of toxicity is lower.

8. These materials are sourced from the immediate surrounding area.

9. They are able to be used in more than one occasion.

10. They are suitable for use in recycling processes.

11. They can be broken down by living organisms.

12. The amount of garbage generated decreased as a result of manufacturing or construction cycles.

13.They are favorable to the environment and help reduce the amount of energy used for operating the building while it is occupied.

14. They contribute to the conservation of water.

The nature of the material can have an effect on the properties that sustainable materials possess.

Where it is essential to evaluate sustainable materials with an understanding of the environmental impacts associated with different materials, understanding of government regulations and renewable materials specifications if they exist, understanding of sustainable materials in regional markets, and an understanding of how are there sustainable components, it is essential to do so.

3.11 Advantages of the Application of Sustainable Materials in Construction

Selecting construction materials that are environmentally friendly might be one of the most challenging aspects of a building project (Hosseinijou et al., 2014):

1. A project is comprised of a variety of components, each of which needed to be evaluated.
2. The criteria for evaluation can vary depending on the material categorization and the country in which the product was manufactured.
3. There is an insufficient amount of expertise within the industrial processes.
4. There is not a universally accepted methodology for the assessment of materials.

3.12 Barriers to Use Sustainable Resources

Possible impediments to the usage of environmentally friendly building materials and products include:

1. Building workers who aren't aware of how important it is to minimize the amount of pollutants released into the environment by the trash generated by the building industries.
2. The limited availability of known environmentally friendly building materials for use in construction.
3. An insufficient amount of environmental understanding on the subject of construction materials to fully analyze various options.
4. The lack of rules and standards that encourage the utilization of environmentally friendly constructions.

3.13 Concepts Principles for Selecting Sustainable Building 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.

3.14 Steps `of Sustainable Materials Choice

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

3.14.1 Stage of gathering data and information

Specifically, this process entails compiling data on the product's professional efficacy and environmental impacts for later classification.

3.14.2 Stage of evaluation

It entails evaluating the product based on the data gathered about it. It might be challenging to make an evaluation when comparing materials that are all being used for the same objective.

3.14.3 Stage of selection

To do this, we use an evaluation instrument called a "assessment matrix" to tally the worth of several environmental parameters. The option with the highest score should be selected with care (Jahan al et al., 2011).

3.15 Objective of Selection Building Material

Consider to Figure (3.3) for a visual representation of the proposed structure for selecting building materials that adhere to the sustainability criteria.

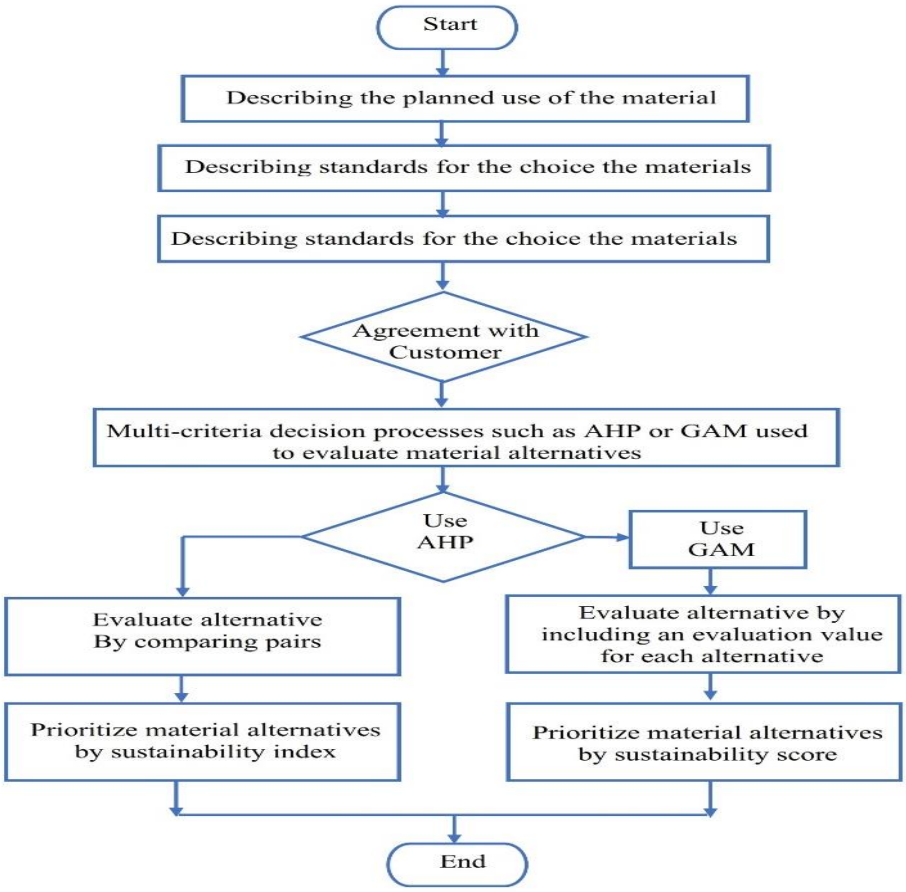

Figure 3.3: Objective of Selection Building Material

Source: (Jahan al et., 2011).

in which the proposed structure can be summed up in five steps:

1. Providing an explanation of the purpose that will be served by the material as the first stage.

2. Outlining criteria for making selections regarding the materials.

3. Providing a description of the criteria used to select the alternative components.

4. The utilization of multi-criteria decision-making techniques, such as AHP or GAM, for the purpose of assessing the available material options.

5. The many options for the material are sorted in order of priority based on the AHP or GAM analysis, and the selection is made depending on how sustainable it is.

3.16 GAM

The purpose of the achievement of targets matrix, also known as the G.A.M., is to determine whether or not different options are practicable in order to accomplish a

set of previously determined goals and detailed objectives. The degree to which the planner was successful in achieving the goals that were anticipated for each of the solutions that were proposed to address a given issue. According to Field and Bryan (2018), the objective accomplishment matrix depends on various phases, including the following:

1. Providing a detailed and high-level explanation of the goals.
2. Providing an explanation of the methodology behind the calculation of all of the goals in accordance with their design (economic, social, and environmental).
3. The process for applying the matrix to the objectives begins with the assignment of weights to the targets.
4. Determine the extent to which each of the alternate goals that were offered was achieved.

a. Assigning a value of evaluation to each possible choice in relation to the predetermined goal.
b. The determination of the weights of the alternative matrices.
c. Figuring out how much each choice contributes to the overall weight (the Sustainability Score).

5. Identifying the option that has the most favorable total weight distribution.
6. A sensitivity analysis is used in certain types of study to determine whether or not the findings can be trusted.

The flow chart that is depicted in Figure (3.4) is an illustration of the correct way to implement the G.A.M system. When making decisions on what should take precedence, it is critical to take into account non-quantifiable aspects like the benefits and drawbacks to society. This is the most significant consideration to take into account before making a selection. The fact that some weighting might be established depending on the requirements of the personal decision is the most major drawback of this technique. As a result of this, the method ought to be based on an exact basis as much as feasible for the selection of targets and the weight of these targets.

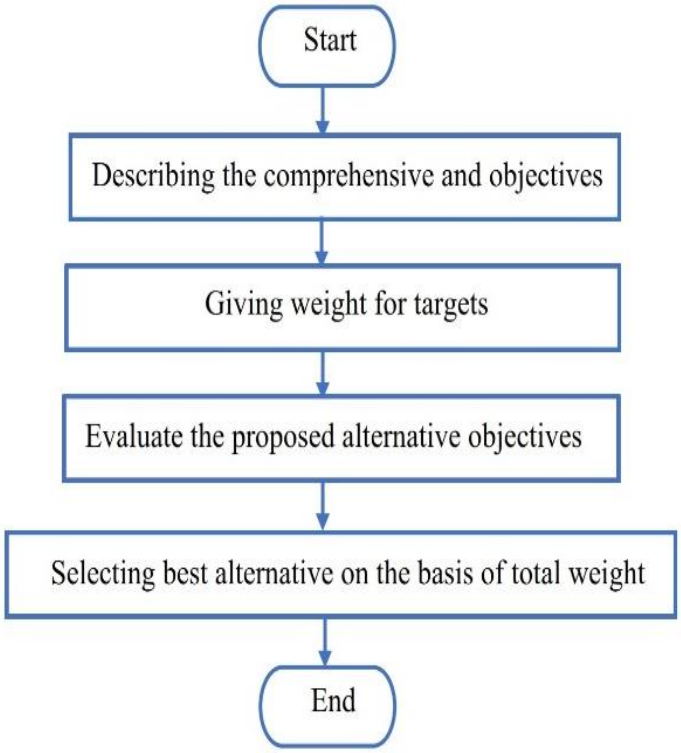

Figure 3.4: GAM

Source: (Field and Bryan, 2018)

3.17 AHP

The Analytical Hierarchy Process (A.H.P.) model offered a method that was both rational and descriptive for organizing the decision issue and determining its order of importance. The AHP model is predicated on adherence to the following four fundamental principles, as outlined by Morioka et al., (2016):

1. Stakeholders are required to be able to compare and contrast any two aspects of the evaluation when presented in pairs.
2. Stakeholders should never operate on the assumption that a single metric is superior indefinitely.
3. The evaluation needs to be given in a hierarchical format.
4. The hierarchy has to display all of the components.

A flow chart illustrating the AHP approach being applied to the selection of construction materials is presented in Figure (3.5).

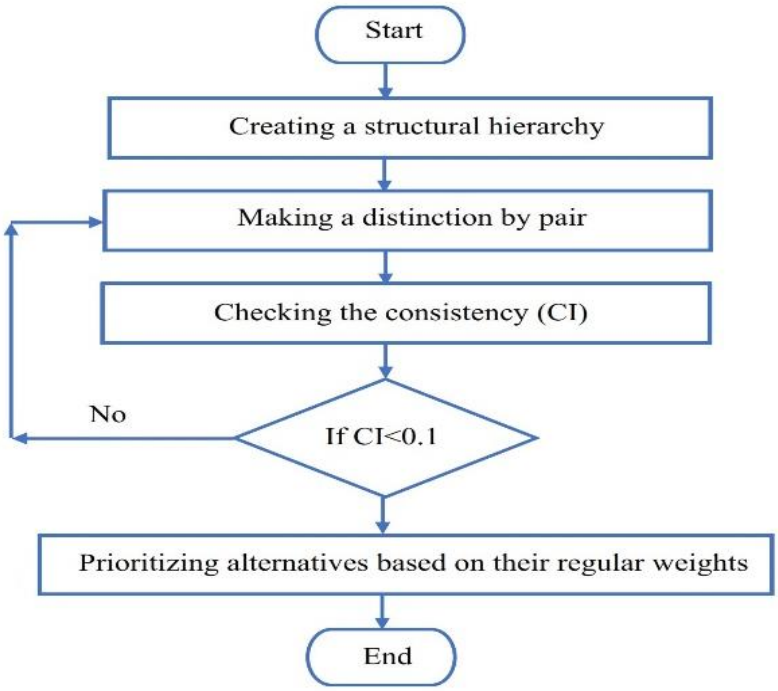

Figure 3.5: AHP

Source: (Morioka et al., 2016)

3.18 Relationship between Management and Sustainability

Metcalf and Benn (2013) investigated the controversy and confusion that exists around the numerous management styles that are associated with the successful adoption of sustainability in companies. When viewed in this light, the writers came to the conclusion that the answer lies within the intricate workings of the idea of sustainability itself.

Yet, management for sustainability necessitates the use of leaders with exceptional skills. Leaders and management play a significant role in the manner of how the sustainability of an institution connects to the larger systems within which the business stands.

Inside the long run, sustainable management practices were adopted by UK construction companies thanks to government policies and legislative acts put out by the government (Galpin et al., 2015).

Davies et al., (2017) included a quantitative study that was based on England and consisted of a total of five case studies in their work. The studies were done in England. After taking the finished projects into consideration, case researches found numerous obstacles to follow sustainable construction practices. These challenges

included clients' lack of requirement for sustainable construction, a shortage of expertise and strength, real and perceived costs implicated in the project, and stakeholders' indecision towards sustainability goals.

In this scenario, the managers in a company must be able to practice strong decision-making when it comes to issues of sustainability and progress beyond the concepts of productivity, compliance, or simply being green.

Many companies have begun to incorporate the concept of "sustainability" into their long-term business survival strategies as well as their strategies for achieving success. It is imperative that leaders are willing to integrate sustainability practices into the day-to-day operations of their companies to ensure that these initiatives become an essential component of the overall business approach (Beehner, 2010).

On the other hand, the research that was carried out by Flora, (2013) placed an emphasis on the connection that exists between sustainable practices and leadership. Leadership is a crucial tool, and as such it plays an essential part in any form of organizational setting that strives to be sustainable. This includes settings such as governments, businesses, and other types of organizations.

3.18.1 Relationship between management and sustainability in the building sector

The building organization is one of the important sectors that drives the economy of the country, and at the same time, it is also a priority for the environment. As a result, sustainable approaches in the construction industry have attracted more attention than in previous years. Due to the fact that the efforts of leaders have a significant bearing on the level of sustainable growth achieved in the construction sector, managers play a significant role.

Regardless of the organization's degree of maturity, the strategy, commitment, and confidence of the organization 's managers have a significant impact on their capacity to work toward achieving their sustainability goals (Flora, 2013).

The authors of the study that was carried out by Tabassi et al. (2016) undertook an investigation into the connection that exists between environmentally conscious building projects and the management style of project supervisors. The authors of this study integrated eight different aspects into their investigation of leadership

competences, which allowed them to extend those competencies into hierarchical and reflective constructs. The information was gathered from a total of seventy different project managers who had worked on green construction projects.

Following the completion of the data analysis, the findings demonstrated that the results of the leadership competencies of PMs as second-order reflective constructs frequently conclude at considerable and direct influence upon the success requirements for sustainable construction. In addition, the findings revealed that the intellectual competency of project managers correlates to the most significant element on the accomplishments of sustainable construction.

Tabassi, et al. (2016) on the other hand, evaluated the function that project managers have in the process of building in a sustainable manner and detailed it in his paper. In order to successfully complete a sustainable building project, the purpose of this study was to evaluate the manner in which project managers incorporate the idea of sustainability into the procedures involved in building construction. According to the findings of the study, clients are susceptible to being swayed by the project managers on occasion. This is due to the fact that project managers are in charge of supervising the designers who are responsible for meeting client specifications.

In order to contribute to the sustainability of the construction industry, Sujana (2020) used path goal theory to analyze the leadership styles of contractor project managers in Indonesia. She came to the conclusion that additional research was required to investigate how the culture of the workplace affects the connection between effective leadership and the promotion of sustainability.

In the grand scheme of things, the project managers play a significant part in the incorporation of sustainable building practices into building projects during the design and construction phases, which is necessary in order to successfully construct a sustainable structure. The studies that were discussed previously shed light on some of the various challenges that must be overcome in order to adhere to sustainable construction practices. Additionally, these studies demonstrated the necessity of strong leadership in order to make decisive actions with regard to issues of sustainability.

In addition, they emphasized the significance of leadership in the process of achieving sustainability in any business. They said this because the implementation

of sustainability in construction firms presents a unique leadership challenge and calls for a distinctive leadership style. All of these studies, however, were carried out in a particular national context, and neither the cultural effect nor the manner in which it influences the promotion of sustainability in either of the contexts studied was taken into account (two countries).

3.18.2 Impact of culture on sustainability and management

As was noted in earlier bullet points, the rising awareness of the importance of sustainability in today's society motivates firms to include sustainable business practices into their long-term goals and operational procedures. However, putting these practices into action is not an easy process due to the fact that culture can have an effect on sustainability. Culture has the potential to play a significant part in determining how a society expects organizations and businesses to deal with social and environmental issues (Ho et al., 2012).

According to Vitale, et al., (2019), culture is the "antecedent," also known as the "condition," that influences the adoption of sustainable practices. In addition, one definition of culture is the set of views and ideals that are generally accepted throughout a society at a particular point in its history.

Because it plays such a significant part in "norming" the proliferation of sustainability-relevant institutions, the concept and perception of culture are fairly complicated. As a result, they can have a wide range of effects on sustainability, which is due to the fact that sustainability-related institutions are proliferating. In addition to this, it has an impact on the "conforming" that occurs in response to the push for sustainability that comes from these organizations (Vitale, et al., 2019).

In addition to this, according to Varsei (2014), culture consists of five dimensions that can be utilized to discern between the cultures of various nations. These factors are power distance, individualism against collectivism, masculinity versus femininity, orientation toward the long term versus the short term, uncertainty avoidance, and short-term versus long-term goals. Several experts have looked into the relationship between the idea of culture and the conception of sustainability.

It was proposed by Harris (2014) that culture can shape people's attitudes and perceptions, which in turn can influence how individuals utilize the natural resources and ecosystems in their own environments. On the other hand, the influence of

culture on normative views about what constitutes morally appropriate behavior might serve as a channel for environmental beliefs and behavior.

As a consequence of this, the view that is considered correct in one society may differ significantly from culture to culture. The concept of sustainability, as well as sustainable development, is frequently investigated in the realm of the construction industry. This is due to the fact that the dynamics, complexity, and multidimensionality of the industry frequently demand an investigation into the sector's influence on ecological security (Grantovna, 2017).

3.19 Obstacles to Sustainable Building Project Management Practice

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, lack of teaching and tools (Sridarran et al.,2016) can be categorized as barriers to projects management in the achievement of sustainable facility structures.

Brown and Pitt (2001) agree, arguing that a lack of specialized and scientific training for facilities managers hinders our current knowledge of projects management concerns and will undoubtedly have an effect on sustainable management as buildings adapt to new technologies.

Disparate incentives, a shortage of government legislation that encourage sustainable structures, and an afterthought approach to construction works are only some of the impediments to sustainable building practice that have been noted in the research (Djokoto et al., 2014).

While the construction sector has been slowly making strides toward greener structures, other fields have been incorporating sustainability into their daily operations and educational curricula for well over a decade (Sridarran et al.,2016). In terms of sustainability education, the construction industry lags far behind.

As Häkkinen et al., (2011) point out, a lack of proper education is a major obstacle to greener construction practices. They state that the shortage of knowledge or

consensus amongst building professionals is preventing the adoption of sustainable approaches.

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 an 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 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 sustainable building approach.

3.20 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.

Ang and Wilkinson (2008), who make 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, Ochoa (2014) stresses the importance of the government being actively involved in environmentally responsible building techniques and initiating rules that will regulate such procedures. In terms of adopting and acknowledging sustainability specifications, government regulations actively discourage the use of building materials that do not meet minimum requirements and encourage the necessity of openness and accountability. These policies also include comprehensive procedures and overviews that all building professionals are required to follow.

According to Tokbolat et al., (2020), one of the primary drivers toward the creation of sustainable buildings is the encouragement of the development of expertise in emerging building technologies between building specialists. The policies of the government can help more people improve their abilities in new technology.

4. METHODOLOGY OF RESEARCH

4.1 General Introduction

The study methodology has been described in this chapter to achieve the purpose of the study and explains the approaches of study used to gathering and analyzing data, where describes the three main steps of this study research framework.

Stage one, review of relevant literature on theoretical foundations quality management system in organizations. Stage two, questionnaire survey of Iraqi Engineers that working in organizations management field. Step three includes validating the development of a management system to achieve motivation for management of sustainable building in Iraq, there are several advantages which will be achieved through quality management in Iraq.

The research methods described above are discussed in depth in the following sections. In order to comprehend the intricacy of the research subject, the wealth of present data was crucial in this study.

Therefore, systems that could collect data on numerous elements of a problem were crucial. Possible methods include survey/questionnaire, modeling, and historical analysis. Therefore, modeling was deemed improper because it could not answer "why" or "where" queries. In addition, a cursory check of the sponsor's archive materials revealed that Historical Analysis might not be acceptable because the accessible materials might not be capable to focus on current events or give the requisite depth of information.

4.2 Study Design

The research design is a structured overview of how the research study is to be performed, where the overall approach is chosen to systematically and logically combine the various components of a study effectively solving the research issue and forming a basis for data collection, calculation, and analysis. The selected approach can be qualitative, quantitative, and mixed methods to guide research procedures,

that follow some philosophical theories, design techniques, and study methods (Tarnoki and Puentes, 2019).

4.3 Hypothetical Concepts

Hypothetical concepts may be described as overall guidelines and understanding of the world or the purpose of a study carried out by the researcher (Tarnoki and Puentes, 2019).

Usually, the author uses those principles and theoretical concepts in a research paper. However, some people might never agree that they should accept a particular assumption or agree on the role these hypotheses play in the study process (Mertens, 2015). Philosophical assumptions include ontology, epistemology, axiology, methodology, and philosophical assumptions of rhetoric (Tarnoki and Puentes, 2019).

Figure (4.1) demonstrates these philosophic assumptions according to Ayarkwa et al., (2017), focusing on particular issues like what is the method of the study? How does the investigator relate to the examined person? Which are the principles that contribute to the study? What was the study's reality? What's learning communication?

Ontology is a philosophical assumption regarding the essence of truth in which the investigators believe the multiple reality of their subjects and this is illustrated by the use of various themes using the technique (What is the study process?) Rhetorical tale (What is the language of research?).

Epistemology is a metaphysical theory of the relation between the researcher and the known and how empirical knowledge has been gained. Axiology is an assumption philosophy on the role of ethics in science. The methodology is a logical theory of the research process and method, which is defined as inductive by the expertise of the scientists in data collection. Rhetoric is the practice of language study and the practice of convincing the public.

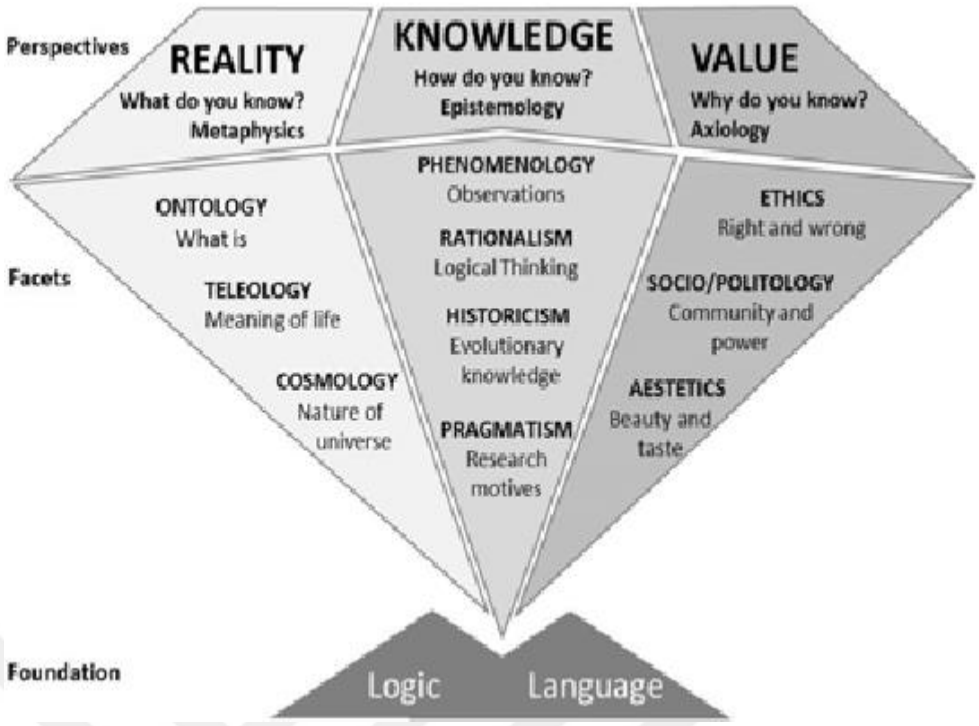

Figure 4.1: Philosophical Theories

Source: (Ayarkwa et al., 2017)

4.4 Research Approach

The researcher's choice of survey type is impacted by three primary factors: the time necessary to complete each survey, the research method, and the sample size. Combining survey methodologies is regarded as an efficient strategy for data collecting. It is based on the concept of mixing two or more strategies for the same subject and maintaining the best characteristics of each while reducing the drawbacks. According to Aaker et. al. (2006), this strategy has been shown to be extremely effective in increasing the credibility of research by increasing the response rate.

This research utilizes a mix of two very effective surveys: an interviewer-administered survey and a self-administered questionnaire.

The variety of this approach enables the researcher to mix several pertinent methodologies in order to address research problems and accomplish research objectives. This combination has the potential to provide a high response rate and a high level of reliability of studies. Additionally, by combining two or more methodologies, the investigator can reach a broader variety of responders who

completed the questionnaire is released. However, this strategy demands researchers to invest additional time and effort, in addition to possessing the necessary abilities and expertise to run the hybrid method procedure.

From the viewpoint of research goals, a research plan can be categorized as descriptive, correlational, illustrating, or exploratory. The aim of the study will decide the kind of research to be implemented from a perspective of the study goals (Bernard, 2014):

- Research is known as descriptive research when attempting to explain a situation, practice, service, or procedure in a systematic manner, or when attitudes regarding certain problems are identified, and how to study issues.
- Research includes a correlation between several parts of a situation if the study focuses on attempting to find or assessing the nature of an interaction, interdependence, or partnership.
- Research is defined as explaining when the main goal of explaining why events happen and constructing, creating, extending, or testing the theory. It helps to explain why and how two parts of a phenomenon are related.
- Research can be exploration if the purpose of a study is to either explore a field where minimal research needs to be done or to explore possibilities for specific research and to establish preliminary concepts and research issues.

The study is descriptive in concept as it aims to explain the various practices of monitoring and optimization in intelligent manufacturing management. The study is also considered an exploration of the method of inquiry, where the study takes both qualitative and quantitative methods into account, and the synthesis between the two methods to sufficient to accomplish the purpose of the study.

4.4.1 Selection of research approach

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 (Tarnoki and Puentes, 2019).

Qualitative study can define an approach to analysis and try to understand the significance of individuals that are dedicated to social issues, where 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 the quantitative and the 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).

This section describes effective research approaches by choosing mixed approaches for this study analysis as an acceptable methodology. The search method is the technique for the gathering of observation research information and may be classified into four main topics: documentation, interviews, analysis, and questionnaires (Denscombe, 2021).

The selected methods used for gathering information in this research include documentation and questionnaires. The study mandated an exploratory development approach involving the collection first of qualitative information and then quantitative data.

The study began with gathering qualitative information from related literature and documentation to collect as much knowledge about sustainable building components, it was the first step of the study. The second step of the study involved the acquisition of quantitative data. The results of the documentation gathered were used for designing a questionnaire that was created and then bring up to members of the manufacturing fields and automation project specialists.

4.4.2 Selecting a mixed approach

This study uses a mixed-methods approach because the study aims to get a detailed understanding of the significance of the monitoring and optimization in intelligent manufacturing management. Regarding Creswell (2018), if a practice or theory requires to be investigated and clarified since few studies have been done, then a mixed approach is needed.

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 the fine, functional, and up to date conditions, by performing the questionnaire investigation and thorough interviews.

The qualitative approach was the first proposed, due to limited the literature in this field, the research analysis is exploratory and required explanatory studies to validate findings.

The quantitative approach was then used to verify and generalize results for a population and to analyze the results of the qualitative process by means of a questionnaire survey. In order to corroborate and generalize the qualitative technique's conclusions to a community and to further investigate their findings, the quantitative approach was then applied via a questionnaire assessment.

4.5 Structure of Research

A three-stage research structure, such as the one illustrated in Figure (4.2), might be used to demonstrate the study methodology that was utilized in this particular investigation. In the first stage, a literature review and an investigation of sustainable building documents and their constituents are carried out.

In addition to the literature review and document research that were a part of stage one, which also included a focus on the difficulties of implementing sustainable buildings in Iraq, the literature review that was conducted was on sustainable buildings.

The second stage consists of conducting an investigation through the use of a questionnaire to analyze the results and evaluate additional documents. Validating and carefully examining the findings of the research is the focus of the third stage.

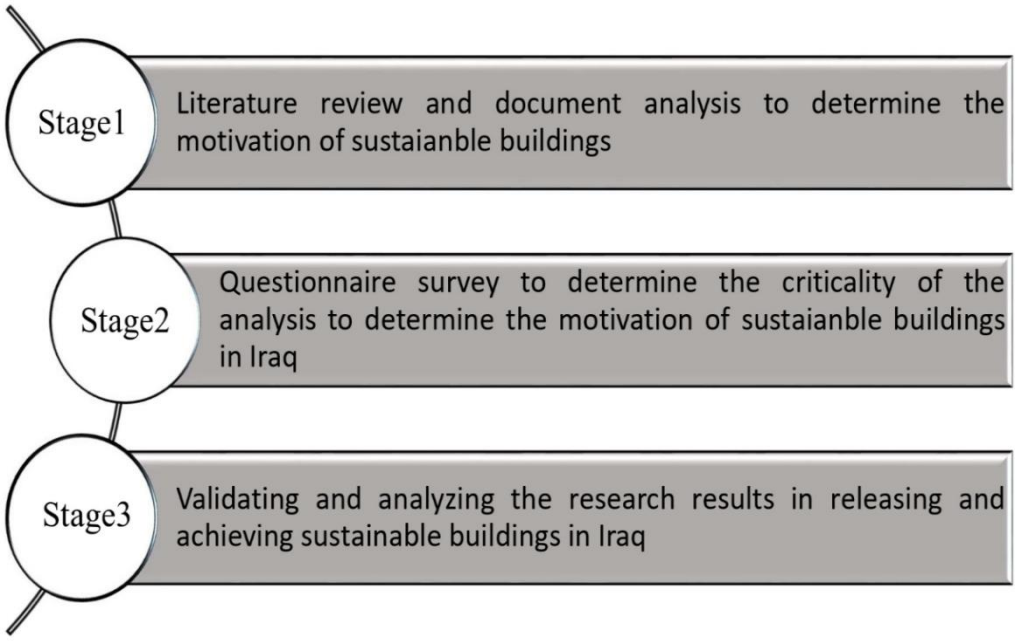

Figure 4.2: Philosophical Theories

Source: (By Researcher)

4.5.1 Literature review stage

The purpose of the literature review in the study was to provide a solid theoretical framework for the field of research and to advance the aims and objectives of the study. When conclusions were reached, the literature review advanced to the final phases of the research process.

A review of the relevant literature positions of a study defines the information gaps, provides a structure for establishing the value of the study, and thus explains the problem statement (Tarnoki and Puentes, 2019).

The literature evaluation served as the basis for the investigation into the theoretical framework for sustainable building materials and implementation challenges in Iraq.

This method, according to Denscombe (2021), seeks to arrive at a conclusion regarding the proposed information of a subject based on a thorough and objective review of studies conducted on the subject. This method was useful in identifying numerous publications on the subject of the study, but these publications needed to identify and define sustainable building components.

In addition to periodicals such as Journal of Building and Environment, Journal of Construction, Engineering and Management, and Journal of Sustainable

Development, the study included the selection of literature from multiple sources, including books, seminars, blogs, and databases, among others.

The concept of conducting a keyword study for “sustainable building” served as the foundation for the gathering of relevant material. The background pertinence to the research, paper currency, and material quality all played a role in the selection of the literature that was utilized.

In spite of the fact that this consistency of the contents involved concern of the rich data on research objectives currently available in the literature, the results and suggestion are typically set out in the abstracts of the studies. The relevance of the analysis included results from earlier studies on the components that establish a sustainable facility.

There were a total of thirty-five reasons given for adopting environmentally friendly building practices. After that, the thirty-five components were arranged according to the literature into the categories of environmental, social, economic, market, and management factors. Every component has been honed to perfection in order to conform to the specifications outlined in the information analysis.

4.5.2 Questionnaire stage

Researchers have developed a survey in the form of a questionnaire with the goal of providing a quantitative or statistical explanation of the patterns, behaviors, or perspectives of a community by studying a sample of that group (Tarnoki and Puentes, 2019).

This portion of the research process is dedicated to constructing and processing the survey questionnaire as well as assessing the survey results, which depicts the research process at this point.

The purpose of this questionnaire is to assess the components that make up a sustainable construction in Iraq as well as the difficulties associated with putting this notion into practice.

A questionnaire is a document containing a group of questions meant to precisely obtain information from individuals and to gather information that can be used for the analysis of information. It is imperative that questionnaires be structured in such a way that they may be finished effortlessly and without the need for any assistance.

They can be challenging since respondents are unable to express themselves in their own words, and the researcher may not always have the opportunity to check if the responses are accurate. However, due to the fact that they are fairly easy to organize and that each participant is obliged to answer essentially the same questions and that responses may be picked from recorded data, this method is well suited for quantitative research (Denscombe, 2021).

4.5.2.1 Questionnaire form

The questionnaire research contains a quantitative method that is specifically to the use of the sample primarily, which picks individuals, choosing a number for several, and generalizing findings that might represent a larger population. Specifically, the use of the sample is the primary focus of the quantitative approach.

According to Bryman (2016), the extent to which a specimen represents a community is dependent on three factors: the specimen volume, the basic design of choice processes, and the specimen structure. The specimen volume refers to the number of people in a community from whom the investigator obtains data; the specimen design or sampling strategy can be referred to as the basic plan choice process; and the specimen structure is a list that represents the individuals who make up a community. The questionnaires were directed toward (148) different stakeholders in the Iraqi construction industry. These individuals work in various building construction-related fields.

In order to get in touch with the participants, the questionnaire was printed out and disseminated in the form of papers, social media numbers, and email addresses that were gathered from the stakeholders in the Iraqi construction sector. When it was asked of the participants that they fill out the surveys and submit them back using the same receipting technique, then all of the questionnaires (123) were returned after a set amount of time had passed (30 days).

4.5.2.2 Questionnaires design

The surveys should be structured to collect data that could be used for evaluation, should include a list of questions, and should ask people for data on identified study matters (Denscombe, 2021). when designing questionnaires, it is essential to take into account the following four criteria:

- A theoretical knowledge of the study, which can be achieved by doing the study and assessing the submitted material, or by using alternative qualitative study methodologies that could serve as a pilot approach.
- The reliability of the questions, including whether or not they are consistent and whether or not they are relevant.
- The validity of the questionnaire, including how well the question tests what it was supposed to test, as well as how well the question tests what it was designed to test.
- Prior experience in both the writing of questionnaires and the utilization of a wide range of available questionnaires.
- A firm grasp on the demographic that will be targeted.

Appendix A is a model response to the questionnaire for your perusal. The knowledge that will be helpful in achieving the aims and objectives of the study is being gathered through the use of a questionnaire that has a series of particular questions designed to obtain that knowledge.

The researcher will create detailed questions that are accompanied by replies that will only allow the responses to fit into categories that have been established in advance.

In addition, the questionnaire contained scales that were defined as measurement levels. These scales are a method for arranging information in the measurement of indicators into the nominal and ordinal level. Additionally, the questionnaire contained scales that determined the intensity, direction, amount, or power of a variable that was measuring quantitative data as per in Appendix B.

4.5.2.3 Research Instruments

The Likert scale, the Thurstone scale, the social distance scale developed by Borgadus, the semantic differential scale, the numerical ranking scale, and the Guttman scale are all examples of scales. Social scientists make use of them in order to improve the quality of the data they gather and analyze, as well as to compare different data sets (Bernard, 2017).

The regular measurement scale, also known as the Likert scale, which featured a scale with five increments the Likert scale as shown in Table (4.1), which asks respondents to indicate the amount to which they agree or disagree with statements regarding the effects and criticality of the ingredients stated for obtaining a sustainable building definition and the challenges faced in creating sustainable buildings in Iraq, was used for this study.

Table 4.1: Likret's Scale Used for Rating

	Effect	**Rate**
Evaluation	Strongly agree	5
	Agree	4
	Neutral	3
	Disagree	2
	Strongly disagree	1

4.5.3 Data collection stage

The study was carried out in the Republic of Iraq, including participants in the building industry from across all of the provinces. Professionals from both the public and private sectors, such as governmental administrations, contracting businesses, consultation bureaus, laboratory facilities, material producers and suppliers, equipment providers, and academic institutions, were targeted in this presentation. This lends credibility to the research by demonstrating that the findings are representative of the applicable jurisdiction over the entirety of Iraq.

The response ratio for the data collection is helpful in measuring the effectiveness of the questionnaires that were returned for the study because it provides this information. The distribution of the questionnaire for the survey method is shown in Table (4.2).

(148) questionnaires were disseminated directly either by printed papers or by sent questionnaire link (google format) through the social media numbers and email addresses, and then (123) completed questionnaires were subsequently returned, which resulted in a (83%) of participants in the study. This was done in one of two ways: either by printed papers or by sending questionnaire link (google format).

Table 4.2: Response Rate

Questionnaire	
The questionnaires distributed directly	20
The questionnaires sent by social media numbers	115
The questionnaires sent by email	13
Overall number of questionnaires	148

4.6 Data Analysis

After following the initial procedures to insert the acquired data into the software SPSS, the data that were afterwards inserted were evaluated, and any errors that were found were validated. Verifying that the method used to input data was accurate was a necessary step that had to be taken. When analyzing the results of the survey, both a descriptive and a differential approach were taken using SPSS.

According to Calkins (2005), descriptive statistics are used to typically define or identify a collection of data elements. Inferential statistics, on the other hand, attempt to deduce information obtained by sampling by graphically presenting the information or explaining its key patterns and how it is distributed. In the study, a value of five percent was considered to be statistically significant. The analysis of the percentile form like standard error (Std. D.), standard deviation (Std. D.), and standard summation (Sum) Cronbach's Alpha, and the relative important index (II) were all components of this study.

4.6.1 Reliability test

When it comes to quantitative studies, a reliability test gives essential information about and an assessment of the internally 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 evaluate 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 the Cronbach's Alpha factor, the critical level that is required to define the acceptable degree of the internal dependability is 0.7 (Pallant, 2020). The reliability test is utilized in order to evaluate how consistent the chosen scale is, and the alpha in Cronbach is the most widely used reliability test, as demonstrated by equation (4.1).

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

Where:

α = alpha Cronbach

n = refer 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 the values of 0.70 or larger are accepted.

Table (4.3) indicates that all values more than 0.70 value, its acceptable Cronbach's alpha value meaning that the scales are reliable for this analysis.

Table 4.3: Alpha Cronbach

Cronbach's Alpha	Internal Reliability
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

4.6.2 Ethics perspective

The researcher ensured that the names of the respondents and the credibility of the data were preserved by presenting the material as blocks, rather than highlighting individual incidents. The researcher won't manipulate the data in order to validate a predetermined opinion or conclusion. In addition, the researcher will ensure the confidentiality of the respondents, maintain proper classification, and maintain the accuracy of the data. Consent on the basis of education will be sought, and no

information will be shared with a third party without first obtaining permission to do so.

4.6.3 Important index

The Importance Index (II) is used when selecting how to evaluate and classify the relative outcomes of participants in relation to a certain point of view or subject matter. The (II) generates rankings in an ordinal format, as indicated in Equation (4.2), so that the results can be compared to one another.

II was computed using the formula provided by Akadiri and Adebayo (2022) in order to assess the relative significance of a number of different reasons motivating sustainable construction practices and the difficulties associated with putting this idea into practice in Iraq:

$$II = \frac{5n_5+4n_4+3n_3+2n_2+1n_1}{(n_5+n_4+n_3+n_2+n_1)} \quad \textbf{(4.2)}$$

Where;

n_5 =no. of respondents which replied with “Strongly agree”

n_4 =no. of respondents which replied with “Agree”;

n_3 =no. of respondents which replied with “Neutral”;

n_2 =no. of respondents who replied with “Disagree”;

n_1 =no. of respondents which replied with “Strongly disagree”.

4.7 Hypotheses of Research

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.

In order to obtain useful results, the questionnaire was divided into four parts as follows:

4.7.1 What are the criteria that motivate people in Iraq to construct sustainable building?

According to the findings of this research, the factors that encourage sustainable motivation in Iraq may be broken down into the following five categories: economic, social, environmental, organizational, and market factors.

The results showing that 35 motivators of sustainable building are described in chapters 2 and 3, where the study has highlighted on the summarization of these motivators to that achieving sustainable building were represented the environmental, social, economic, organizational and market parts. The motivation consists of 13 motivate belong economic part, 4 motivate belong social part, 4 motivate belong environmental part, and 9 motivate belong organizational part and 5 motivate belong market part, as shown in Table (4.3).

This study sought to identify the concepts to the criteria that motivate people in Iraq to construct the sustainable buildings, also to data assessment, re-coded were assigned for the questions where the motivate of construct the sustainable buildings from M1 to M35.

Table 4.4: Economic Motivation

No.	Motivation	Items	Code
1	Economic	Initial expenses are less or equal for sustainable buildings.	M1
2		The return on investment for sustainable buildings is higher.	M2
3		Sustainable buildings have less annual energy expenses.	M3
4		Sustainable buildings provide greater annual water expense reductions.	M4

Table 4.4: (Cont.) Economic Motivation

No.	Motivation	Items	Code
5		Sustainable buildings have cheaper maintenance and operation expenses.	M5
6		Sustainable buildings have lower expenses for sewage treatment.	M6
7		The costs associated with the environment and emissions have decreased.	M7
8		The enhancement of environmental quality contributes to an increase in the amount of profit that the company makes.	M8
9		The expenses of complaints customer concerns are reduced.	M9
10		The rental and resale value of sustainable buildings is greater.	M10
11		The economic life of a sustainable building is longer due to the fact that its plant and technology are more resistant to different applications and therefore more adaptable and durable, so ensuring a greater life.	M11
12		Because obtaining authorization and project approvals is so simple, sustainable construction projects require less time and money for implementation.	M12
13		Government and utility companies provide tax exemptions and incentive payments for sustainable construction.	M13

Table 4.5: Social Motivation

No.	Motivation	Items	Code
1	Social	Sustainable buildings enhance the health of their residents by improving indoor air quality.	M14
2		Sustainable buildings enhance the comfort, contentment, and well-being of their residents.	M15
3		Sustainable buildings enhance the protection and security of residents.	M16
4		Sustainable buildings enhance residents' lifestyles.	M17

Table 4.6: Environmental Motivation

No.	Motivation	Items	Code
1	Environmental	Sustainable buildings minimize the negative environmental implications of buildings.	M18
2		Sustainable Buildings contribute to the reduction of climate change.	M19
3		Sustainable building improves air and water purity.	M20
4		Sustainable Buildings reduce the consumption of natural resources, thereby protecting the ecosystem.	M21

Table 4.7: Organizational Motivation

No.	Motivation	Items	Code
1	Organizational	Sustainable Buildings are an indication of business social responsibility.	M22
2		Sustainable building strategies are incorporated into the strategic management and risk evaluation of the organization.	M23
3		By constructing sustainable buildings, businesses have enhanced their public perception.	M24
4		Sustainable Buildings have the ability to attract highly educated and creative staff.	M25
5		Sustainable buildings enable construction companies to undertake new projects by providing value in a market that is compatible.	M26
6		Sustainable buildings enable risk management simple.	M27
7		Sustainable buildings inspire the creation of new, higher energy-efficient technologies and services in order to increase profits.	M28
8		Sustainable buildings enhance the company's marketing efforts.	M29
9		Sustainable buildings enable for international expansion and the sale of sustainable construction expertise.	M30

Table 4.8: Market Motivation

No.	Motivation	Items	Code
1	Marketing	Sustainable buildings have a favorable effect on the market for construction materials.	M31
2		The market for sustainable buildings is receiving a growing amount of media coverage.	M32
3		Sustainable buildings are gaining prominence at national meetings.	M33
4		The market is experiencing an expansion in client demand for sustainable construction projects.	B34
5		Improvements to building codes and environmental regulations lead to the construction of sustainable buildings.	B35

4.7.2 Where did you gain knowledge sustainable construction?

This section was designed to provide you with an overview of the sustainable construction movement and answer the question, "where did you gain knowledge sustainable construction?" It was requested of the participants that they choose one of the six sources that would have an influence on them and assist them in acquiring general information regarding the gain knowledge sustainable building.

In addition, for the purpose of data assessment, re-coded numbers were allocated for these questions ranging from 1 to 6, as show in Table (4.9).

Table 4.9: Knowledge of Sustainable Construction

Source	Scale
Participating in a conference	1
Reading specialist journals	2
Internet investigation	3
Consulting with Experts	4
Sharing expertise among my colleagues	5
Attending workshops on sustainable construction	6

4.7.3 What do you think about the types of buildings that should sustainable construction?

The objective of this part was to answer the question "what do you think about the types of buildings that should sustainable construction?" by providing you with an overview of the sustainable construction movement.

It was required of the participants that they select one of the six sources that would have an impact on them and help them in the process of gaining general information regarding the gain understanding sustainable building. In addition, for the purpose of evaluating the data, recoded values ranging from 1 to 6 have been assigned to these questions, as can be seen in Table (4.10).

Table 4.10: Types of Buildings That Should Sustainable Construction

Types of Buildings	Scale
Education	1
Medical care	2
Government	3
Accommodation	4
Individual houses	5
Institutional	6

4.7.4 What types of individuals or skill sets in the broader sector would be most helpful in assisting you with the management and implementation of sustainable building projects?

The following section is intended to provide you an overview of the sustainable construction movement and answer the question, "What types of individuals or skill sets in the broader sector would be most helpful in assisting you with the management and implementation of sustainable building projects?" This section was created to offer you with an overview of the sustainable construction movement. It was required of the participants that they select one of the six sources that would have an impact on them and help them in the process of gaining general information regarding the gain understanding sustainable building. In addition, for the purpose of evaluating the data, recoded values ranging from 1 to 5 have been assigned to these questions, as can be seen in table (4.11).

Table 4.11: Types of İndividuals or Skill Sets in the Sustainable Building Projects

Types of skill	Scale
Civil Engineers	1
Architects Engineers	2
Management specialists	3
Information technology specialists	4
Government	5

4.8 Results and Findings

In this section, the primary details are presented, as well as a discussion of the conclusions of the research study that was conducted inside the building and construction industry in Iraq. The findings of the research were derived from a wide range of different sorts of evidence in order to ensure that the objectives of the study were met and that the anticipated outcomes were achieved.

The completion of questionnaires provided the most significant contribution to the verification effort. In addition to that, the researcher came up with a number of interesting findings. Using all of these different bits of data, the results have been triangulated. This tactic makes it possible to investigate unique issues that have come to light as a consequence of the discoveries made during the data collection process but which were not anticipated in the prior research.

These issues were not anticipated because of the findings of the prior study. In addition, we provide a critical analysis of the research methodologies as well as a discussion of the limitations of the findings from the study. Both the methods for conducting the evaluation and the explanation of the findings have been arranged in a fashion that is mostly based on the structure of the questionnaire survey tool. This organization was done in order to facilitate clarity.

4.8.1 Background information

A total of 148 questionnaires were handed out to a total of participants, with 123 of them being completed out. At the outset, it was requested of the participants that they submit some background information. This information included the number of years of experience they have, and their qualification of education.

4.8.1.1 Qualifications of education

The research was conducted at building companies, including government organizations and commercial consulting companies. The organizations represented the many qualifications regarding education, which are detailed in Table (4.12).

Table 4.12: Qualifications of Education

Qualification	No.
BSC	74
MSC	14
PHD	6
Other	29
∑	123

The findings of this survey indicate that 60.2 %of respondents have a background in BSC, which is the highest percentage of participant currently working in the field of building construction. The findings also indicate that 11.4 % of respondents have a background in MSC, that 4.9 % of respondents have a background of PHD, and that 23 % of respondents have a background other qualification regarding to education as shown in Figure (4.3).

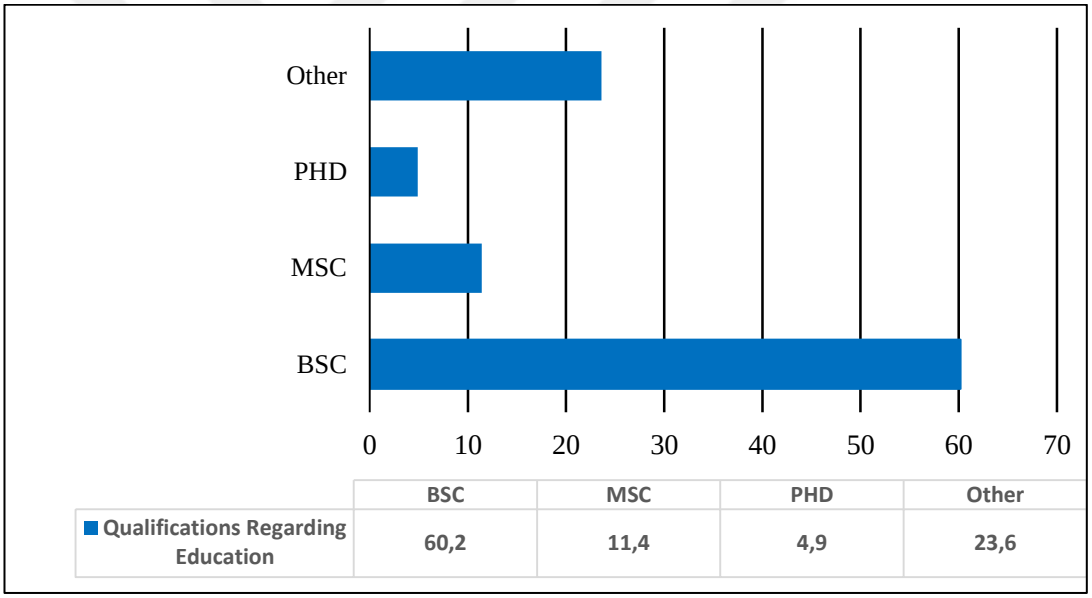

Figure 4.3: Qualifications of Education

4.8.1.2 Years of experience

As can be seen in Table (4.13), 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 21 years of experience.

Table 4.13: Years of Experience

Experience	No.
Less than 5	12
6 to 10	6
11 to 15	20
16 to 20	51
More than 21	35
∑	123

The study shows years of experiencing the of the different participants as per Figure (4.4), where 9.8% of participants less than 5 years of professional experience, 4.9% of participants from 6 to 10 years of working experience, 16.3% from 11 to 15 years of working experience, 41.5% from 16 to 20 years of working experience, and 27.6% more than 21 years of working experience.

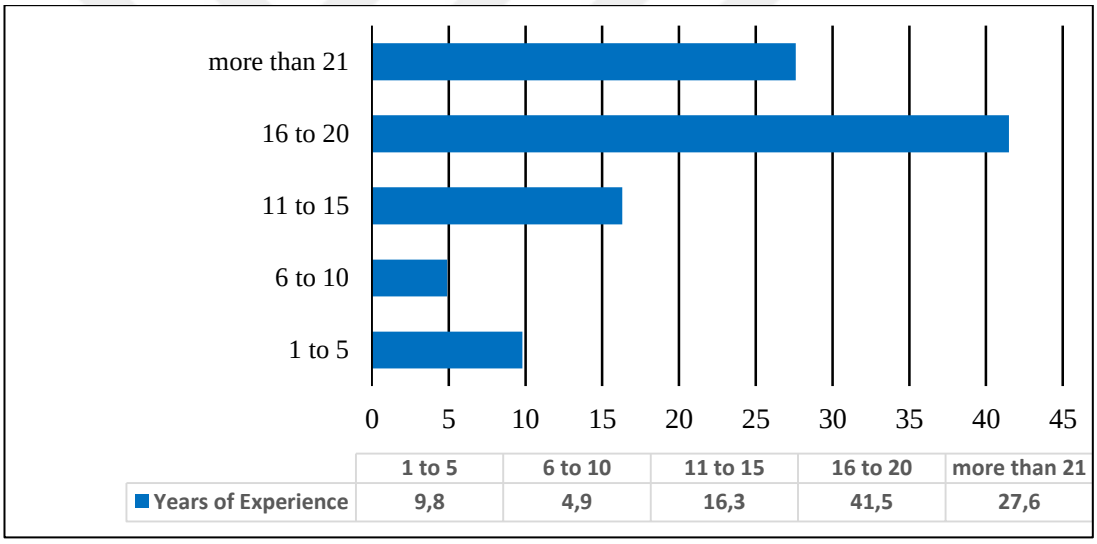

Figure 4.4: Years of Experience

4.8.2 Knowledge of sustainable construction

The Table (4.8) and Figure (4.5) describes the level of the knowledge of sustainable construction.

It shows the participants gain these knowledge of sustainable building from “Internet investigation” as the maximum value of percentage 46.3% a ranking 1st with summation of participants 57.

While 14.6 % from participants gain the knowledge of sustainable building from "Consulting with Experts " ranked the 2nd summation of participant 18.

This is followed by the participants gain these knowledge of sustainable building from "Reading specialist journals" and “Sharing expertise among my colleagues” as 3rd rank with percentage 13 % and with summation of participants 16.

On the other hand, 9.8 % from participants gain the knowledge of sustainable building from "Participating in a conference" ranked the 4th and with summation of participant 12.

And finally the participants gain these knowledge of sustainable building from "Reading specialist journals" as last rank with percentage 3.3 % and with summation of participants 4.

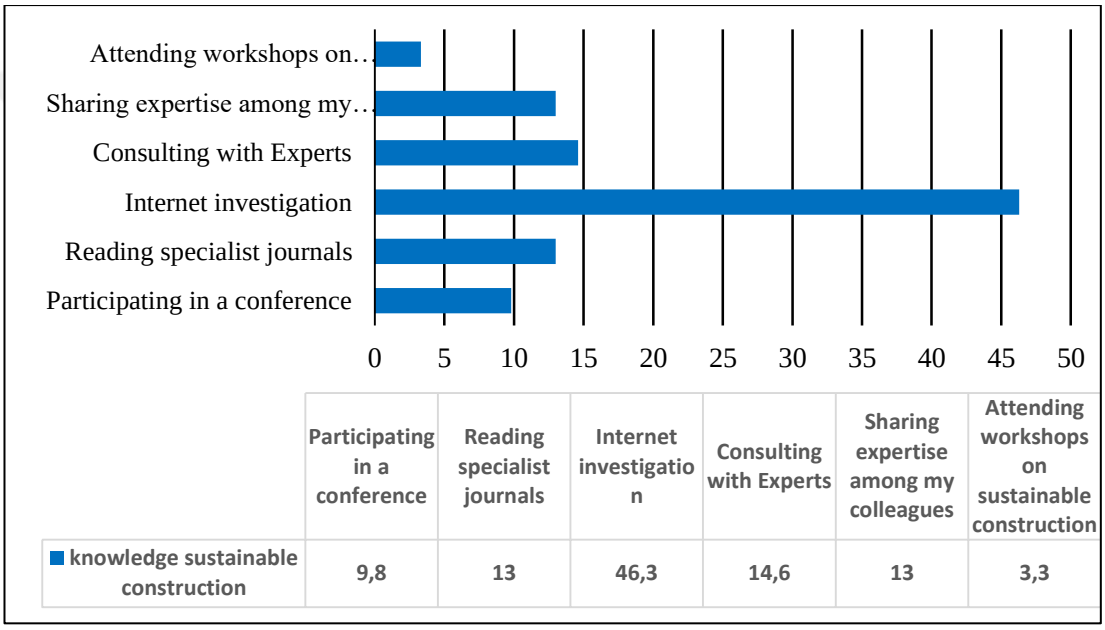

Figure 4.5: Knowledge of Sustainable Construction

Table 4.14: Knowledge of Sustainable Construction

Source	Code	No.
Participating in a conference	1	12
Reading specialist journals	2	16
Internet investigation	3	57
Consulting with Experts	4	18
Sharing expertise among my colleagues	5	16
Attending workshops on sustainable construction	6	4
∑		123

4.8.3 Types of buildings should sustainable construction

Both the Table (4.9) and the Figure (4.6) describe the degree of the different types of buildings that should be considered sustainable construction from the perspective of the participants.

It demonstrates that the participants believe that "Medical care" buildings are required to be sustainable after receiving the highest possible value of percentage 36,6% from them regarding their position as 1st place with the total number of participants 45.

While21.1 % of participants believe that the "Government" should only occupy sustainable buildings following it was placed 2nd and the total number of participants was 26.

This is followed by the opinion of the participants that "Education" must be a sustainable building in third place, with a proportion of 20.3 %, and with a summation of participation of 25.

While 9.8 % from participants see " Individual houses" must be sustainable building after ranked the 4th and summation of participant 12.

This is followed by "Accommodation" as the 5th rank, with a sum of grades 10 for the participant's beliefs that these different types of buildings must be construct as sustainable buildings.

And finally, the participants consider "Institutional" to be the category that comes in last, both in terms of percentage 4.1 % and in terms of the total number of participants 5, who must occupy sustainable buildings.

Table 4.15: Buildings Should Sustainable Construction

Building	Code	No.
Education	1	25
Medical care	2	45
Government	3	26
Accommodation	4	10
Individual houses	5	12
Institutional	6	5
∑		123

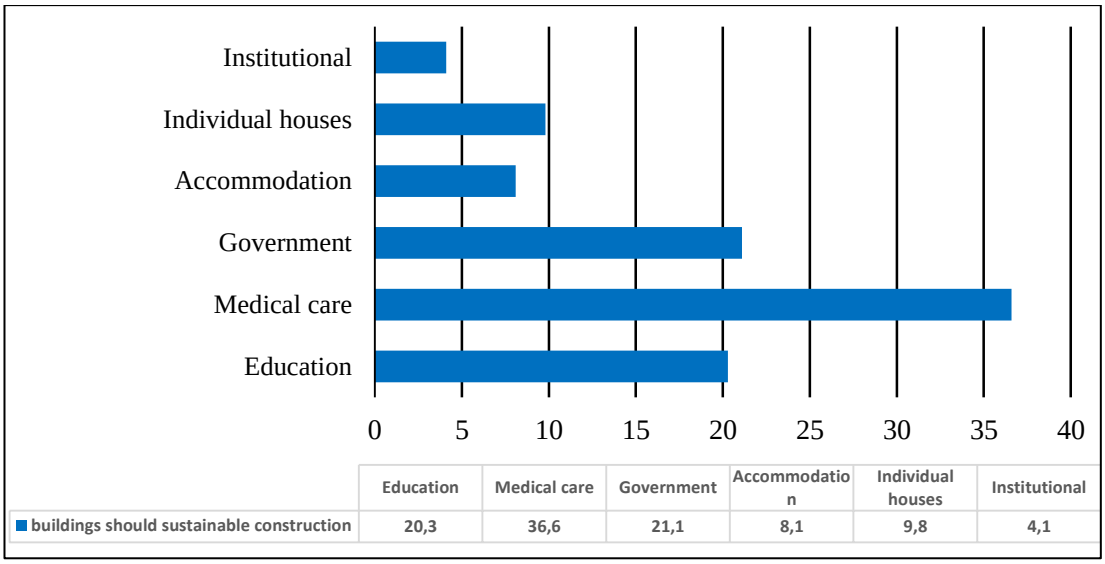

Figure 4.6: Buildings Should Sustainable Construction

4.8.4 Types of individuals or skill sets in the sustainable building projects

The Figure (4.7) and Table (4.10) describes the types of individuals or skill sets in the sustainable building projects.

It demonstrates that the participants believe that "Civil Engineering" types of individuals or skill sets in the sustainable building projects after receiving the highest possible value of percentage 38,2 % from them regarding their position as 1st place with the total number of participants 47.

While 22 % of participants believe that the " Architects Engineers" types of individuals or skill sets in the sustainable building projects it was placed 2nd and the total number of participants was 27. This is followed by the opinion of the participants that " Management specialists" types of individuals or skill sets in the sustainable building projects in 3rd place, with a proportion of 17.1 %, and with a summation of participation of 21.

On the other hand, 14.6 % from participant see, types of individuals or skill sets in the sustainable building projects must be "Government" ranked the 4th and with summation of participant 18. And finally the opinion of the participants that "Education" types of individuals or skill sets in the sustainable building projects in last place, with a proportion of 8.1 %, and with a summation of participation of 10.

Table 4.16: Types of İndividuals or Skill Sets in the Sustainable Building Projects

Skill	Code	No.
Civil Engineering	1	47
Architects Engineers	2	27
Management specialists	3	21
Information technology specialists	4	10
Government	5	18
∑		123

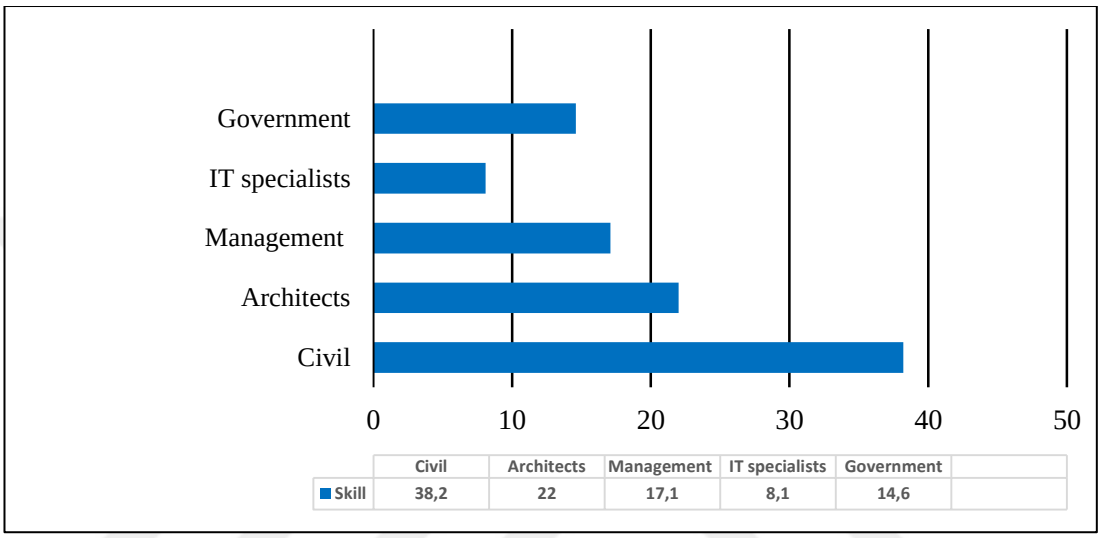

Figure 4.7: Types of Individuals or Skill Sets in the Sustainable Building Projects

4.8.5 Motivation to construct sustainable building

Applying the Cronbach's Alpha factor, the critical level that is required to define the acceptable degree of the internal dependability (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 important the criteria that motivate people in Iraq to construct sustainable building as shown in Table (4.17);

Table 4.17: The Cronbach's Alpha Values

Components	No. of Items	Value	Internal Reliability
Economic Motivation	13	0.900	Excellent
Social Motivation	4	0.811	Good
Environmental Motivation	4	0.826	Good
Organizational Motivation	10	0.803	Good
Market Motivation	5	0.862	Good

Within the scope of this research, the drivers of sustainable advancement are categorized according to a list of advantages:

4.8.5.1 Economic motivators

Where Table (4.18) describes escribes the extent to which economic motivation motivates participants to construct sustainable buildings. It displays initiative motivation “Government and utility companies provide tax exemptions and incentive payments for sustainable construction” it's the high importance motive with II value 4.32.

This is followed by motivation "The return on investment for sustainable buildings is higher" as 2nd rank with II value 4.24.

While the motivation "The costs associated with the environment and emissions have decreased" showing us with low important motive with II value 4.00.

This conclusion explains to us the role that governments and other organizations play in the process of raising the number of people who are motivated to engage in sustainable building practices. In addition, the rate of return on investment for these kinds of structures is considered to be an extremely important economic factor in the construction industry.

Table 4.18: Economic Motivators

Code	Std. E.	Std. D.	Sum	II
M1	0.074	0.817	513	4.17
M2	0.088	0.976	521	4.24
M3	0.096	1.060	493	4.01
M4	0.083	0.916	506	4.11
M5	0.080	0.889	501	4.07
M6	0.079	0.872	515	4.19
M7	0.078	0.868	492	4.00
M8	0.085	0.945	495	4.02
M9	0.066	0.736	503	4.09
M10	0.086	0.951	506	4.11
M11	0.072	0.799	508	4.13
M12	0.075	0.827	510	4.15
M13	0.076	0.839	523	4.32

4.8.5.2 Social motivators

Where Table (4.19) reflects the extent to which the participants were motivated to design sustainable buildings in terms of their social motivation. It shows motivation “Sustainable buildings enhance the health of their residents by improving indoor air quality” it's the high importance motive with II value 4.23. While the motivation " Sustainable buildings enhance residents' lifestyles" showing us with low important motive with II value 4.02.

This discovery provides light on the role that sustainable buildings that improve the health of their residents by raising the quality of the air inside the building plays in the process of increasing the number of individuals who are motivated to engage in socially responsible building practices.

Table 4.19: Social Motivators

Code	Std. E.	Std. D.	Sum	II
M14	0.081	0.904	520	4.23
M15	0.086	0.949	496	4.03
M16	0.079	0.875	510	4.15
M17	0.076	0.844	495	4.02

4.8.5.3 Environmental motivators

Where Table (4.20) indicates the extent to which the participants are motivated to design sustainable buildings by considering their level of social motivation. It shows motivation “Sustainable buildings minimize the negative environmental implications of buildings” it's the high importance motive with II value 4.23.

While the motivation “Sustainable buildings contribute to the reduction of climate change" showing us with low important motive with II value 4.02.

This finding sheds light on the role that reducing the influence that human activities have on the surrounding environment and sustainable buildings contribute to the reduction of climate change showing us with low important role plays in the process of increasing the number of individuals who are motivated to engage in environmentally responsible building practices.

Table 4.20: Environmental Motivators

Code	Std. E.	Std. D.	Sum	II
M18	0.081	0.904	520	4.23
M19	0.086	0.949	496	4.02
M20	0.079	0.875	510	4.15
M21	0.076	0.844	495	4.02

4.8.5.4 Organizational motivators

Where Table (4.21) analysis examines the extent of motivation among participants in relation to the construction of sustainable buildings, specifically focusing on organizational motivation. It shows motivation “Sustainable buildings inspire the creation of new, higher energy-efficient technologies and services in order to increase profits” it's the high importance motive with II value 4.32.

This is followed by motivation "Sustainable buildings enhance the company's marketing efforts" as 2nd rank with II value 4.25.

While the motivation "Sustainable Buildings have the ability to attract highly educated and creative staff" showing us with low important motive with II value 4.02.

The findings of this study shed light on the role that reducing the influence that human activities have on the organismic communities that are located in the surrounding area plays in The number of people who are motivated to engage in ecologically responsible building practices is increased by sustainable buildings, which contributes to a decrease in climate change. Sustainable buildings reduce the bad impacts that buildings have on the environment around them, and sustainable buildings contribute to the reduction of climate change. Buildings that are sustainable also contribute to a reduction in the emissions of greenhouse gases.

Table 4.21: Organizational Motivators

Code	Std. E.	Std. D.	Sum	II
M22	0.081	0.904	520	4.23
M23	0.086	0.949	497	4.03
M24	0.079	0.875	510	4.15
M25	0.076	0.844	495	4.02
M26	0.071	0.782	509	4.14
M27	0.075	0.827	510	4.15
M28	0.075	0.833	523	4.32
M29	0.084	0.929	522	4.25
M30	0.076	0.843	509	4.14

4.8.5.5 Market motivators

Where Table (4.22) indicates the degree of participants' drive to build sustainably in relation to social motivation. It shows motivation “Sustainable buildings are gaining prominence at national meetings” it's the high importance motive with II value 4.32.

While the motivation “The market for sustainable buildings is receiving a growing amount of media coverage" showing us with low important motive with II value 4.14.

This study sheds light on the role that increasing media coverage of the market for sustainable buildings plays in the process of increasing the number of people who are motivated to engage in environmentally responsible building practices. The market for sustainable buildings is receiving a growing amount of media coverage.

More specifically, this research sheds light on the role that an increasing amount of publicity is being given to the market for environmentally friendly buildings.

Table 4.22: Market Motivators

Code	Std.E.	Std.D.	Sum	II
M31	0.071	0.786	510	4.15
M32	0.075	0.833	509	4.14
M33	0.075	0.833	531	4.32
M34	0.084	0.935	522	4.24
M35	0.076	0.076	509	4.14

4.9 Findings Discussion

The participants to the questionnaire believe that sustainable buildings have greater initial costs; however, they also believe that sustainable constructions have greater building values and cheaper operational costs. The construction's stakeholders could be able to repay any additional costs associated with greening if the facility has a greater value and more long-term advantages.

The process of commissioning is an essential component in order to achieve the highest possible energy efficiency in constructions. Testing the functionality of a building's systems to ensure that they satisfy both the design goals and the requirements of its occupants is what is meant by "commissioning”. Tracking the

construction's energy systems on a consistent basis leads to a deeper comprehension of how the building functions and its level of energy effectiveness.

Because is no government assistance or incentive offered for environmentally responsible project finance, hence sustainable development cannot be implemented. It is also evident that the most frequently cited obstacle that was found by the questionnaire is issues about the unavailability, pricing, and supply of environmentally friendly materials, services, or systems. This is something that is rather obvious.

A few of the people working on the combined design team have limited knowledge in the field of environmentally friendly product design. It took some time to educate professionals who lacked previous knowledge in environmentally responsible building practices on the latest sustainable building practices. Because of this, they need a substantial amount of knowledge concerning environmentally friendly architectural practices and building methods.

The vast majority of suppliers are woefully uninformed on the environmental qualities of their products, including their recyclability and the amount of volatile organic compounds they contain. They should be able to back up their claims with sufficient evidence and information before making statements such as "their materials have become more durable, reusable, and have little embodied energy throughout their life cycle." It is possible that there will be an increase in requests for these items, which will force manufacturers of built environments to adapt their production processes.

5. CONCLUSION AND RECOMMENDATIONS

5.1 General Introduction

The Iraqi sustainable construction Sector is still in its infant stages; although its currently small size, its expansion is projected in the near future. In today's modern world, an increasing number of building owners are looking for environmentally conscious building approaches for newly constructed buildings. This trend is expected to continue in the foreseeable future. The conclusions of the thesis were targeted at determining the potential correlations between the perspectives of the respondents and the real state of green construction initiatives. This was done with the intention of achieving green building development.

The result of this thesis reveals that, from the perspective of people who participated in the questionnaire, the construction industry avoids creating green buildings for three primary reasons:

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

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 documentations BREEAM-NC, LEED-NC, and ISO 15392 were reviewed during the literature review, which resulted in the collection of thirty-five factors that motivate participants in the construction industry to implement sustainable building practices. Additionally, the literature review assisted in the creation of a historical knowledge of the structure and its components.

In the second part of the research project, a questionnaire was distributed to 123 people who were members of Iraq's construction professional's association and worked in disciplines related to the construction of buildings. The purpose of this step was to learn what these individuals believed to be essential for a structure.

5.2 Conclusions of Study

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 system and result creativity are, in order of significance, the other most critical obstacles to the implementation of sustainable practices. These obstacles must be overcome in order for sustainable practices to become widespread. These are quite expensive expenditures, not just for the technological advancements but also for the material itself.

It is frequently due to the relatively young age of the business, the nature of the development sector, and a shortage of management frameworks, all of which are factors that limit the progress of the green building marketplace. Education, financial support from the government, and research into environmentally friendly building technology have the potential to remove a major portion of these barriers.

The fact that there is not enough support from the government in the form of monetary incentives, taxes abatements, and policy instruments is something that has been brought to the attention of the general public.

The responses of individuals who were questioned made it plainly clear that they want the government of Iraq to adopt mandatory laws, policies, and rules for environmentally friendly constructions or incentives, as well as to implement energy-efficiency regulation and code modifications in order to generate consumer demand.

An additional role that the government can play is to finance education and development efforts for building specialists who are interested in green buildings, in addition to working on the establishment of procedures for building accreditation. This would fall under the category of "green buildings." In addition, buildings that are constructed with elements that are harmful to the environment, such as fossil fuels, ought to be subject to a tax, while buildings that are environmentally friendly ought to be rewarded.

The ability of the government to reveal the cost savings of demonstrative initiatives over the long run will enable the formation of a market that is more competitive.

In addition, respondents indicated the necessity of conducting additional cost-benefit assessments on this topic in order to address concerns around initial cost and perceptions. In order to support the arguments of sustainable construction on initial cost; annual energy and other expenses; user health, efficiency, and fulfillment; environmental implications; and other social and corporate effects, additional data and knowledge are required.

Researchers should establish and then further refine strategies for determining the actual costs of constructing environmentally friendly buildings over the duration of their whole life cycles. These strategies should be used throughout the entire building's lifespan. It will be of huge benefit in the process of designing in a way that is ecologically responsible if one improves their awareness of the potential financial rewards that may be achieved from increased productivity.

5.2.1 The role of professionals

There will be an increase in the number of environmentally friendly buildings as a consequence of building stakeholders increasing their awareness of the benefits of environmentally friendly buildings. Before there can be a shift in the level of demand in the market, it is essential for consumers of rental housing, insurance companies, and financial institutions to have an awareness of the benefits and economic value provided by environmentally friendly structures.

Another idea that is held by the respondents is the notion 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 viewpoint of the entire life cycle. In this theory, the respondents believe that owners and the general public will become interested in environmentally friendly buildings when they are made aware of the possible cost savings.

Because any additional expenses associated with the project will have the largest impact on the customers, it is vital that any educational campaigns and monetary incentives be directed squarely at prospective customers, or, to put it another way, the general population. This is because any more costs associated with the project will have the greatest impact on the customers.

It is common knowledge that traditional buildings have a number of downsides, whereas eco-friendly structures have a number of benefits that have only recently been discovered. The vast majority of respondents are of the opinion that ecologically responsible building practices will eventually come to be considered the norm in the industry. In the not too distant future, there should be an increased number of examples of ecologically friendly structures, goals should be defined for sustainability, and suggestions can be formulated.

5.2.2 Effect of sustainable development in the construction industry

The incorporation of environmental, social, and economic parameters into sustainable development (SD), the achieving of a productive economy and a balanced environment, is acknowledged to meet humanitarian needs.

It provides for residents now and in the future, by enhancing their economic growth without destroying the natural resources available and without damaging the environment, and also working to create a better life. Because of the significant adverse impact that buildings have on the climate, SD evaluation has been implemented in various industries and the construction industry in particular.

In various phases of construction, the construction industry leads to environmental emissions. Processes involve the manufacture of construction material, the construction process itself, the building's functioning, and the generation of many carbon dioxide and pollutants produced by the chemical toxic substances involved in the construction project.

Buildings are also using vast quantities of energy produced by the various processes of fossil fuels, nuclear energy, hydropower, and wind. However, these buildings may also operate as long-term assets and provide a venue for people to live, socialize, and function. The environmental, social, and economic dimensions of SD must also be added to the construction process to optimize the productivity of the buildings. However, the research has found that a fourth element, the management dimension of SD, needs to be added to implement these three aspects.

The implementation of these four SD aspects has led to sustainable construction development that means the creation and use of materials that are not hazardous to the environment and public health by buildings in an environmentally efficient way.

The same applies in the manufacture of construction materials and the operating process and management of waste to resolve environmental pollution in a more effective and non-energy usage. Sustainable buildings are supposed to enhance the environmental effects of buildings and the efficiency of life safety and wellness.

Sustainable construction is a mechanism that enables sustainable development concepts to be enforced when planning, constructing, operating, and demolishing buildings. As a mechanism, however, it is not enough to fulfill the basic human need for refuge and comfort; it needs to be the endpoint and sustainable building growth. Sustainable construction has made it possible to assess the success of the construction industry regarding achieving SD.

5.2.3 Research restrictions and limitations

This thesis has been successful in achieving its basic purposes and objectives, and it has demonstrated an in-depth analysis of the elements that drive and hinder the planning and construction of environmentally friendly structures. However, there are a few issues with the premise that need to be addressed.

To begin, there are not a sufficient number of green buildings that have been completed and have comprehensive data to evaluate the green running cost in comparison to the finance and operating expenses connected with conventional building projects. This is a significant obstacle. This presents a huge barrier to progress.

The vast majority of the information required to evaluate the effectiveness of today's green projects was not readily available because of the relatively recent development of these buildings. An analytical report on energy management was the source of all of the information that was used to compile the information on cost savings from operations.

Despite this, there is ongoing disagreement on the veracity and precision of the energy models that are utilized in the process of calculating energy savings. In addition, a significant data collection of green construction projects originating from a variety of geographic places and climatic situations should be created in order to make it easier to draw generalizations that are free of any element of mystery.

This will assist the process of drawing conclusions. In addition, it would be able to carry out an examination that is more comprehensive and in-depth if surveys or interviews were conducted with a greater number of market actors than are now being done.

5.2.4 Knowledge and experience

This study aims to gain knowledge about sustainable buildings by defining the components of sustainable buildings and the role that specialists in building construction can play in establishing sustainable building types in Iraq.

Since the introduction of SD, the building sector has been shifting its focus toward the construction of environmentally friendly structures. The goal of sustainable development is to increase awareness of the negative impacts that structures have on the surrounding environment and the urgent need to construct a world that is more sustainable. The building and construction industry makes consistent efforts to reduce these unintended consequences, notably by promoting environmentally responsible building growth.

As a result, building professionals undertake efforts in the direction of achieving them. It was discovered that achieving sustainable structures does not require any one individual or activity, but rather requires the efforts of all participants working together.

Nevertheless, it is necessary to outline the individual responsibilities of each participant in the environmentally responsible building. In addition, the research focused on the perspectives of professionals in the building construction industry on environmentally friendly buildings. Surprisingly, the researchers found that these individuals did not significantly differ in their perspectives.

5.3 Recommendations

Information implies that the Iraqi building industry does not know enough about what constitutes a sustainable building at the present time, and the results of this study will determine whether or not this is the case. As a result, the research proposed several recommendations in two parts:

5.3.1 Recommendations for construction industry experts and professionals

Whereas the study suggests very strongly that the following recommendations be taken into consideration;

1. The work done by all members of the team working on the construction project who are familiar with the day-to-day functions of a facility and its capacity for effectiveness in those functions.

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

2. The architects of the project need to take into account, during the design stage, the benefits of using the monitoring of buildings and energy efficiency problems during the building implementation in order to generate good structures in a timely manner.
3. In order to make an impactful contribution to the design process, the project manager needs to collaborate with the buildings and sustainable energy management and waste management professional, as well as those responsible for the management of waste, the supply of comfort, and so on.
4. The architects and construction designers who are accountable for the design of the building's structural framework need to collaborate in order to achieve the desired aesthetic for the structure and ensure that it functions in a sustainable manner.
5. The electrical and mechanical designers, as well as the engineers who are responsible for the designing of building facilities for electricity, heat, cooling, water supply, and so on, need to collaborate in order to have a better understanding of the sustainable performance of a structure.
6. The owner or the consumer should have an understanding of what a sustainable building is and what has to be constructed for it.
7. The government is mandated to create policies that incorporate an environmentally responsible construction qualification environment.

The building industry requires the establishment of laws by the government that encourage the development, construction, and operation of buildings that are environmentally friendly.

8. In order to support the construction of sustainable buildings, the government needs to provide funding for developers so that they can sustainably borrow money at cheap rates.

This is of utmost importance in the context of a growing nation like Iraq, which only partially implements environmentally responsible building methods at the present time.

5.3.2 Recommendations for the upcoming research

Although the building industry has initiated a number of qualification courses, training programs, and development workshops to educate construction specialists in sustainable methods, the effects of these steps on the fields are insignificant.

The lack of information is currently the biggest obstacle to the specification of the processes of sustainable development in residential construction. Therefore, it is recommended to conduct study on the application of knowledge;

1. There is room for more scientific research to be done within the environmental, social, economic, and management dimensions of SD in order to recognize more components.
2. There is need for additional research in the scientific community to acknowledge the roles that architects and construction experts play in the creation of environmentally friendly buildings.
3. In order to achieve sustainable buildings in Iraq, a framework should be established through the description of the components of sustainable buildings, and this framework should be used as a reference for the professionals who operate in the domains of building construction.
4. It is critical to establish a solid foundation for the wide implementation of sustainable construction practices throughout the building sector, including all practitioners of development, in order to realize this goal.
5. The research suggests conducting additional research to investigate the perspectives of engineers, construction specialists, and building users in Iraq

on the characteristics of sustainable buildings, as defined by the respondents to the survey.

It is anticipated that the implementation of these recommendations will help the SD objective in Iraq in addition to fostering an increase in the knowledge and comprehension of sustainable building practices among all industry specialists.

6. It is important to do additional research in the following categories in order to obtain a deeper knowledge of the green building revolution in Iraq and to make changes to it.

The actual operation of the buildings after they have been occupied should be analyzed first and foremost so that the genuine operating information of green buildings may be compared to the operating data of other buildings, regardless of whether these other constructions are green or traditional.

7. It is essential to monitor and analyze building efficiency in order to determine the 'environmental effects and energy productivity' of a construction over the course of its entire life cycle.

Furthermore, this is necessary in order to convince and motivate policy makers as well as other participants in the construction industry by providing them with feedback that is both logical and practical.

8. It is required to undertake studies that are both extensive and unambiguous, and that center on a specific green strategy, in order to demonstrate the usefulness and advantages of particular green construction techniques.

Only then will it be possible to show that these techniques may be used. Given that each of these techniques has a solid and trustworthy statistical background, it is possible to conduct an analysis of the financial rewards and hazards (both over time and in the short term) connected with each approach. In addition, there is a need for additional research and development in terms of the process and the materials.

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APPENDICES

Appendice A

Section II: In your opinion, what are the criteria that motivate people in Iraq to construct sustainable building?							
No.	**Motivatio**	**Items**	**1**	**2**	**3**	**4**	**5**
1	Economic Motivations	Initial expenses are less or equal for sustainable buildings.					
2		The return on investment for sustainable buildings is higher.					
3		Sustainable buildings have less annual energy expenses.					
4		Sustainable buildings provide greater annual water expense reductions.					
5		Sustainable buildings have cheaper maintenance and operation expenses.					
6		Sustainable buildings have lower expenses for sewage treatment.					
7		The costs associated with the environment and emissions have decreased.					
8		The enhancement of environmental quality contributes to an increase in the amount of profit that the company makes.					
9		The expenses of complaints customer concerns are reduced.					
10		The rental and resale value of sustainable buildings is greater.					
11		The economic life of a sustainable building is longer due to the fact that its plant and technology are more resistant to different applications and therefore more adaptable and durable, so ensuring a greater life.					
12		Because obtaining authorization and project approvals is so simple, sustainable construction projects require less time and money for implementation.					
13		Government and utility companies provide tax exemptions and incentive payments for sustainable construction.					
14	Social Motivations	Sustainable buildings enhance the health of their residents by improving indoor air quality.					
15		Sustainable buildings enhance the comfort, contentment, and well-being of their residents.					
16		Sustainable buildings enhance the protection and security of residents.					
17		Sustainable buildings enhance residents' lifestyles.					
18	Environmental Motivations	Sustainable buildings minimize the negative environmental implications of buildings.					
19		Sustainable Buildings contribute to the reduction of climate change.					
20		Sustainable building improves air and water purity.					
21		Sustainable Buildings reduce the consumption of natural resources, thereby protecting the ecosystem.					

No.	Motivation	Items	1	2	3	4	5
22	Organizational Motivations	Sustainable Buildings are an indication of business social responsibility.					
23		Sustainable building strategies are incorporated into the strategic management and risk evaluation of the organization.					
24		By constructing sustainable buildings, businesses have enhanced their public perception.					
25		Sustainable Buildings have the ability to attract highly educated and creative staff.					
26		Sustainable buildings enable construction companies to undertake new projects by providing value in a market that is compatible.					
27		Sustainable buildings enable risk management simple.					
28		Sustainable buildings inspire the creation of new, higher energy-efficient technologies and services in order to increase profits.					
29		Sustainable buildings enhance the company's marketing efforts.					
30		Sustainable buildings enable for international expansion and the sale of sustainable construction expertise.					
31	Marketing Motivations	Sustainable buildings have a favorable effect on the market for construction materials.					
32		The market for sustainable buildings is receiving a growing amount of media coverage.					
33		Sustainable buildings are gaining prominence at national meetings.					
34		The market is experiencing an expansion in client demand for sustainable construction projects.					
35		Improvements to building codes and environmental regulations lead to the construction of sustainable buildings.					

Appendice B:

Where did you gain knowledge sustainable construction?	Scale
Participating in a conference	1
Reading specialist journals	2
Internet investigation	3
Consulting with Experts	4
Sharing expertise among my colleagues	5
Attending workshops on sustainable construction	6

What do you think about the types of buildings that should sustainable construction?	Scale
Education	1
Medical care	2
Government	3
Accommodation	4
Individual houses	5
Institutional	6

What types of individuals or skill sets in the broader sector would be most helpful in assisting you with the management and implementation of sustainable building projects?	Scale
Civil Engineers	1
Architects Engineers	2
Management specialists	3
Information technology specialists	4
Government	5

Qualifications Regarding Education	Scale
BSC	1
MSC	2
PHD	3
Other	4

Years of Experience	Scale
1 to 5	1
6 to 10	2
11 to 15	3
16 to 20	4
more than 21	5

Appendice C:

Frequencies

Notes

Output Created		11-MAR-2023 13:50:57
Comments		
Input	Data	C:\Users\Toshiba\Desktop\Bushra\Economic Motivations.sav
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	Filter	<none>
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	Split File	<none>
	N of Rows in Working Data File	123
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=M1 M2 M3 M4 M5 M6 M7 M8 M9 M10 M11 M12 M13 /STATISTICS=STDDEV SEMEAN MEAN SUM /PIECHART FREQ /ORDER=ANALYSIS.
Resources	Processor Time	00:00:03.51
	Elapsed Time	00:00:03.43

Statistics

		Initial expenses are less or equal for sustainable buildings.	The return on investment for sustainable buildings is higher.	Sustainable buildings have less annual energy expenses.	Sustainable buildings provide greater annual water expense reductions.
N	Valid	123	123	123	123
	Missing	0	0	0	0
Mean		4.17	4.24	4.01	4.11
Std. Error of Mean		.074	.088	.096	.083
Std. Deviation		.817	.976	1.060	.916
Sum		513	521	493	506

Statistics

		Sustainable buildings have cheaper maintenance and operation expenses.	Sustainable buildings have lower expenses for sewage treatment.	The costs associated with the environment and emissions have decreased.	The enhancement of environmental quality contributes to an increase in the amount of profit that the company makes.
N	Valid	123	123	123	123
	Missing	0	0	0	0
Mean		4.07	4.19	4.00	4.02
Std. Error of Mean		.080	.079	.078	.085
Std. Deviation		.889	.872	.868	.945
Sum		501	515	492	495

Statistics

		The expenses of complaints customer concerns are reduced.	The rental and resale value of sustainable buildings is greater.	The economic life of a sustainable building is longer due to the fact that its plant and technology are more resistant to different applications and therefore more adaptable and durable, so ensuring a greater life.	Because obtaining authorization and project approvals is so simple, sustainable construction projects require less time and money for implementation.
N	Valid	123	123	123	123
	Missing	0	0	0	0
Mean		4.09	4.11	4.13	4.15
Std. Error of Mean		.066	.086	.072	.075
Std. Deviation		.736	.951	.799	.827
Sum		503	506	508	510

Statistics

		Government and utility companies provide tax exemptions and incentive payments for sustainable construction.
N	Valid	123
	Missing	0
Mean		4.32
Std. Error of Mean		.076
Std. Deviation		.839
Sum		523

Frequency Table

Initial expenses are less or equal for sustainable buildings.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.8	.8
	Disagree	6	4.9	4.9	5.7
	Neutral	8	6.5	6.5	12.2
	Agree	64	52.0	52.0	64.2
	Strongly agree	44	35.8	35.8	100.0
	Total	123	100.0	100.0	

The return on investment for sustainable buildings is higher.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	4.1	4.1	4.1
	Disagree	3	2.4	2.4	6.5
	Neutral	8	6.5	6.5	13.0
	Agree	49	39.8	39.8	52.8
	Strongly agree	58	47.2	47.2	100.0
	Total	123	100.0	100.0	

Sustainable buildings have less annual energy expenses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	6	4.9	4.9	4.9
	Disagree	2	1.6	1.6	6.5
	Neutral	26	21.1	21.1	27.6
	Agree	40	32.5	32.5	60.2
	Strongly agree	49	39.8	39.8	100.0
	Total	123	100.0	100.0	

Sustainable buildings provide greater annual water expense reductions.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.4	2.4
	Disagree	3	2.4	2.4	4.9
	Neutral	18	14.6	14.6	19.5
	Agree	52	42.3	42.3	61.8
	Strongly agree	47	38.2	38.2	100.0
	Total	123	100.0	100.0	

Sustainable buildings have cheaper maintenance and operation expenses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.6	1.6	1.6
	Disagree	6	4.9	4.9	6.5
	Neutral	14	11.4	11.4	17.9
	Agree	60	48.8	48.8	66.7
	Strongly agree	41	33.3	33.3	100.0
	Total	123	100.0	100.0	

Sustainable buildings have lower expenses for sewage treatment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.4	2.4
	Disagree	3	2.4	2.4	4.9
	Neutral	10	8.1	8.1	13.0
	Agree	59	48.0	48.0	61.0
	Strongly agree	48	39.0	39.0	100.0
	Total	123	100.0	100.0	

The costs associated with the environment and emissions have decreased.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.8	.8
	Disagree	6	4.9	4.9	5.7
	Neutral	22	17.9	17.9	23.6
	Agree	57	46.3	46.3	69.9
	Strongly agree	37	30.1	30.1	100.0
	Total	123	100.0	100.0	

The enhancement of environmental quality contributes to an increase in the amount of profit that the company makes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.4	2.4
	Disagree	8	6.5	6.5	8.9
	Neutral	11	8.9	8.9	17.9
	Agree	62	50.4	50.4	68.3
	Strongly agree	39	31.7	31.7	100.0
	Total	123	100.0	100.0	

The expenses of complaints customer concerns are reduced.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.6	1.6	1.6
	Disagree	3	2.4	2.4	4.1
	Neutral	7	5.7	5.7	9.8
	Agree	81	65.9	65.9	75.6
	Strongly agree	30	24.4	24.4	100.0
	Total	123	100.0	100.0	

The rental and resale value of sustainable buildings is greater.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	3.3	3.3	3.3
	Disagree	6	4.9	4.9	8.1
	Neutral	7	5.7	5.7	13.8
	Agree	61	49.6	49.6	63.4
	Strongly agree	45	36.6	36.6	100.0
	Total	123	100.0	100.0	

The economic life of a sustainable building is longer due to the fact that its plant and technology are more resistant to different applications and therefore more adaptable and durable, so ensuring a greater life.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.6	1.6	1.6
	Disagree	3	2.4	2.4	4.1
	Neutral	11	8.9	8.9	13.0
	Agree	68	55.3	55.3	68.3
	Strongly agree	39	31.7	31.7	100.0
	Total	123	100.0	100.0	

Because obtaining authorization and project approvals is so simple, sustainable construction projects require less time and money for implementation.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.6	1.6	1.6
	Disagree	3	2.4	2.4	4.1
	Neutral	13	10.6	10.6	14.6
	Agree	62	50.4	50.4	65.0
	Strongly agree	43	35.0	35.0	100.0
	Total	123	100.0	100.0	

Government and utility companies provide tax exemptions and incentive payments for sustainable construction.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.6	1.7	1.7
	Disagree	4	3.3	3.3	5.0
	Neutral	5	4.1	4.1	9.1
	Agree	52	42.3	43.0	52.1
	Strongly agree	58	47.2	47.9	100.0
	Total	121	98.4	100.0	
Missing	System	2	1.6		
Total		123	100.0		

RESUME

Bushra Anaam Abbas AL-BARZANJI

EDUCATION:

- Master's degree in Economic & Management from Istanbul GEDIK University / Turkiye
- Bachelor: Building and constructions / University of Technology 1996-1995/IRAQ

TRAINING COURSES AND CERTIFICATES:

- Using Microsoft Office Programs skillfully
- Autocad 2D&3D engineering drawing program
- Microsoft Project (MS project)
- Primavera program
- Using Internet & Search Engines Programs skillfully
- Using Zoom & WebEx Programs skillfully)
- Workshop of Emergency Loan Activities

WORK EXPERIENCE:

1. 1-Work as engineer in a Company relate to the Ministry of Housing and Construction
2. (Dept. Of Planning – following Company's projects & arranging work progress reports & Development Systems).
3. Pushing the wheel of work forward by solving all problems and obstacles to the return of work in the Basmaiah residential investment project, which consists of 100 thousand housing units that serve the segment of citizens to live a modern life suitable in terms of services, kindergartens, schools, infirmary, main hospital, football stadiums and commercial markets
4. Manager of emergency loan team (Pmt)
5. Member of marshes school committee for minister council

6. Upon order by World Bank, chief of education committee
7. Presenting isolation hospital proposal.
8. Achievement of many Projects in iraq.
9. Assistant of DG of Company of Al-Mu'tasim/ Ministry of Housing and Construction.
10. Director manger of Directorate of Buildings/ Ministry of Housing and Construction
11. Director manger of Public maintenance & Works/ Ministry of Housing and Construction

RESPONSIBILITY:

- Arabic : mother tongue
- English: very good
- Kurdish : good