KEY DRIVERS INFLUENCING GREEN BUILDING PERFORMANCE WITHIN THE CONSTRUCTION INDUSTRY IN UAE

دراسة حول الدوافع الرئيسية التي تؤثر على أداء المباني الخضراء ضمن قطاع البناء في دولة الإمارات العربية المتحدة

by

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ABSTRACT

This research sought to investigate the key drivers influencing the performance of Green Building (GB) in the UAE construction industry and whether these drivers are being changed over time or not. A quantitative research was executed using the survey methodology with stakeholders in various industry roles including consultants, contractors, and clients among others drawn from government, semi-government, and private organizations. The findings show that readiness in GB understanding was high among consultants, contractors, master developers, clients, researchers, and learners and that GB attributes were well developed in GB codes including ventilation and air quality, building fabric and systems, generation and renewable system, water efficient fittings, microclimate and outdoor comfort, neighborhood pollution, access and mobility, thermal comfort, environmental impact assessment, and hazards materials. The financial, operational, functional, environmental, and management drivers were reported to be important in GB adoption in the UAE. The results also indicated that the general requirements, Bronze Sa'fa requirements, Silver Sa'fa Requirements, Gold Sa'fa Requirements, and Platinum Sa'fa Requirements of the Al Sa'fat evaluation system have been remarkably implemented in the UAE.

الملخص

سعى هذا البحث إلى التحقق من العوامل الرئيسية المؤثرة على أداء المباني الخضراء في صناعة الإنشاءات في دولة الإمارات العربية المتحدة وما إذا كانت هذه المحركات تتغير مع مرور الوقت أم لا. تم تنفيذ البحث الكمي باستخدام منهجية الاستبيان مع أصحاب المصلحة في مختلف الأدوار في الصناعة بما في ذلك الاستشاريين والمقاولين والعملاء من بين آخرين مستمدين من المنظمات الحكومية وشبه الحكومية والخاصة.

تظهر النتائج أن الاستعداد لفهم أداء المباني الخضراء كان مرتفعاً بين الاستشاريين والمقاولين والمطورين الرئيسيين والزبائن والباحثين والمتعلمين ، وأن خصائص أداء المباني الخضراء تم تطويرها بشكل جيد بما في ذلك التهوية وجودة الهواء ، وبناء النسيج والأنظمة ، ونظام توليد الطاقة المتجددة ، و التجهيزات ذات الكفاءة في استخدام المياه ، المناخ المحلي ، التلوث الحي ، الوصول والتنقل ، الراحة الحرارية ، تقييم التأثير البيئي ، و غيرها. تم التحقق من اهمية العوامل المالية والتشغيلية والوظيفية والبيئية والإدارية في الإمارات العربية المتحدة.

كما أشارت النتائج إلى أن المتطلبات العامة ومتطلبات نظام (السعفات) البرونزية ومتطلبات نظام (السعفات) الفضية ومتطلبات نظام (السعفات) الذهبية ومتطلبات نظام (السعفات) البلاتينية قد تم تنفيذها بشكل ملحوظ في دولة الإمارات العربية المتحدة.

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Chapter 1: Introduction

1.1 Introduction

Nowadays, "going green" is a common buzzword due to the increased awareness of the need to ensure sustainability of the Earth (Abbas 2018). People are beginning to come to the realization that some natural resources are in the verge of depletion, and that continuing with the current trend of resource consumption will render the Earth unsustainable (Abbas 2018; Gou & Xie 2017). This led to the emergence of the green movement during the 1960s and 70s, which has grown considerably due to advances in scientific research and popular concerns regarding the dilapidation of the natural environment at both global and local levels (Green & Haines 2015). In addition, history is marked with several incidents relating to environmental protests. In addition, it has been typical of conservation groups to engage in campaigns aimed at preserving the natural environment as well as endangered species (Kibert 2012). The emergence of the green movement has led to heightened awareness of environmental conservation is nearly all aspects of peoples' lives.

The green movement is diverse and spans various aspects of society. One of the notable components of the green movement is in the construction industry (Koebel et al. 2015; MacNaughton et al. 2016). The construction sector is crucial due to the outcomes and outputs associated with its activities (Green & Haines 2015). This sector plays a crucial role in fostering the socio-economic development of a country by providing buildings that are utilized in the production of services and goods in an economy. Nonetheless, the design of a building, how it is constructed, and its location have considerable impacts on the buildings' users, the environment, and the larger community (Zuo & Zhao 2014). An implication of this is that the construction sector exerts a considerable effect on the competitiveness of an economy. For instance, the construction sector determines the extent to which a country is able to attract foreign direct investments through infrastructure, which has been reported to be a key factor in attracting foreign investors (Tam et al. 2017; Zuo & Zhao 2014). As a result, it is becoming important for continuous improvement efforts to be initiated in the construction industry, particularly during the current age of globalization since all countries are competing in attracting foreign investment (Abbas 2018). This is particularly important for Gulf countries that are seeking to diversify their economy.

Despite the economic significance of the construction industry, it performs poorly in terms of environmental considerations (Gou & Xie 2017). Activities in the construction industry often entail intensive utilization of resources resulting in the degradation of land, pollution of water and air, and the loss of natural habitats (Gou & Xie 2017; Zuo & Zhao 2014). Construction activities are also characterized by high energy utilization (40 percent of the global energy consumption), accounting for about 23-40 percent of the global greenhouse gas (GHG) emissions (PR Newswire 2016). In addition, buildings account for a huge share of the consumption of materials, water, electricity, and energy (PR Newswire 2016). Failure to adopt novel technologies poses serious problems; the United Nations Environmental Program (UNEP) estimates that GHG emissions will increase twofold by 2050 if no action is taken (Flanders 2016). The considerable negative environmental effects associated with building has played a pivotal role in the emergence of the Green Building (GB) Movement, which emphasizes designing buildings that are both water- and energy-efficient, utilizing non-hazardous material in construction, and providing productive and healthy environment.

The potential to considerably reduce GHG emissions at a small cost to the construction sector is huge (Abbas 2018; O’Neill & Gibbs 2014; Tam et al. 2017). GB has the primary aim of reducing the environmental effects of buildings (Al Abbar 2017). This is achieved through structuring and applying processes that are resource-efficient and environmentally-responsible during the course of the life-cycle of a building including designing and planning, constructing, operation of the building, maintaining it, renovating, and demolishing it (Kibert 2012). Achieving the goals of GB requires a collaborative effort between the client, engineers, architect, and the contract during all stages of the project (MacNaughton et al. 2016). GB practices tend to complement and expand the classical building designs associated with comfort, durability, and economy (Zuo & Zhao 2014). Because construction often results in the degradation of building sites, refraining from building is favored to GB with regard to lessening environmental impacts (Green & Haines 2015; Tam et al. 2017). Another important aspect of GB is that the smallest possible building is recommended (Yudelson 2016). Moreover, GB discourages the sprawl of buildings even if they are energy efficient and constructed in an environmentally-sound and energy efficient-manner (Yudelson 2016). Besides environmental benefits, GB also offers economic and social benefits. Nevertheless, contemporary sustainability efforts require a synergistic and an integrated design in constructing new and retrofitting exiting buildings (Yudelson 2016). By incorporating sustainable design principles, GB requires green practices to be incorporated in every stage of the life cycle of a building.

GB also employs diverse skills, techniques, and practices to lessen and eradicate the environmental and health effects of building (Younis, Sundarakani & Vel 2016). This approach to building design places emphasis on leveraging renewable energy sources through such methods as utilizing sunlight through photovoltaic equipment, active solar and passive solar; and using trees and plants in the form of green roofs; and reducing the runoff of rainwater (Kibert 2012; Tam et al. 2017). Several other practices are used in GB including the use of permeable concrete as substitute for asphalt and conventional concrete to improve ground water replenishment; using packed gravel; and generally using low-impact materials in building projects (Gou & Xie 2017). Taken together, these techniques seek to ensure that building are environment-friendly.

Whereas the GB practices and technologies are continually changing and are likely to vary across regions, the core principles of GB remain the same including reducing toxics and water, optimizing maintenance and operation, enhancing the quality of indoor environment, efficiency of materials, water efficiency, energy efficiency, efficiency of the design structure, and siting efficiency (Kibert 2012). The overall spirit of GB is to ensure that at least one of these principles is optimized (Koebel et al. 2015). Moreover, appropriate synergistic design helps to ensure that the individual GB practices work together to result in a better cumulative impact (AlFaris, Juaidi & Manzano-Agugliaro 2016). GB also emphasizes aesthetic design elements (Ameen, Mourshed & Li 2015), which entails designing a building such that synchronizes with the natural environment that surrounds its site.

Across the globe, GB is increasingly being implemented. A survey conducted by United Technologies Climate, Controls, and Security (UTCCS) and Smart Market Report showed that 51 percent of global enterprises including building consultants, building owners, contractors, engineers, and architects drawn from across the world are emphasizing sustainable construction and design (Smart Market Report 2013). Construction firms are increasingly adopting green practices (Gou & Xie 2017). Regardless of the remarkable progress in GB, major obstacles exist emanating from the construction industry and building professions and are further amplified by the difficulties in amending building codes (Abbas 2018), financial barriers, behavioral and cultural barriers (Flanders 2016), and lack of adequate information on the GB techniques, its potential, and possibilities (MacNaughton et al. 2016). Amidst this backdrop, it is essential to identify the key factors driving GB performance.

1.2 Research Context

The general context for this research is the construction industry in the UAE, which can be further subdivided into infrastructure, residential, office, retail, hospitality, healthcare and leisure (Abbas 2018). In the UAE, numerous infrastructure projects have been initiated as have upgrades of existing infrastructures. Some of the major infrastructure projects in the country include the expansion of the Abu Dhabi Airport completed in 2017; the Abu Dhabi Metro expected to be completed in 2020; Airport Expansion project expected to be completed in 2018; Etihad Railway Network expected to be completed in 2018; and the Dubai Metro expected to be completed in 2030. Residential projects also account for a significant proportion of the building projects in the UAE; however, residential projects in the UAE are declining with considerable investments being channeled towards healthcare, education, and hospitality sectors (Flanders 2016). Residential projects are mostly found in Abu Dhabi and Dubai. Office buildings constitute another important segment of the construction sector in the UAE. Some of the notable office projects in the UAE include the Capital District – Abu Dhabi, expected to be completed in 2030; Renaissance City in Abu Dhabi, expected to be completed in 2020; and Masdar City in Abu Dhabi, expected to be competed in 2025, among others (Flanders 2016). Retail projects are also common in the UAE, which have been fueled by the need to diversify the country’s economy. Dubai is a favorite destination for international retail brands; hence, the demand for increased retail space is driving up investments in retail projects (Flanders 2016). Some of the notable retail projects include the Deira Islands Mall, expected to be completed in 2018; Reem Mall, expected to be completed in 2018; Mall of the World, expected to be completed in 2022;

Yas Island Development, an ongoing project that began in 2006 and continues today; and the Al Futtaim Community Mall to be completed in 2018 (Flanders 2016). Investments in building projects are also being made in the hospitality, healthcare, and leisure sectors in the UAE. Moreover, the construction industry in the UAE is expected to be witnessed considerable growth in the foreseeable future as evident by several oil and gas, utilities, transport, industrial, and urban projects being in tender phases (Flanders 2016). As of June 2017, there were 7,488 building projects underway in the UAE (Abbas 2018).

A notable trend in the UAE construction industry is GB. Over the last decade, there has an increased awareness for GB as well as environment-friendly products/services and building practices in the country (PR Newswire 2016). Several organizations have been established, and regulations and rules created to govern GB (Asif 2016). However, in practice, GB in the UAE construction sector has yet to pick up and the private sector has reluctantly adopted the guidelines developed by the private sector. (PR Newswire 2016) The government has developed eco-standards to help buildings be more efficient and greener to reduce costs and cut the overall GHG emissions in the UAE (Azar & Al Ansari 2017). In the country, buildings consume about 80% of electricity through essential utilities such as air conditioning (Flanders 2016). Despite the considerable energy consumption of buildings in the UAE, the country is gradually but steadily embracing GB practices (Bakar et al. 2015). This is evident by the implementation of decrees mandating urban buildings to comply with eco-friendly GB standards (PR Newswire 2016). In addition, the government of the UAE has continually reviewed its sustainable development objectives including the UAE Energy Plan for 2050, the Dubai Clean Energy Strategy 2050, and the Dubai Integrated Energy Strategy (PR Newswire 2016). All these initiatives act as drivers for embracing green practices in both the private and public sector.

The UAE case has been described as exemplary for the Gulf region to replicate with regard to the implementation of tangible, efficient, and effective GB practices (Abbas 2018). However, a number of priority areas should be emphasized beginning with a solid environmental commitment that is aligned to the strategy and vision of the UAE (Abbas 2018). With support from the government, the private sector has become motivated to embrace and adopt GB practices. The need for awareness of GB in the UAE has also been emphasized (Al Abbar 2017). At the time when the Emirates GB Council was launched in 2006, there was limited dialogue on and awareness of sustainable built environments and GB (Abbas 2018). It was generally believed that moving towards GB would be a costly initiative (Balasubramanian & Shukla 2017). Nevertheless, over time, it is increasingly becoming acknowledged that GB offers long-term benefits and helps secure a sustainable future for the next generations (Flanders 2016). In the UAE, Abbas (2018) emphasizes the importance of benchmarking projects with the aim of evaluating water use and energy efficiency in the same way it was performed in the hospitality industry (Flanders 2016). This will be crucial in understanding the magnitude of the challenge towards the adoption of GBs to facilitate corrective actions (Al Abbar 2017). Additionally, there is the need for promoting investment and innovation in green technologies as a whole (PR Newswire 2016). There are several clean technology start-up companies in the country that have the potential of energizing the sustainable development discourse in the country (Flanders 2016). At the same time, it crucial to note that no universal formula exists for promoting the adoption of GB practices. Moreover, it is essential to recognize and reward different GB practices adopted by product specialists, contractors, and developers in the UAE. Every country experiences unique challenges with respect to promoting GB practices (Abbas 2018; Al Abbar 2017); thus, a comprehensive understanding of factors specific to the UAE is needed when developing initiatives to promote GB.

1.3 Statement of Research

The purpose of this research is to investigate the key drivers influencing the performance of GB in the UAE construction industry and whether these drivers are being changed over time or not. There is vast literature focusing on GBs; however, few research studies have attempted to explore the key GB drivers in the UAE construction sector. Whereas GB has received heightened attention in the recent past, barriers still exist in facilitating its widespread use. Promoting the novel concept of GB requires taking some factors into consideration. Most countries, including the UAE, have already implemented GB guidelines (Green & Haines 2015). Because the advantages of GB have been outlined, it is essential to identify the drivers of GB to help increase the adoption of these practices (PR Newswire 2016). It is also essential to explore the barriers and risks associated with the implementation of GB, especially in UAE where the concept of "going green" is still novel. A quantitative research was executed using the survey methodology with stakeholders in various industry roles including consultants, contractors, and clients among others drawn from government, semi-government, and private organizations. The survey findings provided important insights regarding the applicability of the GB system in the UAE, readiness in understanding GB development in the UAE, development of GB codes, importance of financial attributes associated with GB designs, importance of functional performance drivers affecting GB projects, importance of operational performance attributes associated with GB projects, importance of environmental performance attributes related to GB, and the importance of management performance drivers of GB. Other aspects covered in the survey included beneficial returns of GB systems, implementation of GB evaluation system in the UAE, and ways of increasing public awareness of GB, important factors considered by clients in implementing GB.

1.4 Research Questions

The following are the research question for this research study:

1. What are the characteristics of GB implementation in the UAE?
2. What are the important performance drivers associated with GB designs in the UAE?
3. What can be done to improve GB implementation in the UAE?

1.5 Research Aims and Objectives

1.5.1 Aims

The main aim of this study is identify the key drivers that influence GB in the UAE construction industry. The study also examined whether these drivers are being changed over time or not.

1.5.2 Objectives

To achieve the above aims, the following are the specific objectives of this study:

1. To explore the nature and characteristics of GB implementation in the UAE.
2. To investigate important performance attributes associated with GB practices in the UAE.
3. To recommend ways of improving GB implementation in the UAE.

1.6 Structure of Research

This report is divided into seven chapters. The first chapter provides an introduction into the research including the background, research context, statement of the research, research questions, and research aims and objectives. The second chapter focuses on GB including its historical background worldwide, in Gulf Cooperation Council (GCC), and the UAE and the application of GB within the UAE construction sector. Chapter Three reviews existing literature on GB systems, factors influencing GB performance construction within the UAE, the Al Sa'fat evaluation system, and the UAE global ranking in GB performance. Chapter Four presents the methodology adopted to collect and analyze the data. The aspects covered in this chapter include the research approach, research design and rationale, and the research method process. The results of the research are presented in Chapter Five. Chapter Six discusses the findings of the study. Chapter Seven presents the conclusion and recommendations to enhance GB performance in the UAE.

Chapter 2: Green Building

2.1 Pros and Cons of GB Application

Vast information has been documented regarding the advantages and disadvantages associated with GB practices. GBs offer numerous advantages when compared to conventional buildings. GBs offer an effective approach to accomplishing diverse global goals like eliminating climate change, building sustainable communities, and achieving economic growth (Gou & Xie 2017; Wheeler & Beatley 2014). The advantages of GBs can be categorized into economic, environmental, and social.

GBs provide a wide-range of economic benefits for various parties including users and developers of these buildings. From the perspective users, these type of buildings result in significant cost savings in terms of utility bills, which is primarily attributed to their high water and energy efficiency (World GB Council [WGBC] 2018). GB designs make use of distinctive constructions features in order to promote the efficient resource use leading to low costs for maintenance and operation (Koebel et al. 2015). For instance, by relying primarily on natural light, GBs significantly lower the amount of energy used for lighting, which leads to substantial cost savings on lighting bills (WGBC 2018). Since maintenance costs constitute about 80 percent of the lifetime costs associated with a building, lowering these costs can considerably increase the earnings for owners of buildings (Kibert 2012). Thus, GBs are effective for users.

From the perspective developers, the economic benefits of GBs take the form of reduced costs for construction, higher value for the property, higher rates of occupancy, and reduced operating costs for the owners of buildings (WGBC 2018). The demand for GBs is increasing globally because of the sustainability of their components that reduce the costs of maintaining them. Globally, GB practice are capable of saving about $ 280-410 billion annually in the form of energy-related expenditures (Balasubramanian & Sundarakani 2017). Even through the construction of a GB is likely to be more costly compared to a conventional non-GB, the lower costs for maintenance and operation render these building less costly in the long-term.

GBs also offer numerous environmental benefits. These buildings capable of reducing or eliminating negative environmental impacts through water and energy efficiency (Green & Haines 2015; Kibert 2012; Wheeler & Beatley 2014). They can also result in positive impacts on the environment through the generation of energy and enhancing biodiversity (WGBC 2018). Worldwide, it has been acknowledged that the opportunity to lower GHG emissions is in the constructions sector when compared to other sectors that emit GHG (Green & Haines 2015). The potential for GHG emissions savings in the constructions sector is estimated at about 84 giga-tonnes of carbon dioxide via GB measures such as using renewable energy sources, fuel switching, and energy efficiency (WGBC 2018). As a result, it has been reported that the construction industry is capable of achieving at least 50 percent energy savings by 2050 (WGBC 2018). At the building level, GB practices have been reported to result in significant environmental benefits. For instance, in Australia, the GHG emissions by GBs is 62 percent lower compared to conventional buildings (WGBC 2018). In India, GBs with a certification from the Indian GB Council (IGBC) have been reported to yield 40-50 percent energy savings and 20-30 percent water savings when compared to standard houses (WGBC 2018). In South Africa, it has been reported that Green Star certified buildings save about 30-40 percent carbon emissions and energy and 20-30 percent portable water annually relative regular buildings (WGBC 2018). In the US, energy consumption in LEED certified GBs is 25 percent lower and water consumption is 11 percent lower when compared to conventional buildings (Vierra 2016). These energy savings come from the fact that GB designs strive to lessen reliance on non-renewable energy sources such as using solar panels and designing windows to bring in a lot of natural light (Kibert 2012). Water efficiency is achieved through the use of water resources in such a way that this resource is saved by using alternative water sources like rainwater, lessening water wastage by installing efficient plumbing fixtures, and recycling water (MacNaughton et al. 2016). Therefore, GB designs emphasize water and energy efficiency, which lead to positive effects on the environment.

GBs also offer a myriad of social benefits, which most relate to the wellbeing and health of individuals working in GBs. Empirical evidence shows various benefits offered by GB measures in organizations (WGBC 2018). For instance, employees in organizations having green offices that are ventilated well have showed significant increases in brain function (cognitive scores) and performance improvements due to improved quality of indoor air because of low concentrations of pollutants and carbon dioxide as well as high ventilation rates (WGBC 2018). Improved quality of the indoor environment enhances occupants' health, lessens stress, and improves the overall quality of life (WGBC 2018). Companies with GBs have reported an increase in employee productivity, which stems from the clean air, natural light, and efficient use of energy resources resulting in increased employee productivity (Tam et al. 2017). These companies have also reported improvements in employee attendance following the adoption of GB practices, which is attributed to the positive association that exists between an environment-friendly workplace and employee satisfaction (Tam et al. 2017). Moreover, these organizations have reported that GB projects help in promoting their corporate values as stewards of the environment, which further helps to build their reputation and image (Taleb 2014); thus, contributing to their bottom line.

Along with these aforementioned advantages of GBs, drawbacks also exist. One of the commonly cited drawbacks associated with GBs relates to the high initial costs, which is one of the most prohibitive factors discourages the construction of GBs (AlFaris, Juaidi & Manzano-Agugliaro 2016; Jeaidi & Mezher 2017). Finding environment-friendly construction materials is often difficult, which leads to a higher cost when compared to standard construction materials. In addition, the construction materials for GB need special ordering, which further increases the cost of construction (Giusti & Almoosawi 2017). Essentially, whereas the overall costs of GBs are lower in the long-term compared to standard buildings, the initial construction costs are significant because of the difficulty in finding eco-friendly construction materials. In some instances, these materials have to be imported, which makes them costlier.

Legal, technical, and architectural issues have been raised in GBs. Some GBs have to be designed and developed such that optimal sunlight is let in, which means that they should be positioned facing the opposite direction relative to adjacent buildings (Doan et al. 2017). Two problems arise from such a design. First, such a building would need more shades and blinds when compared to a standard house to prevent the entry of sunrays into the house. Second, such a building may result in problems with neighbors (Juaidi et al. 2016; Jose & Chacko 2017). Legal issues also exist in GB. In some countries and cities, specific laws govern the construction of buildings (Taleb 2014). In some instances, GBs utilize some technologies or materials that are prohibited in these laws, which hinders the construction of GBs in these locations. Another drawback associated with GB is the increased project timeframe (MacNaughton et al. 2016). Because GB designs require the use of recycled materials, finding them might be challenging and require additional time, which leads to an extended time frame for completing GBs when compared to standard buildings (Khalfan et al. 2015). These drawbacks have to be taken into consideration when adopting GB practices.

2.2 Historical Background About GB Worldwide

GB has its origins in prehistoric times where cavemen employed environment-friendly materials and located their dwelling in such a manner that they resonated with the natural landscape (Kibert 2012). Today, the GB movement is only beginning as evident with the steady but the gradual introduction of efficient designs, renewable materials, and solar panels into mainstream building projects (Gharzeldeen & Beheiry 2015). In the future, it is projected that GB will become the norm. Green homes have only been in existence since the 1970s; however, within that time, the green movement has witnessed considerable growth. The GB history goes back further before the 1970s (Green & Haines 2015). During the 19th century, buildings like the Crystal Palace in London and Galleria Vittorio in Milan implemented passive systems such as underground air cooling chambers and roof ventilators for purposing of moderating indoor temperatures (Kibert 2012). During the early 19th century, skyscrapers such as the New York Times Building and the Flatiron Building in New York used deep-set windows for purposes of shading the sun. Moreover, the Rockefeller Center, designed in 1932, incorporated sky gardens and openable windows (Wheeler & Beatley 2014). Other building design elements common in early 19th century buildings included retractable awnings and window shaded. From the 1930s, the urban landscape was transformed by novel building designs and technologies (Wheeler & Beatley 2014). The invention of reflective glass, low-watts fluorescent lighting, structural steel, and air conditioners allowed enclosed steel-and-glass structures to be cooled and heated using massive air conditioning systems due to the availability of cheap fossil energy (Portalatin, Roskoski & Shouse 2015). During this time, there was little concern for environment-friendly building designs because of the abundant supply of fossil energy.

The energy crisis witnessed during the 1970s played a monumental role in giving impetus to the GB movement which questioned traditional building designs (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). The oil crisis was characterized by a surge in oil prices, which led to people questioning the reliance on fossil energy for buildings and transportation (Juaidi et al. 2016). Designers, environmentalists, builders and ecologists were searching for ways to lessen the dependence of home and buildings on fossil energy (Clark 2017). Solar panels emerged as the best environment-friendly solution; however, its adoption was slow because of the significant initial costs. This was followed by efforts aimed at developing less costly and more efficient solar panel, which helped increase the use of solar energy in homes and buildings (Govindan, Shankar & Kannan 2016; Younis, Sundarakani & Vel 2016). In the course of this transition phase, consumers, builders and designers started exploring other options besides solar panels that could be implemented to achieve greener home by reducing energy bills and negative environmental panels. GB emerged as an innovative concept that could help build greener homes beyond just relying on solar panels only (Issa & Al Abbar 2015). The options explored to increase the efficiency of buildings included the use of passive systems like reflective roofing and environment-friendly location of buildings to result in energy savings. Technological solutions like triple-glazed windows were also considered (Keeler & Vaidya 2016). Even with the decline of the energy crisis, the pioneering efforts aimed at conserving energy in buildings remained as evident by the use of daylight auditoriums mirrored windows, and commissioning of energy-sensitive office buildings (Kibert 2012). The 1980s and 90s witnessed additional efforts to make buildings greener. At the global level, Germany experimented with prefabricated energy-efficient wall systems; modular constructions units designed to lessen waster; and water-reclamation systems. In Scandinavia, the governments established requirements for daylight access and installing operable windows in the workplaces (Friess & Rakhshanbabanari 2017). At the same time, in 1987, the UN World Commission on Environment and Development provided a definition of sustainable development, which helped increased interest in sustainability and ways of achieving sustainability (Taleb & Al-Saleh 2015). Over the years, research on GB practices have been conducted to propose several ways of incorporating green design elements in buildings.

Today, GB is still a novel concept having been in existence only for about four decades characterized slow adoption. However, it seems the growth of the movement is inevitable since consumers are more interested in having cleaner, safer, and environment-friendly buildings (Medineckiene, Zavadskas, Björk, & Turskis 2015). GB is one of the design concepts that is growing fast evidenced by homeowners, architects, and designers showing interest in ways of saving costs, giving buildings a modern look, and designing building that resonate with the natural environment. Moreover, they are focusing on reducing long-term costs associated with maintaining and operating buildings. The WGBC was established in 2002 as the global educator and leader of GB practices (Qin, Mo & Jing 2016). Given this trend, it is expected that GB practices will continue to be embraced in the future.

2.3 Historical Background about GB in GCC

The concept of GB in the Gulf region would appear a peculiarity due to the abundant supply of gas and oil in the region, which forms the economic backbone of these countries (Abbas 2018). However, energy use attitudes are gradually changing in the Gulf region (Saleh & Alalouch 2015). People in the Gulf countries are increasingly acknowledging that the apparently limitless supply of fossil energy will eventually become depleted; hence, sustainability is an assured path for these countries (Sayigh 2016). Buildings appear are the ideal place to initiate the path towards sustainability in these countries. In the GCC countries, 70 percent of energy is used in buildings, which is higher compared to global average of 40 percent (Khalfan et al. 2015). This high-energy consumption in buildings is attributed to the increase in glass skyscrapers coupled with the extremely hot climate.

The GCC countries joined the GB movement late and lags behind other countries in Asia, Europe, and the US with respect to constructing buildings with higher energy- and water efficiency (Al Abbar 2017). However, the GCC is among the leaders in constructing buildings that are striving to achieve the Leadership in Energy and Environmental Design (LEED) (Flanders 2016). LEED is a certification program developed by the US GB Council (USGBC), which is used to internationally for certifying GBs. GCC countries boast of at least 1350 LEED-registered buildings (Gharzeldeen & Beheiry 2015). In the recent years, GCC countries have focused their attention on driving sustainable building practices, which is primarily seen on novel buildings instead of embarking on retrofitting existing buildings.

In all the Gulf countries, the International Trade Administration (2016) reports that there is a heightened interest in enhancing the environmental performance of buildings in terms of water conservation and energy efficiency (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). For some countries in this region, building construction efficiency and environmental sustainability have been incorporated into their priorities of the government aimed at the diversification of the economy and cutting dependence on oil, creating jobs, and promoting local manufacturing (ITA 2016). Whereas the countries have adopted different approaches to achieving sustainability in built environments, they are showing interest in ensuring that they align their initiatives (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). One of such aspects that are aligned among these countries involves the development of a regional GB code to specify the minimum threshold requirements needed to achieve water efficiency and energy efficiency, improve the quality indoor air as well as other aspects associated with the environmental performance of buildings (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). Although the development of a regional GB code is still ongoing, the fact that these countries are interested in developing a coordinated GB code signals a bright future for GB in the region and addressing the intricate navigational challenges in GB.

Several GB projects are currently underway and some have already been completed in the Gulf region. For instance, Dubai has a green shopping mall and environment-friendly mosque – one of the first in the region (Friess & Rakhshanbabanari 2017). In the outskirts of Abu Dhabi, the Masdar Institute is constructing a green city expected to be powered by renewable sources of energy. Besides UAE, Saudi Arabia and Qatar seem to be more ambitious in terms of adopting GB (Issa & Al Abbar 2015). In Doha, Qatar's capital, a GB project initiated in 2010 was billed as the largest sustainable community in the globe having more than 100 GBs (Sayigh 2016). Lusail City, in Doha, has also planned a green project development to accommodate about 200,000 people (Al Abbar 2017). This development is based on the GB guidelines in the country, which is the same as those implemented other Gulf nations. Authorities in Saudi Arabia are seeking to ensure that the King Abdullah Financial District is LEED-certified (Al Abbar 2017). The King Abdullah University of Science and Technology employs GB practices including water recycling and consumes 27% less energy when compared to an average campus (Jeaidi & Mezher 2017). The majority of the GBs in the GCC countries depend on 21st century solutions for lessening their carbon footprint such as high-tech computer systems to ration power and electricity, thicker glass and extra insulation to lower heat entering the building, structurally positioning the building to lessen exposure to the sun (Flanders 2016).

2.4 Historical Background about GB in UAE

Globally, sustainability has been an important issue for decades. However, in the UAE, the concept of sustainability has only become popular recently with country looking forward towards establishing a greener future (AlFaris, Juaidi & Manzano-Agugliaro 2016). Because of the realization that fossil energy is bound to be depleted, the UAE government has been keen on transforming its economy into an eco-friendly one. About 74 percent of the ecological footprint of the UAE emanates from the GHG emissions coming from energy generation, fossil fuel burning, and the operations of inefficient buildings (AlFaris, Juaidi & Manzano-Agugliaro 2016). As a result, the government is committed to reducing its GHG emissions by adopting several initiatives one of them being promoting GB practices in the country (Azar & Al Ansari 2017; Kibert 2012). Currently, UAE performs exceptionally well with regard to the implementation of rating standards for sustainable buildings for new construction projects. The UAE has also adopted its specific rating standard, which takes into consideration the cultural, economic, environmental and regional factors unique to the country (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). Nevertheless, efforts aimed at developing codes, implementing frameworks and criteria for retrofitting building to enhance the energy efficiency of existing building is still under development.

The industrial sector in the UAE is relatively small; therefore, existing buildings consume the bulk of the electricity generated in the country (about 60 percent) (Friess & Rakhshanbabanari 2017). From this fact, it can be seen that an opportunity exists in the UAE to improve energy efficiency in the construction sector (Asif 2016). Just like other GCC countries, the UAE is a late entrant into the GB bandwagon; as a result, the fraction of energy-efficient building projects is only beginning to burgeon (Clark 2017). The various emirates have adopted regulations and policies aimed at stimulating the uptake of energy-efficient building projects. Presently, the efforts used in the country to minimize energy use in buildings include performing energy audits and subsequent energy-efficient retrofitting projects (AlFaris, Juaidi & Manzano-Agugliaro 2016). These initiatives have played an integral role in helping owners of buildings to minimize the carbon footprint of their structures while at the same time resulting in significant cost savings for both tenants and the owners.

Several milestone events can be used to illustrate the history of GB in the country. One of these important milestones is the establishment of the Emirates GB Council (Emirates GBC), which was created in 2006 to advance GB principles aimed at conserving the environment and promoting sustainability in the country (Sichali & Banda 2017). The Emirates GBC has formed a taskforce consisting of industry experts who are charged with identifying the challenges and barriers to the implementation of GB practices in the UAE and proposing approaches for dealing with the identified challenges (Gharzeldeen & Beheiry 2015). In addition, the Emirates GBC is in the process of publishing retrofitting technical guidelines that complement the current GC regulations and rating systems used in the country (Jeaidi & Mezher 2017). In 2014, the Government's National Agenda 2021 acted as the umbrella initiative for all sustainability projects (AlFaris, Juaidi & Manzano-Agugliaro 2016). This program is aimed at promoting sustainable infrastructure and environment in the country. Because of its efforts in GB, the UAE has emerged as the leader in GB solutions among the GCC countries, being home to about 66 percent of the LEED-certified building projects (Koebel et al. 2015). In addition, the UAE is a leader in the Gulf region with respect to the implementation of unified building codes targeting novel construction projects (Issa & Al Abbar 2015). Therefore, it can be noticed that although GB is still in its infancy stages in UAE, the country has made significant strides towards enhancing the sustainability of its building projects.

2.5 Main Values, Culture or Policies Underpinning any Organizations to Apply GB Systems

Vast research has been conducted focusing on delineating the organizational values, culture and policies associated with sustainability including GB systems. Recently, corporate sustainability has become an important aspect of doing business (Giusti & Almoosawi 2017). Organizations that focus exclusively on making profits are no longer held in high regard by the public and other stakeholders; instead, people want organizations to be involved in sustainability initiatives. Surveys indicate that an increasing number of organizations are becoming aware of this trend and are incorporating sustainability in their strategies (AlFaris, Abu-Hijleh & Abdul-Ameer 2016; Green & Haines 2015). Empirical evidence shows that organizations that value sustainability in their operations outshine their rivals that do not incorporate sustainability in their strategies in terms of financial metrics such as return on equity and return on assets (Issa & Al Abbar 2015). From these comparisons, it can be inferred that high sustainability companies implementing GB practices are likely to exhibit higher organizational performance when compared to those that place little emphasis on GB.

One of the main aspects of organizational culture that underpins the application of GB systems is organizational and leadership commitment to sustainability (Issa & Al Abbar 2015). According to Asif (2016), the top leadership in an organization are capable of creating an organizational-wide vision to build a sustainable organization, which then creates a conducive environment for adopting GB practices and policies. The aspects of leadership commitment associated with sustainability have been vastly examined in the literature (Gou & Xie 2017). Data shows the differences between leaders of sustainable organizations and non-sustainable organizations. First, in sustainable organizations, the top leadership adopt a long-term perspective when making decisions (O'Neill & Gibbs 2014). Such leaders believe that sustainability goals cannot be achieved in the short-term and require substantial time before the benefits of sustainability to be realized. In addition, leaders of sustainable organizations tend to be knowledgeable on various sustainability issues and understand the business effects associated with making sustainability an important part of the organization's strategy (Qin, Mo & Jing 2016; Zuo & Zhao 2014). Moreover, these leaders exhibit a personal commitment towards sustainability, which in turn create a culture of sustainability within the organization. Because of leadership commitment towards sustainability, such organizations are more likely to adopt GB practices.

Another important organizational aspect with applying GB practices is external engagement (Clark 2017). Various authors agree that organizations that are bent on sustainability are aware of the significance of engaging external stakeholders. Sustainable organizations are keen to learn from external sources and collaborate with outside agents to devise innovative solutions to their problems as well as broader societal problems as a whole (Saleh & Alalouch 2015). It is widely acknowledged that organizations cannot achieve sustainability goals and objectives on their own. Instead, these organizations exchange best practices on sustainability such as ways of applying GB.

Another important aspect associated organizational application of sustainability entail embedding environmental sustainability in the charters and mission statement of the organization (Tam et al. 2017). By adopting such an approach, environment stewardship is institutionalized within the organization; thus, the organization is incentivized to adopt ways of demonstrating environmental responsibility such as by applying GB practices (Jeaidi & Mezher 2017). Moreover, organizations that acknowledge the long-term environmental impacts into their strategic planning processes are likely to apply GB practices. In this respect, these organizations strive to ensure that their operations and processes have minimal negative impacts on the environment (Medineckiene et al. 2015). By adopting these business practices, such organization strive to ensure that they are the best in the industry with respect to environmental stewardship.

2.6 Application of GB Systems within the Construction Industry in UAE

Among the countries in the Gulf region, the level of economic diversification in the UAE is the highest (Abbas 2018). Also, the government has continued to focus its efforts on promoting services, construction, and manufacturing in order to diversify economic activities from the gas and oil sector that currently dominate the country’s economy (ITA 2016). The constructions sector in the UAE is project to demonstrate a yearly growth rate of 6.5% up through 2019 due to the vast investments in energy projects, residential projects, commercial projects, and infrastructure.

The two leading emirates – Dubai and Abu Dhabi – have been at the forefront in applying GB systems. For instance, the Urban Planning System in Abu Dhabi has adopted the Pearl Rating System (PRS) to help in supporting its sustainability initiative known as Estidama (ITA 2016). The PRS ranks the sustainability of various building projects including villa homes, buildings, and residential projects (Asif 2016). This system takes into consideration the sustainability of the various building project phases starting from the design phase to the operation of the building and particularly focuses on how these buildings use energy in air condition in a climate that is hot and dry characterized by infrequent rain and water scarcity (ITA

2016). This system outlines the requirement and guidelines as well as the five likely certifications. In Dubai, the municipality adopted the GBRS, enacted in 2012 and targeting public and private buildings in the emirate (Ameen, Mourshed & Li 2015). While the GBRS does not represent a rating system, it denotes a written code comprising of green methods and features that should be satisfied when designing buildings and be implemented during the construction phase (Green & Haines 2015). The GBRS comprises the best international GB practices and standards that have been tailored to match the local conditions in the emirate (Gou & Xie 2017). The goal of the GBRS is to enhance the environmental performance of buildings through lessening the use of materials, water and energy; enhancing the general welfare, safety, and health of the public; and improving how buildings are designed, constructed, and operated (ITA 2016). The World Expo 2020, which Dubai will host, that is themed on sustainability, which is expected to solidify Dubai's emphasis on sustainability and GB practices.

GP practices in UAE are commonly applied in schools, hospitals, and government buildings (Clark 2017). Other sectors where GB practices are commonly applied in the country include novel commercial buildings (hotels, offices, and retail) as well as community projects. Due to the booming construction of new buildings in the country, retrofitting is not a common practice in the country with the exception of buildings that are undergoing extension and renovation (ITA 2016). However, the issue of retrofitting gained considerable attention following a fire accident that occurred in 2015 at Address Hotel located in Dubai (Asif 2016).

In the MENA region, the lion's share of GBs (65%) are found in the UAE (Al Abbar 2017). The construction companies in this country have strongly adopted GB practices. Moreover, in the MENA region, construction companies in the UAE constitute the early adopters of GB practices (Al Abbar 2017). Currently, more than 50% of continuing building projects in the country are green (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). Essentially, the high level of GB application in the UAE has been attributed to government regulations and policies related to GB (ITA 2016). One of these policies make it mandatory for all government buildings to green, which acts as an incentive for applying GB practices in the private sector.

2.6.1 The Need for GB in UAE

The increased emphasis on sustainability marks one of the visible trends in the building sector in UAE. This trend emanates from the need for the country to diversify its economy and cut on the reliance on oil and gas (Ameen, Mourshed & Li 2015). The UAE government seeks to create a sustainable economy focusing on the management of energy on the demand side and achieving efficiency in the use of energy and water, which have played an instrumental role on encouraging builders to align their practices to help in the achievement of these goals (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). As a result, significant contributions have been made with respect to the quality of indoor air, renewable energy, sustainable materials for construction, and energy efficiency (Smart Market Report 2013). The government has articulated clear targets to support the achievement of sustainable development such as reducing the consumption of water and energy by 30% and increasing the fraction of solar energy in the country's energy mix by 2030 (Younis, Sundarakani & Vel 2016). Emirates such as Dubai have developed their own sustainable development targets that are driving builders to adopt GB practices. For instance, Dubai has adopted the Clean Energy Strategy (CES) that aims at achieving 75% clean energy by 2050 (Al Abbar 2017). The federal government has expressed the need to achieve 50% clean energy in its energy mix by 2050 and waste treatment of 75% by 2021 (Al Abbar 2017). Given the explicit guidelines that have been established by the local and federal government, the building industry in the country has heightened its interest in sustainable building in order to comply with the regulations governing GBs like the Estidama PRS system in Abu Dhabi and the GBRS in Dubai (Ameen, Mourshed & Li 2015). As a result, major developers in the country are focusing their efforts on enhancing their buildings' energy performance via applying best practices, property benchmarking, and creating strategies aimed at enhancing efficiency in buildings (Balasubramanian & Shukla 2017). As a result, best practices in GB are being implemented in all stages of building projects commencing from the design phase up to the construction phase, in both commercial and residential projects with the aim of enhancing efficiency and lessen the carbon footprint associated with buildings (Tam et al. 2017). Essentially, the need for GB in UAE stems from the sustainable development goals adopted by the government, which is compelling stakeholders in the buildings sector to employ best practices that are aligned with the goals of the government.

2.6.2 Available Assessment Systems (Globally)

Certification and rating systems are needed to determine the extent to which a building can be considered green (Vierra 2016). In essence, these systems report the environmental soundness of a building by clarifying the green components included in the building as well as the sustainability practices and principles used in designing, constructing, operating, and maintaining a building (Green & Haines 2015). Several rating systems for GB exist, with each having its own strengths and weaknesses based on the particulars of a building (Portalatin, Roskoski & Shouse 2015). One of the most commonly used GB rating system is the LEED, which has been developed by the USGBC. It is commonly used for assessing commercial buildings (Issa & Al Abbar 2015). The LEED rating system comprises numerous categories relevant to various aspects in the life-cycle of a building (Vierra 2016). The components captured in this rating system include design and innovation, education and awareness, regional priorities and issues, use of innovation and technology, building location, quality of lighting and indoor air, sustainability in the using and transporting materials, consumption of energy and water, and impacts of the building on the ecosystem (Portalatin, Roskoski & Shouse 2015). Although the LEED system was developed in the US, this rating system can be adapted to meet the local requirements. Several countries including Spain, Philippines, India, Canada, China, and Brazil have adapted this rating system that is regulated by the GBC within their respective countries (Portalatin, Roskoski & Shouse 2015).

Another commonly used GB rating system globally is the Green Globes, which represented a web-based interact GB assessment tool developed by the GBs Institute (BGI). This rating system is a do-it-yourself tool that offers instant feedback regarding the weaknesses and strengths of the building (Portalatin, Roskoski & Shouse 2015). The Green Globes system is used in the UK, US and Canada for both existing and new buildings although its use is not restricted to these countries. The categories captured in this assessment system include the comfort of occupants and air emissions; use of low impact materials and systems; water performance; the development area; environment-friendly purchasing; and energy efficiency/reduction (Portalatin, Roskoski & Shouse 2015). The Green Globes places considerable emphasis on reducing energy consumption and incorporating energy-efficient systems in buildings. Also, this assessment tool incorporates life-cycle assessment (LCA), which measures the effects of the building materials in the course of the building's lifetime (Portalatin, Roskoski & Shouse 2015; Vierra 2016). This rating system is less common when compared to the LEED; however, it is less costly, which makes it appealing to low budget building project projects.

The ENERY STAR is another GB rating system commonly used. It was developed through a collaborative effort involving the US Department of Energy (DEO) and the Environmental Protection Agency (Vierra 2016). The ENERGY STAR was created for existing buildings and is offered as a free web-based tool that places emphasis on a building's energy performance. This rating system does not consider the effects of other factors such as recycling, quality of indoor air, and materials (Portalatin, Roskoski & Shouse 2015). Instead, it benchmarks a building's energy performance to the national average of similar buildings.

Another popular GB rating system is the Building Research Establishment Environmental Assessment Method (BREEAM), which evaluates eight key categories relating to environmental effects. These include water, transport, pollution, materials, management, ecology and use of land, wellbeing and health, and energy (Portalatin, Roskoski & Shouse 2015). Most of these categories take into consideration issues such as the building's impact on ecology; recycling and using materials responsibly; management of water and energy; reducing carbon dioxide; occupant control; and policies for maintaining and operating the building. BREEAM is primarily used in the UK (Portalatin, Roskoski & Shouse 2015); however, other countries are permitted to customize this system or utilize the BREEAM International system for certifying GBs. Netherlands and Spain have customized their BREEAM versions.

Globally, there several other GB certification and rating systems. While they are not popular globally, they are influential in the just emerging concept of GB (Vierra 2016). Examples include the Building Environment Assessment Method (BEAM) developed by the Hong Kong BEAM society; the Ecology, Energy Saving, Waste Reduction and Health (EEHW)developed by the Architecture Research Institute in Taiwan; the GB Certification System (GBCS) developed by the Korean Ministry of Land, Transport, and Maritime Affairs; the

Comprehensive Assessment System for Built Environment (CASBEE) created by the Sustainable Building Consortium in Japan; and the Green Star Australia among others (Portalatin, Roskoski & Shouse 2015). The use of these standards these standards are mostly limited to the countries of the institutions that developed them.

2.6.3 Al Sa’fat System and Other Available Systems in UAE

Al Sa’fat is the most popular GB rating system in the UAE developed by the Dubai Municipality (AlFaris, Juaidi & Manzano-Agugliaro 2016). Sa’fat is a traditional Arabic technique that involves using palm fronds roofing to cool home interiors. Sa’fat was likened to a construction symbol that represents caring for the environment (Jeaidi & Mezher 2017). The Al Sa’fat GB rating system has the main goals of reducing the use of electricity by 20%, reducing the use of water by 15%, reducing carbon emissions by 20%, and reducing waste by 50% (Al Abbar 2017). This rating system was implemented to increase the buildings’ performance with respect environmental and human health through enhancing the phases of planning, designing, constructing, and maintaining buildings (Koebel et al. 2015). The core objectives associated with the adoption of this rating system include accelerating the realization of sustainable development in Dubai and making Dubai a healthy city characterized by the highest sustainable development standards achieved via continually reducing the use of energy, conserving water resources, and protecting the environment (Friess & Rakhshanbabanari 2017). This is geared towards helping Dubai boost its competitiveness and emerge as a leader as regards matters sustainable development. The Al Sa’fat rating system brings together the practices and standards that can be implemented in the course of the lifecycle of a building with an emphasis on enhancing efficiency, reducing the utilization of energy and water, using materials that are environment-friendly, and talking advantage of renewable and alternative energy (Taleb & Al-Saleh 2015). In addition, since this rating system evaluates buildings beginning from the design phase, its implementation will help to generally lower the negative effects of buildings to the environment (Saleh & Alalouch 2015). It has been projected that the implementation of this rating system will result in energy savings of 34% when compared to the energy that buildings are currently consuming (Younis, Sundarakani & Vel 2016).

Another commonly used rating system for GBs in the Estidama PRS developed by the Urban Planning Council (UPC) in Abu Dhabi to help in the realization of the city's sustainable development program dubbed Estidama (Ameen, Mourshed & Li 2015). In Arabic, *estidama* is a word for sustainability. Abu Dhabi's UPC implemented a sustainability initiative to help realize the vision of the late Sheikh Zayed bin Sultan Al Nahyan, associated with visionary governance together with responsible development (Jeaidi & Mezher 2017). Estidama has the primary objective of preserving and enriching the cultural and physical identity of Abu Dhabi as well improving the residents' quality of life (Khalfan et al. 2015). The PRS was implemented to support the realization of the Estidama initiative.

The PRS represents a framework that promotes sustainability when designing, constructing, and operating villas, communities, and buildings (Al Abbar 2017). This rating system has been described as being unique because it has been particularly tailored to fit Abu Dhabi's arid environment and the hot climate (Friess & Rakhshanbabanari 2017). The PRS also considers Abu Dhabi's cultural and social values and traditions. This system was developed to ensure sustainability in various phases of a development project from the design phase to the construction phases (Ceylan 2010; Portalatin, Roskoski & Shouse 2015). It also emphasizes operational accountability in order for the performance of a building to be determined. The PRS also offers requirements and guidelines for rating the performance of a building project with respect to four Estidama pillars including cultural, social, economic, and environmental sustainability (Al Abbar 2017). This system consists of seven optional and mandatory categories. Achieving a Pearl 1 Rating requires developers to meet all the credit requirements that are compulsory. Higher Pearl (2-5) Ratings can be achieved by meeting all the credit requirements that are mandatory together with the minimum credit points (Juaidi et al. 2016). For new building projects to be approved, a Pearl 1 Rating is a must (Azar & Al Ansari 2017). Government buildings are required to have a Pearl 2 rating and above.

The PRS was implemented to encourage sustainable buildings to be developed in Abu Dhabi and enhance the quality of life (Issa & Al Abbar 2015). According to this system, achieving sustainable buildings needs integrating the aforementioned four Estidama pillars together with an interdisciplinary and collaborative building approach referred to as the Integrated Development Process (IDP) (Clark 2017). The key aspects emphasized in this GB rating system include the minimization of waste, reducing the use of energy and water, using locally available materials, and improving the supply chains of recycled and sustainable building materials.

The PRS has been praised as a groundbreaking approach for assessing the environmental soundness of buildings since it was integrated into Abu Dhabi's permit process and the building code (Ameen, Mourshed & Li 2015). Moreover, it was tailored to fit the region and continually assesses the performance of a building even after it has been commissioned. Despite these advantages, it is still surprising that some property developers in the UAE are opting for the LEED rating system, which is effective and suited for the building environment in the US (Khalfan et al. 2015). However, its usefulness in the UAE has been questioned because of the significant differences between the building style and conventions in the Western world compared to the UAE. Essentially, the PRS addresses regional differences and the loopholes found in LEED.

2.6.4 Response of End-users/Clients/Consultants/Contractors to GB Implementation

Attitudes and perceptions of GB implementation have been studied widely among consumers and construction companies/developers (Doan et al. 2017). There is overwhelming evidence showing that consumers are receptive to sustainability including GB implementation. This is primarily attributed to the fact that consumers are increasingly embracing greener lifestyles. Moreover, they are becoming increasingly committed to living sustainably (Jose & Chacko 2017). Numerous indicators exist to show that consumers have favorable views towards sustainability initiatives including GB implementation. For instance, surveys have consistently indicated that consumers are willing to purchase from companies that demonstrate commitment to environment sustainability (Khalfan et al. 2015). A global survey conducted dubbed the Rep Trak reported that about 73% of consumers surveyed indicated that they are willing to purchase from companies that are involved in various sustainability initiatives such as sustainable buildings, low consumption of energy, and use of recycling (Neff, Spiker & Truant 2015). The same consumers indicated poor attitudes and perceptions of companies that are not committed to sustainability. Another global research survey showed that more than 75 percent of consumers are purchasing green products including GBs (Juaidi et al. 2016). In fact, these consumers indicated that they are prepared to pay more for green products (Juaidi et al. 2016). These findings seem to suggest that GBs, GB practices and certifications are favorably received by consumers/end-users globally.

From the supply side (in particular, consultants and contractors), evidence suggests that GB practices are favorably received in various countries across the globe. For instance, in

Zambia, a quantitative survey conducted by Sichali and Banda (2017) with building professionals revealed a favorable attitude towards GB practices and methods. The survey reported a heightened interest in GB practices among building professionals in the country (Sichali & Banda 2017). Similar findings have been reported in the Russian construction sector. Ceylan (2010) conducted a survey to investigate the attitudes of Russian contractors towards GB practices and methods. The findings of their survey indicated that a high level of awareness in GB practices among Russian contractors. The study further showed that all of the contractors who participated in the survey had no qualms with the BREEAM requirements used in the country (Ceylan 2010). In addition, the contractors surveyed believed that GB practices and methods are feasible and expressed confidence that the BREAM certification system was an effective to help control the negative impacts of buildings on the environment (Ceylan 2010). In general, the researchers concluded that contractors in Russia were optimistic regarding the potential of GB practices in helping deal with a myriad of environmental problems affecting the country. Similar findings were noted among Australian contractors in a survey conducted by Khalfan et al., (2015). The researchers indicated a positive attitude towards GB among Australian contractors as well as high awareness level regarding the aspects associated with sustainable building practices (Khalfan et al. 2015). The majority of the contractors who participated in the survey reported using GB practices and had favorable attitudes towards the utilization of effective management of waste and using recycled building materials (Khalfan et al. 2015). The contractors further acknowledged the benefits associated with GB design and claimed that incorporating GB practices helped to make them more competitive. In the UAE, there is currently a total lack of published research on the attitudes of contractor and consultants towards sustainable building practices. However, anecdotal evidence exists to show that GB practices have been favorably received on the supply side of the construction sector. For instance, Majid Al Futtaim of the Emirates GBC received the “Developer of the Year” Award for engaging in sustainable practices in their building projects (Al Abbar 2017). Moreover, there is an increased interest in GB among developers and consumers alike (Al Abbar 2017). In general, it can be seen that GB implementation has been favorably received both internationally and in the UAE.

Chapter 3: Literature Review

3.1 GB Systems

Several related definitions of what makes up GB have been suggested by various institutions and authors. For instance, according to the US Office of the Federal Environment Executive, GB is defined in terms of a practice, which focuses on enhancing the efficiency of buildings and the building sites in terms of the use of materials, water, and energy and lessening the impacts of a building on the environment and human health through improved siting consideration, designing, constructing, operating and demolishing the building - all of which make up the life-cycle of a building (Kibert 2012). Another definition of GB is provided by the US Environmental Protection Agency, which also views GB as a form of building practice that entails developing structures using resource-efficient and environment-friendly processes in the course of the lifecycle of a building when it is designed, constructed, operated, maintained, renovated, and then demolished (Kibert 2012). The EPA emphasis that the GB practice serves to complement and expand the classical building design considerations of comfort, durability, utility, and economy. The WGBC defined GB as a building rather than a practice which is characterized by reduced negative impacts and increased positive effects on the natural environment and climate in the course of development phases including design, construction, and operation (Kibert 2012). The WGBC outlined essential features that GB must have including efficient resource use (energy and water); using renewable energy; measures to reduce waste and pollution and facilitate recycling and re-use; good quality of indoor air; using non-toxic and sustainable building materials; taking into account the environment when designing, constructing, and operating the building; considering the quality of life of the people who occupy the building; and the ability of the building to adapt to changes in the environment (WGBC

2018). Some authors consider GB to be form of architectural movement that is seeking to create structures that are friendly to the environment as well as occupants by considering aspects such as healthfulness, energy efficiency, and sustainability of the building (Green & Haines 2015; Wheeler & Beatley 2014).

The key aspects of GB that have been consistently emphasized in these definitions include environmental responsibility, resource-efficiency, and lifecycle assessment (LCA) (O'Neill & Gibbs 2014). Environmental responsibility means that GB, both as a practice, process or structure, should strive to minimize detrimental impacts on the environment and increase positive impacts on the same. Resource efficiency requires building to minimize the use of resources such water, energy, and other resources (Keeler & Vaidya 2016). LCA emphasizes evaluating the social, economic, and environmental impacts (O'Neill & Gibbs 2014). In the GB context, LCA is concerned with evaluating the impacts of building during the lifetime and considers the environmental effects, the energy used, the generation of solid waste, carbon footprint, and water and air pollution emanating from the building.

It is imperative to note that although buildings can have several green aspects, they do not fall into the category of GBs if they fail to incorporate means of achieving energy efficiency. Some authors argue that the phrase "GB" is somewhat broad and vague; hence, they prefer using the phrase "high performance building" to represent buildings with a significantly higher environmental performance and energy efficiency when compared to standard buildings (Wheeler & Beatley 2014). Whereas GBs utilize less energy than traditional buildings on average, achieving energy efficiency is something that is still elusive (Saleh & Alalouch 2015). There are various ways that be used to enhance the energy efficiency of buildings; thus, it can be stated that a building that lacks energy efficiency does not merit to be referred to as a GB system.

GBs denote the next stage in building approaches; however, most of the existing buildings fail to satisfy the green criteria and that these buildings are expected to be operational for several years in the future (Khalfan et al. 2015). The energy efficiency of these buildings can be enhanced through the retrofitting processes. The GB system seeks to address several problems associated with existing buildings including huge energy consumption stemming from the use of heating, ventilation, and air conditioning (HVAC) systems and electric lighting; pollution of indoor air an GHG emissions due to buildings' reliance on fossil energy; high consumption of water resources; massive land use; use of vast construction materials; vast waste emanating from constructing, operating, and demolishing buildings (Smart Market Report 2013).

3.2 GB Design Characteristics

Although GB design characteristics are continually evolving and might vary between regions, the core principles guiding GB design practices are consistent. The first important characteristic of GB design is LCA, which is needed to prevent builders from having a narrow perspective regarding the economic, social, and environmental issues by comprehensively evaluating the impacts of a building through the various project stages (Giusti & Almoosawi 2017). GB design is gradually shifting from a prescriptive approach typified by assuming the effectiveness of particular practices in mitigating negative environmental impacts towards actually evaluating the performance of the building using LCA (Kibert 2012). Whereas the LCA uses the ideal method for evaluating the environmental impacts associated with buildings, its requirements in various GB codes and rating systems are not consistent regardless of the importance of considering life-cycle impacts in designing environmentally sound buildings.

The second important characteristic of GB design relates to efficiency in the siting (building's location) and the design of the structure. In any building project, the design phase is the most important that affects the performance as well as the cost of a building (Issa & Al Abbar 2015). In the design of GBs, the aim is to lessen the overall environmental effect stemming all life-cycle phases of the building (Khalfan et al. 2015). The process of developing buildings is a complex one because the different materials used and different design variables that should be taken into consideration. In GB design, any factor that might have an impact on the environment should be taken into consideration (Portalatin, Roskoski & Shouse 2015). Equally important in the design of GBs is the need to ensure that the structure synchronizes with the adjacent natural environment to lessen the impacts on the environment.

Another critical aspect of GB design is energy efficiency. As mentioned earlier, despite having green features, failing to incorporate measures to achieve energy efficiency renders the building non-green (Jeaidi & Mezher 2017). Therefore, in designing GBs, it is crucial that measures aimed at lessening energy use be considered. It is essential to consider the energy used in extracting, processing, transporting and installing the building materials as well as the energy used in operating the building (O'Neill & Gibbs 2014). Several design aspects can be incorporated in GB such as reducing the air the leaks via the building's envelope; using additional insulation in floors, ceilings, and walls; and using high-performance windows. Other designs that can be used to achieve energy efficiency include effectively placing windows to maximize daylight, orienting walls and windows; and solar passive design among others (Gou & Xie 2017). Essentially, there are many design approaches that could be incorporated to enhance the energy efficiency of buildings.

Water efficiency is another important design characteristic of GBs. One of the core goals of GB is to reduce the use of water and safeguard its quality (Green & Haines 2015). Nevertheless, a key problem associated with water use is that the demand for water often surpasses supply. As a result, GB design advocates for designing buildings that depend of on-site collection, use, purification, and re-use of water resources. Various design approaches can be used to protect and conserve water in the course of a building's life cycle (Flanders 2016). One of such design considerations entails using dual plumbing for recycling water. In addition, waste water can be reduced by incorporating water conserving fixtures in the building like low-flow shower heads and toilets with ultra-low flow (Gou & Xie 2017). Water quality in buildings can also be improved by implementing water treatment systems. On site, usage of grey-water can contribute to the overall water sustainability.

The efficiency of materials is yet another crucial characteristic of GBs. Construction materials for GBs is often comprised of renewable resources and have lower impacts on the environment (Al Abbar 2017). Moreover, GB materials lead to lower costs of maintenance and operating costs in the building's life-cycle, lower the energy consumed, and enhance the productivity and health of the occupants (Portalatin, Roskoski & Shouse 2015). Sustainable construction materials can be identified by assessing various characteristics such as local production, longevity, durability, recyclability, renewable materials that are harvested rapidly, low levels of toxicity, materials with low GHG emissions, and made using recycled content (Vierra 2016).

The quality of the indoor environment is also an important design consideration for GBs, which is needed to ensure the productivity, wellbeing, and the comfort of the buildings' occupants (Portalatin, Roskoski & Shouse 2015). The aspects of the indoor environment that should be considered include the quality of lighting, thermal quality, and the quality of indoor air. Thermal quality of a building in GBs are enhanced using well-designed envelopes. Integrating electrical light and day lighting helps to enhance the lighting quality of GBs

(Flanders 2016). Regarding the quality of indoor air, GBs are designed such that volatile organic compounds and impurities in the air are minimized. GBs depend primarily on ventilation systems that are well designed such that they offer sufficient ventilation. During the designing and construction phases, using interior finishing products and building materials having low VOC emissions can help enhance the quality of indoor air (Green & Haines 2015). An essential aspect in the quality of indoor air relates to moisture accumulation, which leads to the growth of mold as well creating an environment for bacteria to grow. This should be minimized when engaging in GB projects by minimizing the intrusion of water via the envelope of the building (Keeler & Vaidya 2016). In this regard, GB design can incorporate effective insulation coupled with tight sealing of the envelope to lessen moisture issues.

Another important characteristic of GB design is waste reduction. At the core of GB design is the need to reduce the waste of materials, water and energy during the building's life-cycle (Ameen, Mourshed & Li 2015). In the course of construction, GB design seeks to abate the waste amount being challenged in landfills. GBs are also designed to lessen the quantity of waste that the occupants generate through the provision of on site solutions like compost bins, which help in reducing landfill waste (Wheeler & Beatley 2014). Another GB design aspect used for reducing waste is the use of wood recycling. After the useful life of a building has ended, it is often destroyed, after which the waste materials is moved to landfills. GB design employs a concept referred to as deconstruction, which entails harvesting materials from the demolished buildings for use in constructing other building (Wheeler & Beatley 2014). Moreover, GBs are designed in such a way that their useful can be extended to minimize waste. This is done by using building materials that facilitate the renovation process. Other GB design characteristics for reducing waste include reusing greywater; incorporating rainwater collectors; and using biogas systems among others (Giusti & Almoosawi 2017).

3.3 Factors Influencing GB Performance within Construction in UAE

The GB performance in the UAE construction sector is influenced by numerous factors, including financial performance, functional performance, operational performance, environmental performance, and management performance attributes. These are covered in the following subsections.

3.3.1 Financial Performance Attributes

The economic benefits of GBs have been documented in the literature including improving economic efficiency of a building; improving the economic lifetime of a building; increasing a building's return on investment (ROI); increasing the efficiency of the capital expenditure (capex); positively influencing the cost efficient to the building; reducing the payable fee; boosting sales prices; boosting rental prices; and boosting occupancy rates. With respect to economic efficiency, the UAE is focusing on capitalizing GB practices to boost the efficiency of its economy in various ways such as creating new jobs (Green & Haines 2015). GBs create jobs needed for implementing the sustainability measures and producing and supplying sustainable materials and equipment (Portalatin, Roskoski & Shouse 2015). The majority of GB-associated jobs in the UAE have been created in manufacturing and construction sectors, having diverse technical specialization and pay grades including construction managers, building inspectors, energy auditors, insulation installers, HVAC technicians, and electricians among others. Saleh & Alalouch (2015) used the job creation model to estimate a single GB project in UAE can create at least 56,000 new jobs yearly. In addition, GBs in UAE help to address the unsustainable economic development in a country whose economy has been mostly reliant on fossil energy (Al Abbar 2017). Thus, GBs constitute one of the measures adopted by the government to achieve its economic diversification initiative.

Another financial performance attribute associated with GBs is the increased economic lifetime of a building. GB practices have been established to optimize the life cycle of a building. This is because durability is an important aspect of GB practices to help minimize the environmental aspects associated with buildings (Flanders 2016). In addition, GBs are designed such that their service life can be extended. In the UAE, several retrofitting projects have been initiated to help extend the lifespans of existing buildings and enhance their overall efficiency. For instance, in Abu Dhabi, more than 3,000 nonresidential buildings have been slotted for retrofitting with the aim of enhancing their efficiency as well as extending their lifespan (Jeaidi & Mezher 2017).

The solid ROI associated with GBs is also another important financial attribute, which stems from the high demand for these buildings (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). Globally, the GB market is growing, which is projected to reach $960 billion by 2023 (Green & Haines 2015). In addition, consumers are willing to pay more for GBs, which in turn makes investments in GBs a sure bet. GBs resulted in ROI improvements by 19.2 percent, indicating considerable cost savings (Issa & Al Abbar 2015). The USBC makes a business case for GBs by highlighting that LEED certified GBs often have an internal rate of return (IRR) of about 20 percent, which is due to the energy savings (Jose & Chacko 2017). Moreover, GBs enable investors to recoup their investors earlier when compared to standard buildings.

GBs also increase the efficiency of the capital expenditure (Capex). This means that the market valuation of GBs far surpasses the actual capital invested in the property (AlFaris, Juaidi & Manzano-Agugliaro 2016). On average, it has been estimated that the market valuation for

LEED-certified buildings is 30% more than non-LEED certified buildings, which is an indication of the economic benefits offered by GBs (MacNaughton et al. 2016). Moreover, GB certification is increasingly becoming the benchmark of building quality, which implies that the market valuation of standard buildings is posed to decline considerably (Green & Haines 2015). GB practices increase the value of newly constructed buildings by about 10.9 percent and that of existing buildings by approximately 6.8 percent (Taleb 2014). Therefore, GB practices increases the efficiency of Capex through increasing the market valuation of buildings (Portalatin, Roskoski & Shouse 2015). Additionally, from the perspective of organizations, incorporating GB practices helps to improve the organization's financial performance.

The high occupancy rates, rental prices, and sales prices constitute other crucial financial attributes of GBs. Certified GBs have lower operational costs and offer improved environmental quality, which makes them attractive to individual and corporate buyers (Asif 2016). Green features in buildings significantly influence the decisions to purchase properties and homes. Contemporary tenants are aware of GB practices and search for buildings offering GB benefits (Issa & Al Abbar 2015). Green residential and office buildings have 20% higher lease rates than conventional buildings (Kibert 2012). Also, incorporating green features in buildings help facilitate competitive pricing, which explains why GBs are sold at higher prices when compared to conventional buildings (Ameen, Mourshed & Li 2015).

GBs also enhance the cost efficiency to the building, which is an important aspect of GB performance. GBs have been reported to reduce the operational costs by 13.6 percent for newly constructed buildings and 8.5 percent for existing buildings (Green & Haines 2015). Another important financial attribute associated with GB relates to lower payable fees (Jeaidi & Mezher 2017), which stems from the reduced legal liability associated with sustainability.

3.3.2 Functional Performance Attributes

The functional performance attributes associated with GB performance are several. They include maintaining the building's adaptability; suitability for growth; increasing ease of use; upgrading the building's efficiency; facilitating accessibility; maintaining security, health, and safety; ensuring convenience; satisfying all building requirements and regulations; making sure that the building design follows established standards; reducing the risk of failure; and increasing the strength and stability of the building. Other functional performance attributes of GBs include ensuring favorable superstructure performance; ensuring favorable exterior construction performance; ensuring favorable roofing performance; ensuring interior construction performance; ensuring mechanical functional performance; and ensuring electrical functional performance.

Regarding adaptability of GBs, they are designed such that they are flexible and adaptable to the surrounding environment. Adaptability simply means that such buildings are capable of accommodating novel uses in the future (Friess & Rakhshanbabanari 2017). This performance attribute can be achieved in various ways such as incorporating multifunctional spaces as well as excess service capacity (AlFaris, Abu-Hijleh & Abdul-Ameer 2016). As result, adaptable GBs can accommodate any future changes relating to the use of a building.

Another important functional attribute associated with GBs is the ease of use. One of the core aspects of GBs is that they place emphasis on the users, besides just focusing on achieving sustainability. GBs are designed with the user in mind, which plays an instrumental role in the increasing acceptability of these types of buildings (Neff, Spiker & Truant 2015). In hot and dry climates such as the UAE, the usability of GBs is very high. GBs have been fronted as the solution for addressing user concerns such as comfort that standard buildings have failed to address in these extreme climates.

The suitability of GBs for growth constitutes another critical aspect of the functional performance of GBs. Globally and in UAE, GB practices have been incorporated in sustainable growth initiatives because of their huge potential to help towards the achievement of sustainable growth and development (Ameen, Mourshed & Li 2015). Essentially, GB practices constitute an essential component of UAE's economic growth strategy, which is focusing on the diversification of its revenue sources through reducing reliance on oil. With the UAE seeking to morph into an international hub together with an exemplary green economy model, GB practices are core to the achievement of these goals.

Another potentially important aspect associated with GBs functional performance is the ability to upgrade the efficiency of the building. In this respect, it is well acknowledged that GBs have significantly higher performance than standard buildings in terms of resource and energy efficiency (Vierra 2016). GBs offer diverse energy efficiencies including resource efficiency, water efficiency, and energy efficiency. In UAE, the promise of GBs to deliver remarkable efficiency benefits underlies the country's fascination with sustainable buildings. Moreover, UAE is banking considerably on GBs to reduce its energy costs and GHGs emissions (Younis, Sundarakani & Vel 2016). Given that the UAE is located in a hot and dry climate, building essentials such as HVAC systems consume substantial energy; thus, the country is encouraging the adoption of GBs as a way of achieving energy efficiency.

GBs also play pivotal role in maintaining health, security and safety, which is an important criterion for a building to be deemed a "high performance building". The health benefits associated with GBs are well-documented in the literature (Abbas 2018; Asif 2016).

GBs are designed with the health, security, and safety of occupants in mind. In terms of health performance, GBs practices take into consideration the effect of features like natural lighting and ventilation and improvements in the quality of indoor air (Kibert 2012). For high performance GBs, volatile organic compounds (VOCs) that are detrimental to the health of humans should be minimized. Essentially, GBs ensure that its occupants are more productive and healthier. Additionally, GBs are designed to minimize safety and security risks for the occupants (Saleh & Alalouch 2015). A survey conducted by Honeywell and KRC Research in major cities in the US indicated that security and safety of GBs were important requirements, although going green without compromising on these factors has proved challenging (PR Newswire 2016). In the survey, 51% of the respondents indicated that safety is the main attribute they used to determine the level to which a building is considered high performing, 27% indicated that green assets are the most important whereas 22% considered productive assets as the most important (PR Newswire 2016). GB practices such as using acrylic plastics can improve visual clarity as well as strength, which ensures the safety and security of occupants in these buildings. Other functional performance aspects associated with GB include convenience, reduced failure risk, increased strength and stability of the building, superstructure performance, exterior performance, roofing closure performance, interior performance, mechanical performance, and electrical performance. These attributes are essential in enhancing the functional performance of GBs.

3.3.3 Operational Performance Attributes

The operational performance attributes associated with GBs reducing energy consumption; maintaining energy efficiency; easy maintaining, managing, cleaning and operating equipment; suitability for telecommunications; easing security operations; improving waste management; and managing operational risk. Reducing energy consumption is one of the pivotal goals underpinning the adoption of GB practices in the UAE (Asif 2016). Currently, buildings in UAE account for 80% of the electricity consumed in the country due to the need for building essentials such as air conditioning (AlFaris, Juaidi & Manzano-Agugliaro 2016). As a result, the performance of GBs in UAE is determined by the extent to which they help cut energy consumption in the country (Asif 2016). These buildings should not only lower the amount of energy consumed, but also continually maintain energy efficiency.

Another important operational performance attribute for GBs is that they should be suitable for and support telecommunications. Given the important role that telecommunications plays in the economy, GBs should be capable of supporting uninterrupted telecommunication service by supporting telecommunication infrastructure (Friess & Rakhshanbabanari 2017). Moreover, because telecommunication infrastructures are operational all the time, there is the need to reduce the energy consumed, wherein the telecommunication infrastructure should leverage the green features of these buildings.

Another essential aspect in the operational performance of GBs relates to the ease of security operations (Flanders 2016). In this regard, high performing GBs should be designed to facilitate security such as by enabling visibility and strength of the building. Using materials like acrylic plastic can help enhance the strength while at the same time ensuring visibility for elements that might compromise security.

Improving waste management and reducing failure constitute other essential operational performance attributes for GBs. A survey conducted by the McGraw Hill Construction (2013) showed that 61% of the contractors surveyed rated waste management as the most important aspect of GB with energy efficiency being ranked first. The importance of waste management in GB stem from the substantial demolition and construction debris (Smart Market Report 2013).

The contractors in the survey indicated concerns that waste management can positively enhance GB practices. Moreover, the core drivers for waste management in GB included demands by clients, regulations imposed by the government, increased awareness among consumers, and competitive advantage.

Risk/failure denotes another essential consideration with respect to the operational performance of GBs. A paradox associated with GB is that concepts employed to enhance the performance of a building in the course of its life cycle represent the same things that increase the likelihood of failure in the course of its operations (Keeler & Vaidya 2016). Concerns have been raised that GBs are vulnerable to mold and moisture problems. Despite the vast benefits offered by GBs, empirical evidence shows an association between innovative design and products and failures of buildings. Essentially, deviation from the established methods increases the risk of failure of the building (Jose & Chacko 2017). According to industry experts, buildings with lower risk of failure do not exceed the industry guidelines with respect to mechanically introduced external air (Wheeler & Beatley 2014). By contrast, GB practices emphasizes more external air to be introduced into the building exceeding the existing industry standards; thus, increasing the likelihood of mold growth and humidity issues.

3.3.4 Environmental Performance Attributes

A number of environmental performance attributes are pivotal in the design of GBs. They include achieving a low carbon environment; reducing energy consumption; maintaining natural light and ventilation into the building; managing the quality of air in the building; reducing pollution; using renewable resources; using low maintenance, durable, and environment-friendly building materials; conserving water resources; and ensuring adaptability of the building to future climate/natural changes (Medineckiene et al. 2015). These environmental performance attributes emanate from the expected environmental benefits associated with GB practices. In this regard, GBs are designed with the ultimate aim of reducing water wastage; conserving natural resources; reducing GHG emission to create a low carbon environment; and reduce pollution (Younis, Sundarakani & Vel 2016). The performance of GBs is dependent on the extent to which these goals are achieved (Saleh & Alalouch 2015). In the UAE, the environmental performance of GBs is an important consideration given the high GHG emissions because of an economy that is dependent on fossil energy.

3.3.5 Management Performance Attributes

The management performance attributes for GBs include maximizing project management efficiency and delivery; enhancing risk management; maximizing organizational efficiency; ensuring that project objectives are achieved; increasing stakeholders interaction; and leading work design and delivery planning (Juaidi et al. 2016). GB practices have numerous implications for management, which constitute the above-mentioned management performance attributes. Evidence exists suggesting that organizations that apply GB practice outperform their counterparts who do not (Tam et al. 2017). This is because GBs encourage learning, productivity, and comfort, which in turn facilitates organizational management. It is widely acknowledged that the workplace environment exerts a considerable influence on the productivity of employees (Taleb 2014). In this respect, GBs offer improved quality of indoor air, outdoor views and day lighting, which results in a healthy work environment characterized by optimum organizational efficiency and ensuring that projects are completed in a timely manner because of the resultant increased employee productivity (Ceylan 2010). Evidence indicates that the healthier workplace environment accorded by GBs reduces employee turnover and absenteeism. These productivity benefits associated with GBs translate to improved project management efficiency.

3.4 GBs Codes and Regulations in UAE

3.4.1 Al Sa'fat Evaluation System

The Alsa'fat Evaluation system was implemented with the aim of improving the performance of buildings in Dubai through lessening the use of materials, water and energy; enhance the health, welfare, and safety of residents; and by improving the processes of designing, constructing and operating buildings to ensure comfort living (Asif 2016). The Al Sa'fat was adopted to provide support to the Dubai's Strategic plan by creating an urban environment that is more sustainable and expand the capacity of Dubai's infrastructure to satisfy future development needs.

The Al Sa'fat evaluation system is applicable in various building typologies including villas, residential/commercial properties, public buildings, and industrial buildings. The villa types where this evaluation system is applicable include Arabic houses, private villas, and investment villas (Yudelson 2016). The types of residential properties where this evaluation system can be applied include apartments, labor accommodation, and student accommodation. The commercial houses where the Al Sa'fat system can be applied include food outlets, resorts, officers, laboratories, furnished apartments, motels, and hotels. The types of public buildings where this evaluation system is applied include petrol stations, museums, heritage buildings, healthcare facilities, government buildings, educational facilities, theaters, banks, post offices, retail outlets, shopping malls, worship houses, entertainment complexes, and festival centers (Yudelson 2016). For the case of industrial buildings, the Al Sa'fat is applicable in workshops, warehouses, and factories.

In terms of applicability, the Al Sa'fat applies to newly constructed buildings, existing buildings, and refurbishment, extensions, and additions that need a building permit (Yudelson 2016). For the case of mixed use buildings, each section of the building is required to comply with the applicable regulations for the specific type of building in the section. It is imperative to note that there are Al Sa'fat cannot be applied in temporary buildings that will be demolished after two years.

In the Al Sa'fat system, the performance of buildings is determined by energy and water compliance. Energy compliance is determined by comparing the yearly amount of energy consumed by the building compared to a reference building having the same size, operational patterns, and shape, where the proposed building being evaluated should consume a less or an equal amount of energy relative to the proposed building (Yudelson 2016). For the case of water compliance, it is determined by comparing the yearly use of water for the proposed building with that of the reference building. The general criteria for evaluating the extent to which a building is green in this rating system include building vitality and resource effectiveness – energy, water, and materials and waste (Yudelson 2016). Building vitality has three components including visual comfort and day lighting, quality of water, and responsible construction. The components of energy effectiveness assessed in this rating system include the efficiency and conservation of the building systems and building fabric and the available of onsite systems for generating renewable energy (Yudelson 2016; Al Abbar 2017). The water effectiveness requirement entails implementing onsite systems for recovering and treating water such as cooling towers. The materials and waste effectiveness requirement examines the use of materials containing lead and asbestos in constructing the building.

3.4.2 Regulation Green Building

The GBRS were adopted with the aim of improving the performance of Dubai's buildings through lessening the use of materials, water, and energy; enhancing the health of residents and their general welfare; and improving the process of planning designing, constructing, and operating building (Al Abbar 2017). These regulations have been implemented as a component of the Dubai's Strategic Plan by creating an urban environment that is more sustainable as well as enable Dubai's infrastructure to be able to satisfy its future development needs (Gou & Xie 2017). The regulations focus on four key aspects including the vitality of buildings; energy resource effectiveness; water resource effectiveness, and materials and waste resource effectiveness.

Building vitality focuses on various aspects including the quality of indoor air and ventilation; the quality of air in the course of constructing, renovating, or decorating a building; ensuring that air inlets are located at a safe distance from likely contamination sources and that exhaust air is released such that it does not come back to the building or its ventilation system; isolating buildings from sources of pollution; ensuring that windows can be opened with the exception of safety requirements that limit opening windows; inspecting and cleaning HVAC systems; ensuring that parking places are adequately ventilated; restricting tobacco smoking in all public places (Yudelson 2016). Other important aspects of building vitality include thermal comfort, acoustic comfort, hazardous materials, visual comfort and day lighting, and water quality.

Energy resource effectiveness requirements focuses on ensuring that minimal energy is in operating the building. These regulations outline the requirements for minimum envelop performance including floors, roofs and external walls; thermal bridging; design parameters for air conditioning; preventing conditioned air from being lost; and minimizing air leakage (Yudelson 2016). Other aspects of energy efficiency regulations relate to HVAC systems and equipment, escalators and elevators, interior and exterior lighting power density, lighting controls, control systems for HVAC, and insulation among others (Al Abbar 2017). Moreover, electricity used should be metered. Other important aspects of energy efficiency include ensuring the availability of renewable energy sources onsite such as solar energy.

Water resource effectiveness regulations are concerned with minimizing the amount of water used in the course of a building's operations. These regulations specify the water fixtures and fittings to be installed in buildings; implement condensate drainage; implementing water efficient irrigation; and implementing onsite systems to facilitate the treatment and recovery of water (Al Abbar 2017).

The regulations on waste and materials effectiveness cover a number of aspects including specifying the acoustical and thermal insulation materials to be used; using certified timber; refraining from using materials having asbestos and lead; using materials with zero potential to deplete the ozone layer; using recycled content (about five percent of all the materials used in constructing the building; using materials that are regionally available (at least 5 percent); and using materials that do not have urea-formaldehyde resins (Al Abbar 2017). With respect to waste management, these regulations cover requirements associated with handling demolition and construction waste; collection of bulk waste; storage of waste; collection of waste; and providing facilities for handling recyclable waste. Taken together, these regulations seek to ensure that buildings in Dubai are sustainable.

3.5 UAE Practices on GB Systems within the Construction Industry

3.5.1 Louvre Abu Dhabi

Louvre Abu Dhabi one of the notable GB projects in UAE. It is a civilization and art museum that became operational on 8th November 2017. This project has received numerous awards for excellence in sustainable building practices (Clark 2017). For instance, the museum was given the Green Building Awards during the Green Middle East Awards for Environmental Excellence. In addition, the company that developed the building project, the Tourism Development and Investment Company, has been acknowledged for environmental excellence as well as sustainable design (Clark 2017). The Abu Dhabi UPC awarded the Louvre Abu Dhabi with a Pearl 3 Rating, which is the first certification to be given to cultural projects in Abu Dhabi. The GB practices and design incorporated at the Louvre Abu Dhabi include enhanced quality of indoor environment; responsible management of waste and selection of materials; sustainable development and selection of the site for the building; reducing the consumption of water, and energy efficiency. By incorporating these practices, the Louvre Abu Dhabi has managed to achieve a 31% reduction in the consumption of energy as well as reducing water use by 27% relative to conventional buildings (Kibert 2012). The building also reduced external heat gain by 72% through the use of the dome roofing design (See Figure 1). Moreover, Louvre Abu Dhabi has an LEED Gold Certification.

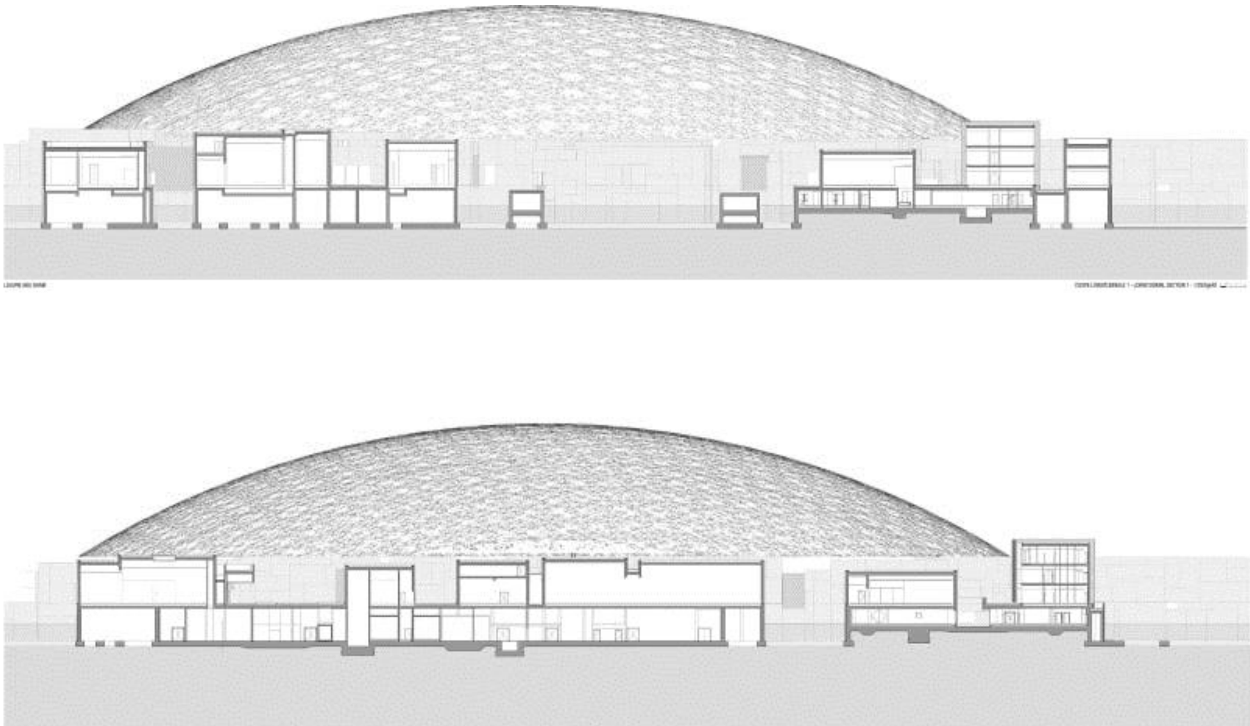


Figure 1: Dome Roofing Design of Louvre Abu Dhabi

3.5.2 Sustainable City Dubai

The Sustainable City Dubai was implemented with the aim of providing the maximum quality of life under minimal environmental footprint without compromising the developments needs for the future generations (Issa & Al Abbar 2015). Whereas the quality of life is determined by numerous aspects such as living costs, growth in income, unemployment, health statistics, and rates of crime among others, the built environment as well as the design of a city plays a significant role in reducing the environment impacts of people and enhancing the quality of life. Several challenges existed in the design of Sustainable City Dubai, with the most notable being providing holistic solutions. The underlying notion of the holistic approach to achieving sustainable development focuses on offering a whole solution that tackles the three core elements associated with sustainability instead of merely focusing on one sustainability element. While it is commonly believed that sustainable design needs a considerable increase in the costs of construction, this is not the case. Using passive design approaches like form, density, and orientation will yield huge environmental benefits with minimum costs (Issa & Al Abbar 2015). The core challenge in the Sustainable Dubai City initiative was to offer affordable, holistic solutions dealing with all the three sustainability pillars.

The Sustainable City Dubai stands on 46 hectares and is described as the pioneer zero energy property development in Dubai. This property has 89 apartments, 500 villas as well as a mixed use area comprising healthcare facilities, retail outlets, officers, beverage and food outlets, and a nursery (Clark 2017). The second phase of the Sustainable City Dubai will consist of a center for innovation, a school, and a hotel. Diamond Developers, a Dubai-based property company, was contracted to develop the city. The design and development of this city incorporated a number of GB practices including eleven natural “biodome” green houses, individual garden farms and organic farms to facilitate local production of food; use of solar energy with a peak production of 10 megawatts; recycling of waste water (both black water and grey water); jogging and biking trails; and car free locations (Kibert 2012). The peak solar energy was achieved through the use of green roofing systems in all the houses in the City.

3.6 UAE Ranking in GB Systems Implementation Globally

The UAE ranks 10th in the implementation of GB systems as of 2016, according to the USGBC. This ranking is based on countries that are focusing on promoting the construction of buildings that are energy-efficient and cost-efficient (McCadden 2016). The UAE has been keen on implementing international standards in the construction sector. In the future, it is expected that the global ranking of UAE with respect to the implementation of GB practices will improve because most of the building projects are underway, particularly in Dubai that were LEED-certified in the design phase (McCadden 2016). The number of LEED-certified buildings in the country is increasing with the most notable one being the Dubai Electricity and Water Authority Headquarters that has an LEED-Platinum rating, which is the highest LEED rating available. Across the world, there is an increase in GBs, with more than 140 countries having LEED-certified projects underway (McCadden 2016). In the MENA region, UAE remains the only country ranked in the top 10 with regard to the implementation of GB systems. Based on figures published by the USGBC, the number of LEED-certified projects in the real estate sector of the UAE is higher than the combined number of such projects in three countries that are ranked above UAE including Germany, Taiwan, and South Korea (Issa & Al Abbar 2015). Moreover, the number of LEED-registered building projects in the UAE is tenfold the number of similar projects in Singapore.

In 2016, the USGBC ranked China first with respect to the implementation of GB practices. China was the largest LEED user having about 36.42 million square meters of space being LEED-certified (McCadden 2016). This was followed by Canada, India, Brazil, and South Korea, which made the top five countries in the list. The Table 1 shows the USGB rankings in 2016 with respect to the number of LEED projects and LEED-certified building space. Note that the ranking excludes the US.

Rank based on LEED Space	Country	Gross square meters of LEED space	Number of LEED projects
1	China	34.62	931
2	Canada	34.39	2,586
3	India	15.90	644
4	Brazil	7.43	380
5	South Korea	5.95	97
6	Taiwan	5.66	99
7	Germany	5.03	215
8	Turkey	4.78	191
9	Sweden	3.88	210
10	UAE	3.64	190
	U.S	336.84	27,699

Table 1: GB Ranking - Global

3.7 Conclusion

GB emphasizes environmental responsibility, resource-efficiency, and LCA. GB design is characterized by LCA, siting efficiency, energy efficiency, water efficiency, materials efficiency, quality of indoor environment, and waste reduction. The performance of GBs in the UAE is dependent on various factors including financial performance, functional performance, operational performance, environmental performance, and management performance attributes. The financial performance attributes of GBs include improving economic efficiency of a building; improving the economic lifetime of a building; increasing a building's return on investment (ROI); increasing the efficiency of the capital expenditure (capex); positively influencing the cost efficient to the building; reducing the payable fee; boosting sales prices; boosting rental prices; and boosting occupancy rates.

The functional performance attributes found in the literature include maintaining the building's adaptability; suitability for growth; increasing ease of use; upgrading the building's efficiency; facilitating accessibility; maintaining security, health, and safety; ensuring convenience; satisfying all building requirements and regulations; making sure that the building design follows established standards; reducing the risk of failure; and increasing the strength and stability of the building. Other functional performance attributes of GBs include ensuring favorable superstructure performance; ensuring favorable exterior construction performance; ensuring favorable roofing performance; ensuring interior construction performance; ensuring mechanical functional performance; and ensuring electrical functional performance.

The operational performance attributes associated with GBs include reducing energy consumption; maintaining energy efficiency; easy maintaining, managing, cleaning and operating equipment; suitability for telecommunications; easing security operations; improving waste management; and managing operational risk. The environmental performance attributes of GB are concerned with: achieving a low carbon environment; saving energy consumption; maintaining natural light and ventilation into the building; managing the quality of air in the building; reducing pollution; using renewable resources; using low maintenance, durable, and environment-friendly building materials; conserving water resources; and ensuring adaptability of the building to future climate/natural changes. The management performance attributes for GBs include maximizing project management efficiency and delivery; enhancing risk management; maximizing organizational efficiency; ensuring that project objectives are achieved; increasing stakeholders interaction; and leading work design and delivery planning. The following section outlines the methodology used to examine these performance attributes in the UAE construction sector.

Chapter 4: Methodology

4.1 Introduction

This chapter outlines the steps that were taken to collect the data required for answering the research questions. These steps include the research approach, the method of collecting data, research methods, rationale for the research design, and the research process.

4.2 Research Approach

The research approach denotes the route taken by the research to develop knowledge. Two forms of research approaches exist that can be used in any research investigation – inductive and deductive research approaches. The inductive research approach is often employed to develop theory and is suited for exploratory research lacking predetermined variables (Cozby 2012). This approach was not suitable for this research because the study sought to explore the state of GB performance attributes in the UAE relative to what has been reported in the literature. The deductive research approach uses a top-down thinking that commences with reviewing existing literature followed by answering research questions. Essentially, the deductive approach is akin to testing hypotheses that are grounded on existing data (Creswell 2011). In this research, the deductive approach was employed by collecting data regarding GB performance in the UAE and comparing them with the insights found in existing literature. Therefore, the deductive approach was suited for this research because the findings regarding the GB practices in the UAE will be reviewed with respect to those in the literature. Since the discussion of the results will be based on existing literature to derive conclusions, the deductive approach was ideally suited for this research.

4.2.1 Data Collection Methods

Data for this research was collected using the survey strategy administered using questionnaires. The survey strategy is characterized by distributing questions to selected respondents using tools such as questionnaires or interviews. The survey strategy was used in this research because of its effectiveness in collecting vast data amounts (Evans & Rooney 2013). Also, it is effective in gathering data to show diverse opinions and viewpoints about a given phenomenon being investigated. Another advantage of the survey strategy is due to its cost effectiveness (Evans & Rooney 2013). A notable problem of the survey strategy is that it is not helpful in providing information about the causes of the phenomena being investigated. Nevertheless, establishing causality was not a focus of this study as it is purely descriptive. The specific survey data collection method that was used in this study is the questionnaire, which was used to elicit responses from participants in the UAE construction sector including builders, clients, and contractors among others. Questionnaires have been described as an effective tool for collecting huge data amounts within a limited time period. Questionnaires are also cost effective because they are standardized, which in turn eases the process of analyzing the data collected (Creswell 2011). Therefore, the questionnaire was the most appropriate tool to collect data when compared to other survey tools like interviews that are often time consuming and yield non-generalizable data.

4.2.2 Research Methods

The nature of the research determines the research method. Research studies can be explorative, predictive, or descriptive. Three options exists for researchers in choosing the research method – qualitative, quantitative, or mixed methods. Qualitative research entails gathering textual data to explore deeper meanings that people attach to some phenomena. The quantitative research entails gathering and analyzing numerical data. The quantitative method was used for this study.

4.3 Rationale for the Research Design

The rationale for using the quantitative design is because the research is descriptive. Descriptive research involves exploring the views and opinions expressed by participants regarding some variable (Evans & Rooney 2013), which in this research related to key drivers influencing GB in UAE. The quantitative research design is also used because of the well-defined and structured nature of the research. From the review of the literature, the key aspects to be studied were developed instead of using an open, unstructured method to investigate the issue at hand.

4.4 The Research Method Process

4.4.1 Initial Research

The initial research process entailed conducting a preliminary research aimed at exploring the issues related to the research. The preliminary research was conducted using online and local print sources to become familiar with the issue, and determine the scope of the issue to be investigated. An outcome of the preliminary research was the development of a refined research area of interest and the study objectives.

4.4.2 Literature Review

The literature review was the second stage of the research process. Literature to be reviewed was gathered from electronic databases such as Google Scholar, Emerald, PubGet, SpringerLink, and ScienceDirect, which yielded at least 50 papers to be reviewed. Besides, an internet search using Google was conducted to access extra reliable and credible information sources such as government reports, published theses and conference papers among others. The findings of the literature review are presented in Chapter 3.

4.4.3 Questionnaire Design and Development

The development of the questionnaire was based on the findings of the literature review. The constructs captured in the questionnaire included applicability of GB in building developments in the UAE; level of readiness in understanding GB development in the UAE; development of the various components of GB codes in the UAE; performance drivers; impacts of implementing GB practices in organizations; level of implementation for each category of Al Sa'fat evaluation system in the UAE; ways in which awareness of the Al Sa'fat evaluation system can be increased in the UAE among authorities, clients, and the public; important considerations by clients when implementing GB designs; practices that organizations can adopt to help implement GB designs and systems; level of future GB development in organizations in the UAE; the perceived need for increasing awareness about the al Sa'fat certification system among authorities, managers, and consultants. These items were measured on a five-point scale consisting of 0%, 25%, 50%, 75%, and 100% to denote the extent to which they agreed with the statement.

4.4.4 Data Collection and Design

The questionnaire developed for the research was distributed to stakeholders in the construction industry including consultants, clients, and contractors among others. A total of 31 respondents took part in the research. Snowball sampling was used to recruit participants, which was done by relying on an initial pool of participants to refer other potential participants among their acquaintances. Respondents were given the questionnaire and given24 hours to complete and return it. Completing and returning the questionnaire indicated an implied consent to participate in the research.

4.4.5 Assessment Tool for Value Created by GB Design

The tool for measuring the value created by GB design captured five constructs including financial, functional, operational, environmental, and management performance. The financial performance drivers include improving economic efficiency of a building; improving the economic lifetime of a building; increasing a building's return on investment (ROI); increasing the efficiency of the capital expenditure (capex); positively influencing the cost efficient to the building; reducing the payable fee; boosting sales prices; boosting rental prices; and boosting occupancy rates. The functional performance drivers are maintaining the building's adaptability; suitability for growth; increasing ease of use; upgrading the building's efficiency; facilitating accessibility; maintaining security, health, and safety; ensuring convenience; satisfying all building requirements and regulations; making sure that the building design follows established standards; reducing the risk of failure; and increasing the strength and stability of the building; ensuring favorable superstructure performance; ensuring favorable exterior construction performance; ensuring favorable roofing performance; ensuring interior construction performance; ensuring mechanical functional performance; and ensuring electrical functional performance. The operational performance drivers are reducing energy consumption; maintaining energy efficiency; easy maintaining, managing, cleaning and operating equipment; suitability for telecommunications; easing security operations; improving waste management; and managing operational risk (reducing failure). The environmental performance drivers captured in the questionnaire consist of: a low carbon environment; saving energy consumption; maintaining natural light and ventilation into the building; managing the quality of air in the building; reducing pollution; using renewable resources; using low maintenance, durable, and environment-friendly building materials; conserving water resources; and ensuring adaptability of the building to future climate/natural changes. The management performance attributes for GBs include maximizing project management efficiency and delivery; enhancing risk management; maximizing organizational efficiency; ensuring that project objectives are achieved; increasing stakeholders interaction; and leading work design and delivery planning

4.4.6 Discussion and Conclusion

The results of the study are discussed with reference to the findings of the literature review. The findings are compared to those in existing literature. In addition, the findings are discussed and presented based on the objectives of the research. Recommendations to improve GB implementation and awareness are also presented.

4.5 Summary

The quantitative research approach was adopted for this research, which was administered using a questionnaire. The questionnaire developed for the research was distributed to stakeholders in the construction industry including consultants, clients, and contractors among others. A total of 31 respondents took part in the research recruited using snowball sampling. The questionnaire captured various aspects including applicability of GB in building developments in the UAE; level of readiness in understanding GB development in the UAE; development of the various components of GB codes in the UAE; performance drivers; impacts of implementing GB practices in organizations; level of implementation for each category of Al Sa’fat evaluation system in the UAE; ways in which awareness of the Al Sa’fat evaluation system can be increased in the UAE among authorities, clients, and the public; important considerations by clients when implementing GB designs; practices that organizations can adopt to help implement GB designs and systems; level of future GB development in organizations in the UAE; the perceived need for increasing awareness about the al Sa'fat certification system among authorities, managers, and consultants.

Chapter 5: Results

This chapter presents the findings from the survey. They are presented based on the survey questions administered to participants. Demographics along with description for each question will be given and discussed separately. It will identify the key drivers that affects GB application within the the UAE construction industry. The results had provided an important insights about the implementation of GBs in UAE in all management, engineering and construction fields.

5.1 Participant Demographics

Table 2 below summarizes the demographic characteristics of the survey participants. The majority of participants were Arab, male, aged 35 years and below, with high school education, in mid-level positions in semi-government organizations. Participants were mostly clients and consultants with 20+ years of experience in the construction industry.

		n	%
Gender	Male	24	77.4
	Female	7	22.6
Age	Less than 25	11	35.5
	26-35	10	32.3
	36-45	7	22.6
	46-55	3	9.7
	56+	11	35.5
Nationality	UAE	2	6.5
	Arab	17	54.8
	Asian	11	35.5
	American	1	3.2
	European	2	6.5
	Others	17	54.8
Educational Level	High school	18	58.1
	Bachelor’s	11	35.5
	Masters	2	6.5
	PHD	18	58.1
Career Level	Junior	3	9.7
	Mid-level	10	32.3
	Senior	18	58.1
Organization Type	Government	7	22.6
	Semi-government	17	54.8
	Private	7	22.6
Industry Role	Consultant	5	16.1
	Contractor	1	3.2
	Client	8	25.8
	Others	17	54.8
Years of experience in the construction industry	Less than 5	5	16.1
	5-10	2	6.5
	11-15	9	29.0
	16-20	3	9.7
	20+	12	38.7

Table 2: Participants Demographics

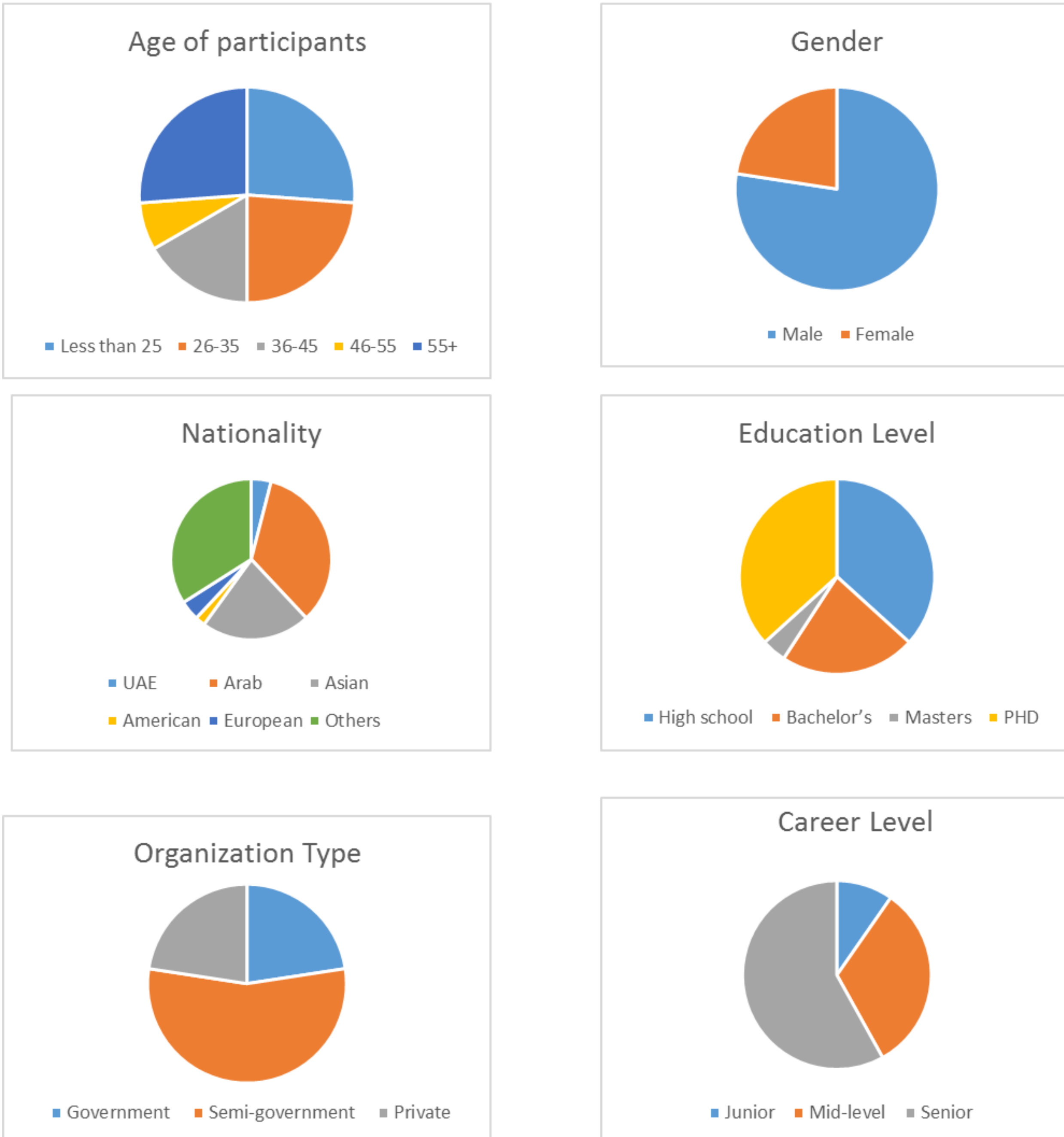


Figure 2: Participants demographics - age, gender, nationality, education level, organization type, career level

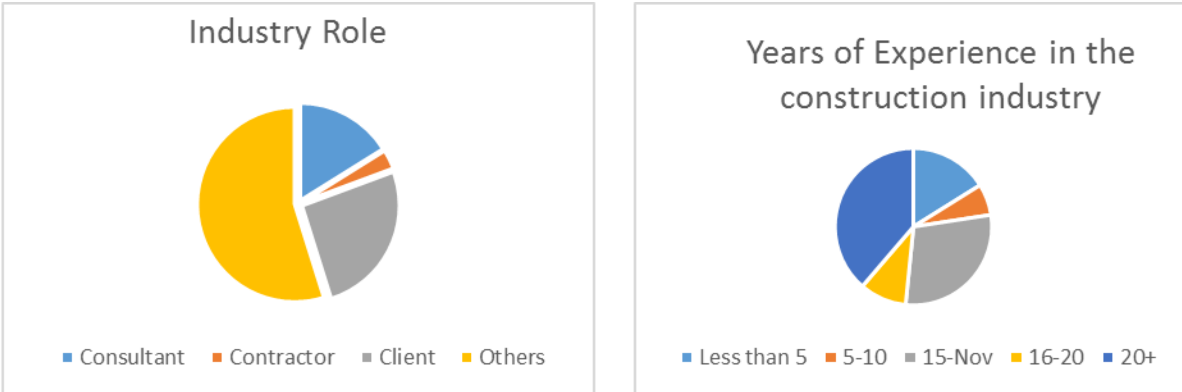


Figure 3: Participant Demographic - Industry Role and Years of Experience in the Construction Industry

5.2 Q1: How applicable is the “green building system” in below developments within UAE?

The participants were asked to rate the applicability of the GB system in various types of building projects including all new buildings, mixed use buildings, buildings that has change of use, existing buildings, and additional, extension, or refurbishment to existing buildings. Table 3 summarizes their responses. The mean rating for the applicability of GB systems in all new buildings was 90.32 ± 16.68. The mean rating for the applicability of GB systems in mixed used buildings was 75.81±28.49. The mean rating for the applicability of GB systems in buildings with a change of use is 56.45±32.89. In existing buildings, the mean rating for the applicability of GB systems was 37.10 ±28.77. Lastly, for additional, extension or refurbishments to existing buildings, the mean rating for the applicability of GB systems was 52.42±38.38. In general, it can be seen that applicability of GB systems in new buildings and mixed-use building was high. GB applicability in existing buildings in the UAE is moderate whereas its applicability in additional, extension, or refurbishments to existing buildings is low.

	Mean (SD)	Rating	n	percent
All New Buildings (Q1.1)	90.32 ± 16.68	50%	3	9.7
		75%	6	19.4
		100%	22	71.0
Mixed Use Buildings (Q1.2)	75.81±28.49	25%	3	9.7
		50%	10	32.3
		75%	1	3.2
		100%	17	54.8
Buildings That Has (Change Of Use). (Q1.3)	56.45±32.89	0.00%	3	9.7
		25.00%	6	19.4
		50.00%	10	32.3
		75.00%	4	12.9
		100.00%	8	25.8
Existing Buildings (Q1.4)	37.10 ±28.77	0.00%	6	19.4
		25.00%	11	35.5
		50.00%	10	32.3
		75.00%	1	3.2
		100.00%	3	9.7
Additional, Extension Or Refurbishment To Existing Buildings (Q1.5)	52.42±38.38	0.00%	6	19.4
		25.00%	7	22.6
		50.00%	5	16.1
		75.00%	4	12.9
		100.00%	9	29.0

Table 3: Applicability of GB systems in new buildings, mixed-use buildings, existing buildings, and extensions/refurbishments

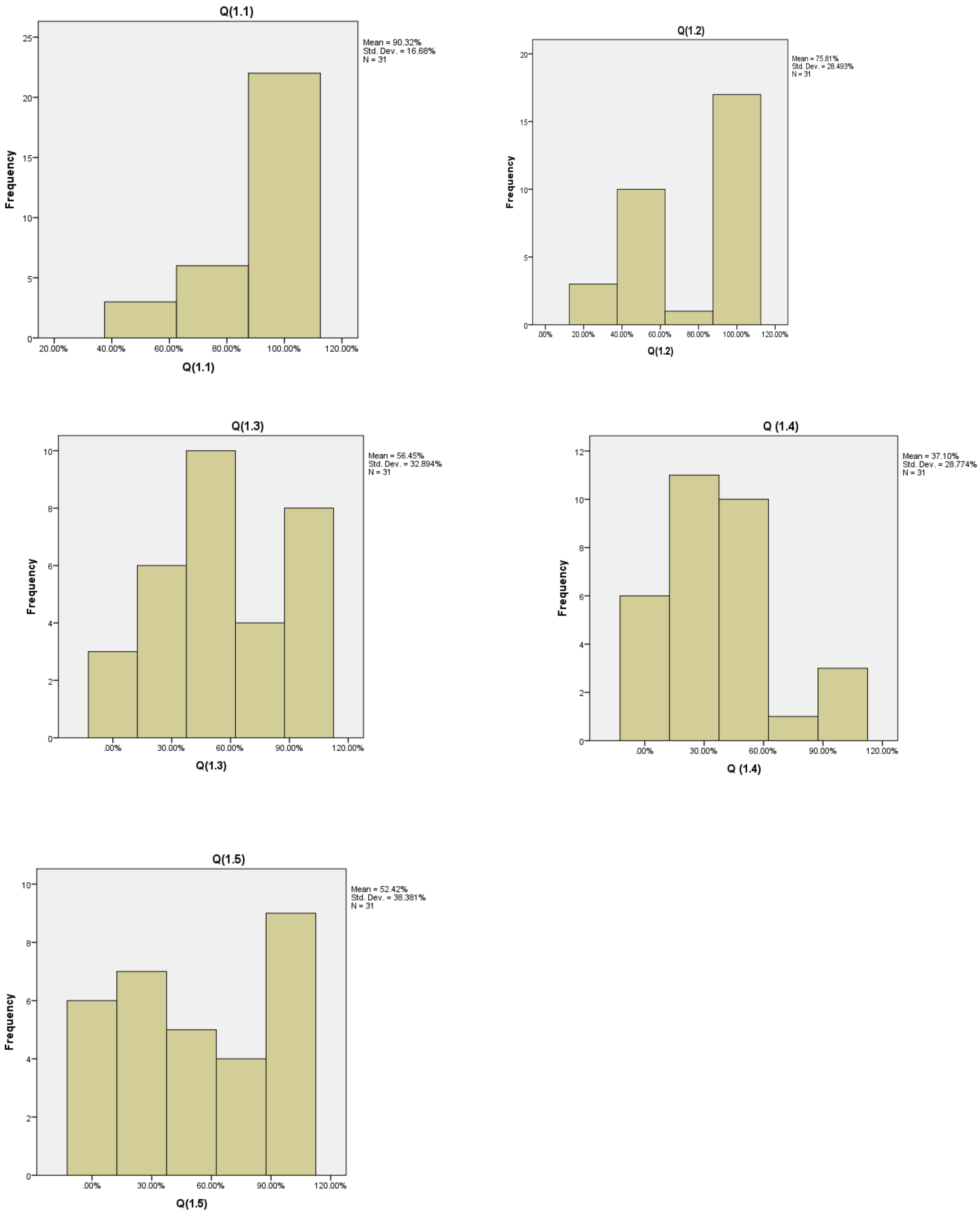


Figure 4; Frequencies for Q1.1-Q1.5

5.3 Q2: How would you evaluate the readiness of below list in understanding the green building development in UAE?

Participants were asked to assess the readiness of consultants, contractors, master developers, authorities, client/end users, researchers, and learners in understanding GB development. Table 4 provides a summary of their responses. The mean readiness for consultants/contractors in understanding GB development in the UAE was 78.23± 28.68%, master developers (74.19±26.99%), authorities (89.52±16.80%), client-end user (60.48±30.12%), and researchers/learners 80.65 ± 20.11%. Therefore, it can be seen that the readiness in understanding GB development in UAE is high in all these groups, with authorities having the highest level of GB understanding.

	Mean (SD)	Rating	n	percent
Consultant/contractor (Q2.1)	78.23± 28.68%	25%	5	16.1
		50	3	9.7
		75%	6	19.4
		100%	17	54.8
Master developers (Q2.2)	74.19±26.99 %	25%	4	12.9
		50%	6	19.4
		75%	8	25.8
		100%	13	41.9
Authorities (Q2.3)	89.52±16.80 %	50.00%	3	9.7
		75.00%	7	22.6
		100.00%	21	67.7
Client/end user (Q2.4)	60.48±30.12 %	25.00%	9	29.0
		50.00%	9	29.0
		75.00%	4	12.9
		100.00%	9	29.0
Researcher/learners (Q2.5)	80.65 ± 20.11%	50.00%	7	22.6
		75.00%	10	32.3
		100.00%	14	45.2

Table 4: Readiness in Understanding Green Building among consultants, master developers, authorities, clients, and researchers

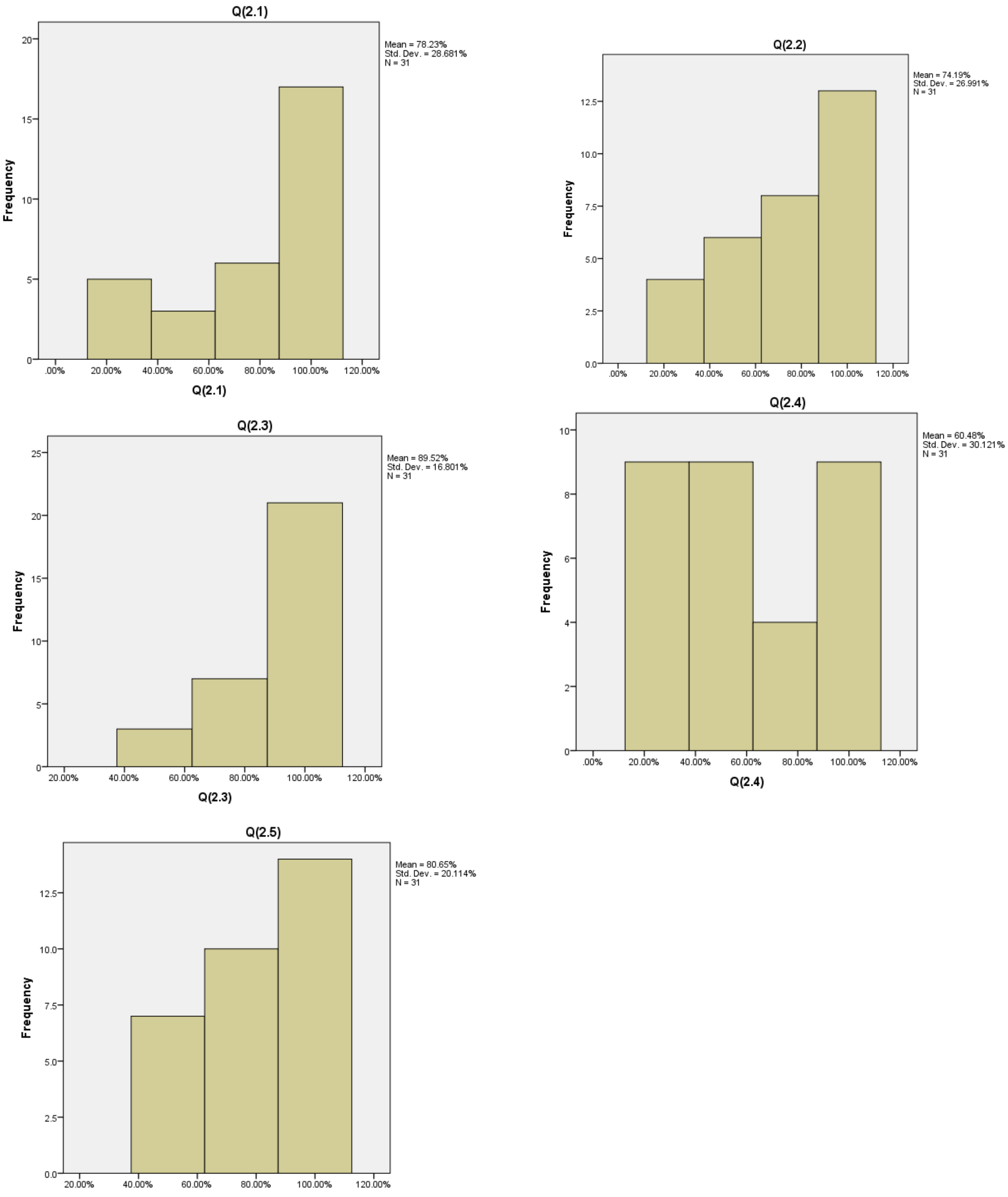


Figure 5: Frequencies for Q2.1-Q2.5

5.4 Q3: How would you rate the development of each below listed attributes of green building codes in UAE?

Participants in the survey were asked to rate the development of GB attributes in the GB codes in the UAE, which included ventilation and air quality, building fabric and systems, generation and renewable system, water efficient fittings, microclimate and outdoor comfort, neighborhood pollution, access and mobility, thermal comfort, environmental impact assessment, and hazards materials. Table 5 provides a summary of their responses with respect to these attributes. The mean ratings for the development of the GB attributes in the UAE building codes are as follows: ventilation and air quality (81.45±23.24%), building fabric and systems (79.84±26.94%), generation and renewable system (63.71±26.49%),water efficient fittings (79.84±23.64%), microclimate and outdoor comfort (67.74±27.53%), neighborhood pollution (70.16±26.15%), access and mobility (66.94±24.48%), thermal comfort (70.16±26.94%), environment impact assessment (76.61±29.53%) and hazards materials (64.52±32.12%). These results suggest that the development of these green attributes in UAE GB code is above average with all of these attributes having mean ratings of more than 50%.

	Mean (SD)	Rating	n	percent
Ventilation and air quality (Q3.1)	81.45±23.24%	25.00%	2	6.5
		50.00%	4	12.9
		75.00%	9	29.0
		100.00%	16	51.6
Building fabric and systems (Q3.2)	79.84±26.94%	0.00%	1	3.2
		25.00%	2	6.5
		50.00%	3	9.7
		75.00%	9	29.0
		100.00%	16	51.6
Generation and renewable system (Q3.3)	63.71±26.49%	25.00%	4	12.9
		50.00%	15	48.4
		75.00%	3	9.7
		100.00%	9	29.0
Water efficient fittings (Q3.4)	79.84±23.64%	25.00%	2	6.5
		50.00%	5	16.1
		75.00%	9	29.0
		100.00%	15	48.4
Microclimate And Outdoor Comfort. (Q3.5)	67.74±27.53%	0.00%	1	3.2
		25.00%	2	6.5
		50.00%	12	38.7
		75.00%	6	19.4
		100.00%	10	32.3
Neighborhood Pollution (Q3.6)	70.16±26.15%	0.00%	1	3.2
		25.00%	2	6.5
		50.00%	8	25.8
		75.00%	11	35.5
		100.00%	9	29.0
Access and mobility (Q3.7)	66.94±24.48%	0.00%	1	3.2
		25.00%	2	6.5
		50.00%	9	29.0
		75.00%	13	41.9
		100.00%	6	19.4
Thermal comfort (Q3.8)	70.16±26.94%	0.00%	1	3.2
		25.00%	3	9.7
		50.00%	6	19.4
		75.00%	12	38.7
		100.00%	9	29.0
Environment impact assessment (Q3.9)	76.61±29.53%	0.00%	2	6.5
		25.00%	1	3.2
		50.00%	5	16.1
		75.00%	8	25.8
		100.00%	15	48.4

	Mean	Rating	n	percent
Hazards materials (Q3.10)	64.52±32.12%	0.00%	1	3.2
		25.00%	8	25.8
		50.00%	4	12.9
		75.00%	8	25.8
		100.00%	10	32.3

Table 5: Development of Green Building Attributes

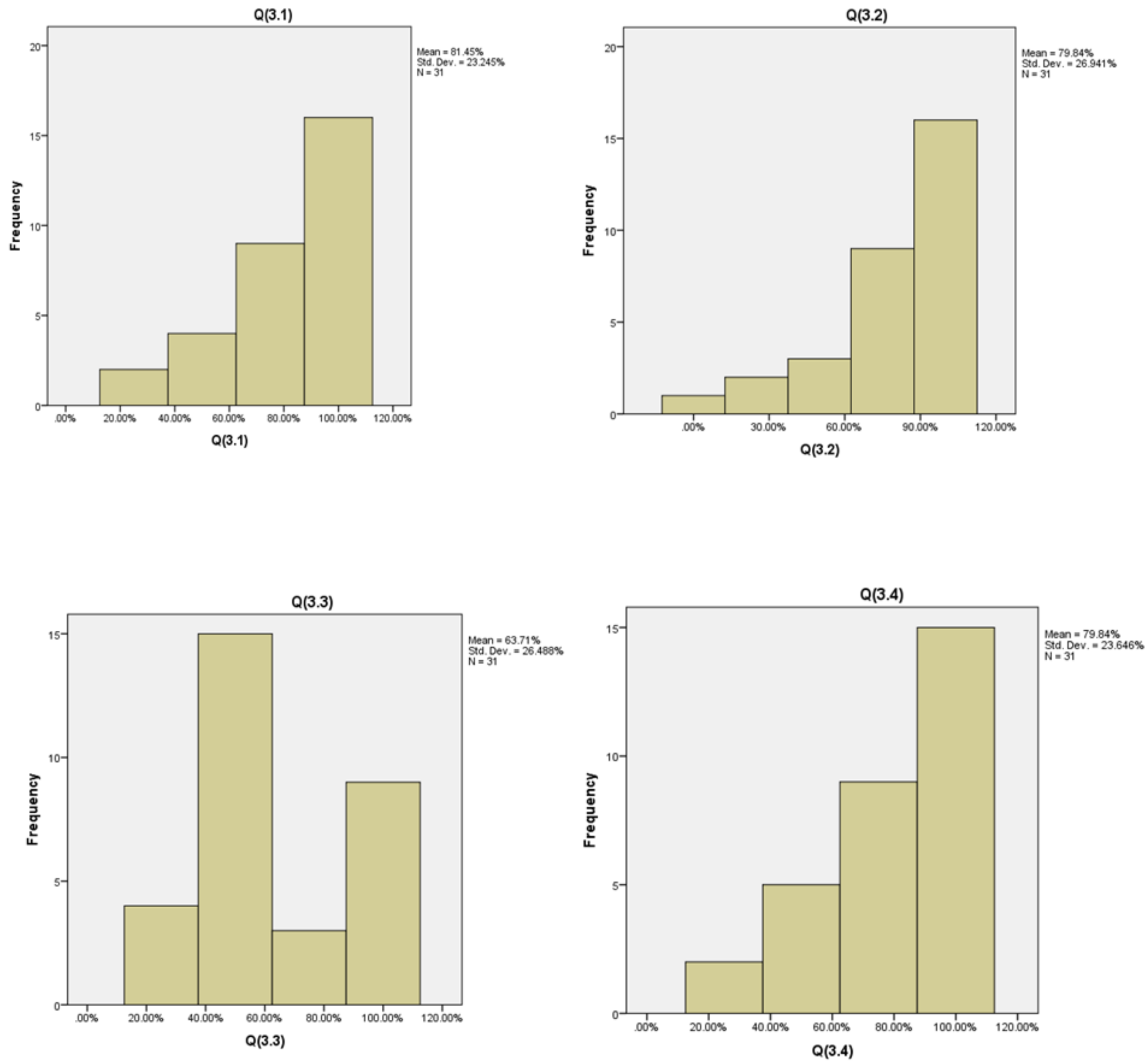


Figure 6: Frequencies for Q3.1-Q3.4

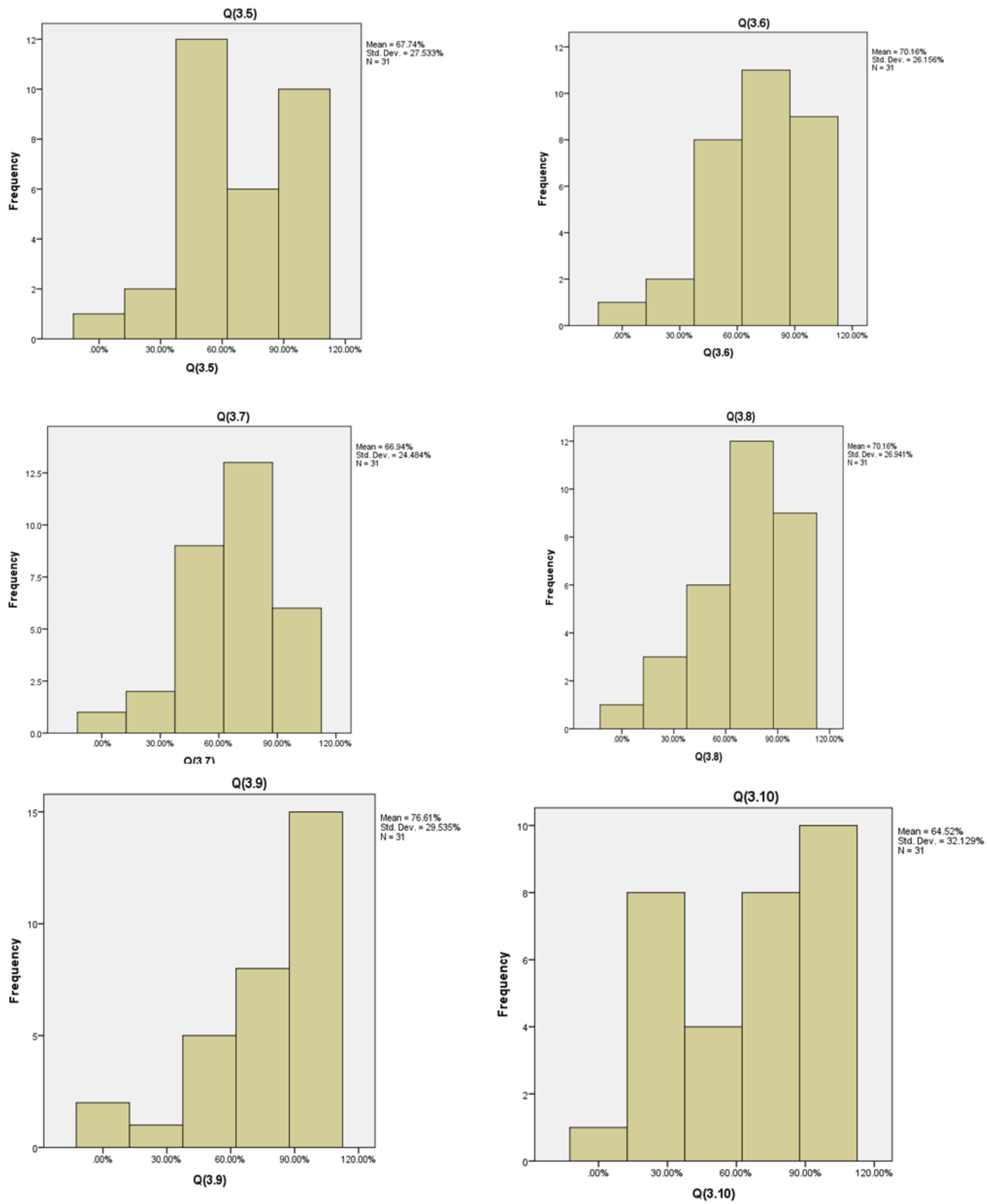


Figure 7: Frequencies for Q3.5-Q3.10

5.5 GB Performance Attributes

5.5.1 Q4: How important are the following financial performance attributes to the project value created by green building designs?

Participants were asked to rate the importance of financial attributes including improving economic efficiency, improving economic lifetime, increasing ROI, help in cut cost process of capital, increasing efficiency of Capex, positively influencing cost efficiency to the building, reducing payable fee, boosting sale prices, boosting rental prices, boosting occupancy rates, and improving economic efficiency. The responses from participants are summarized in Table 6. All of these financial performance attributes are perceived as important in GB designs in the UAE since all of them were rated above 50%.

	Mean %	Rating	n	percent
Improve Economic Efficiency (Q4.1)	79.84 (SD = 22.74)	25.00%	2	6.5
		50.00%	4	12.9
		75.00%	11	35.5
		100.00%	14	45.2
Improve Economic Lifetime (Q4.2)	88.71 (SD = 18.07)	25.00%	1	3.2
		50.00%	1	3.2
		75.00%	9	29.0
		100.00%	20	64.5
Increase Return On Investment (Q4.3)	78.23 (SD = 22.11)	25.00%	1	3.2
		50.00%	7	22.6
		75.00%	10	32.3
		100.00%	13	41.9
Help In Cut-Cost Process Of Capital (Q4.4)	73.39 (SD = 27.33)	25.00%	4	12.9
		50.00%	7	22.6
		75.00%	7	22.6
		100.00%	13	41.9
Increase Efficiency Of The Capital Expenditure (Capex) (Q4.5)	70.97 (SD = 23.36	25.00%	1	3.2
		50.00%	13	41.9
		75.00%	7	22.6
		100.00%	10	32.3
Positively Influence Cost Efficiency To The Building (Q4.6)	75.00 (SD = 25.00)	25.00%	3	9.7
		50.00%	6	19.4
		75.00%	10	32.3
		100.00%	12	38.7
Reduce Payable Fee (Q4.7)	73.39 (SD = 22.30)	25.00%	1	3.2
		50.00%	10	32.3
		75.00%	10	32.3
		100.00%	10	32.3
Boost Sale Prices (Q4.8)	70.97 (SD = 20.51)	25.00%	1	3.2
		50.00%	10	32.3
		75.00%	13	41.9
		100.00%	7	22.6
Boost Rental Prices(Q4.9)	68.55 (SD = 24.97)	25.00%	4	12.9
		50.00%	8	25.8
		75.00%	11	35.5
		100.00%	8	25.8
Boost Occupancy rates (Q4.10)	68.55 (SD = 26.59)	25.00%	5	16.1
		50.00%	7	22.6
		75.00%	10	32.3
		100.00%	9	29.0

Table 6: Financial Performance Drivers

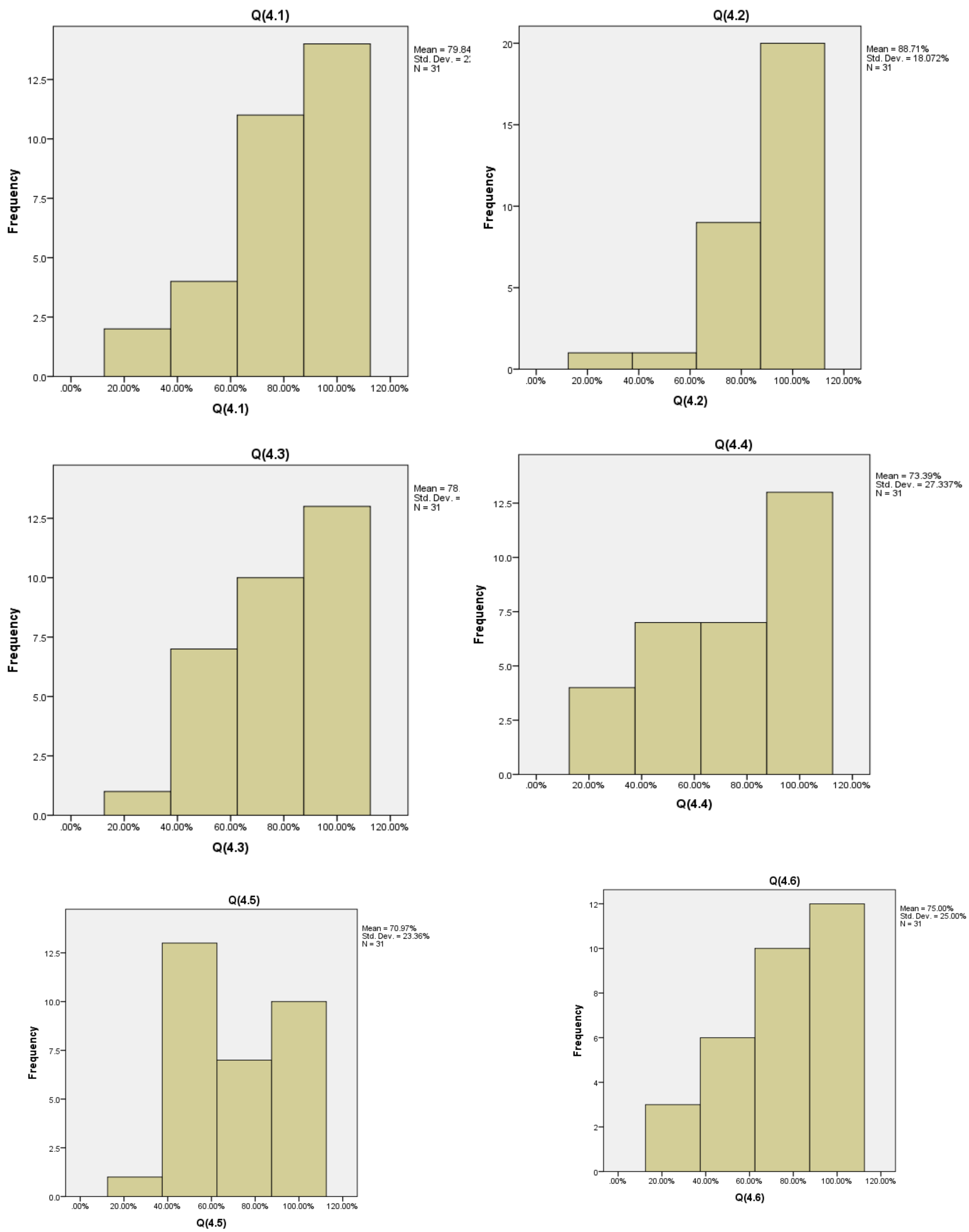


Figure 8: Frequencies for Q 4.1-4.6

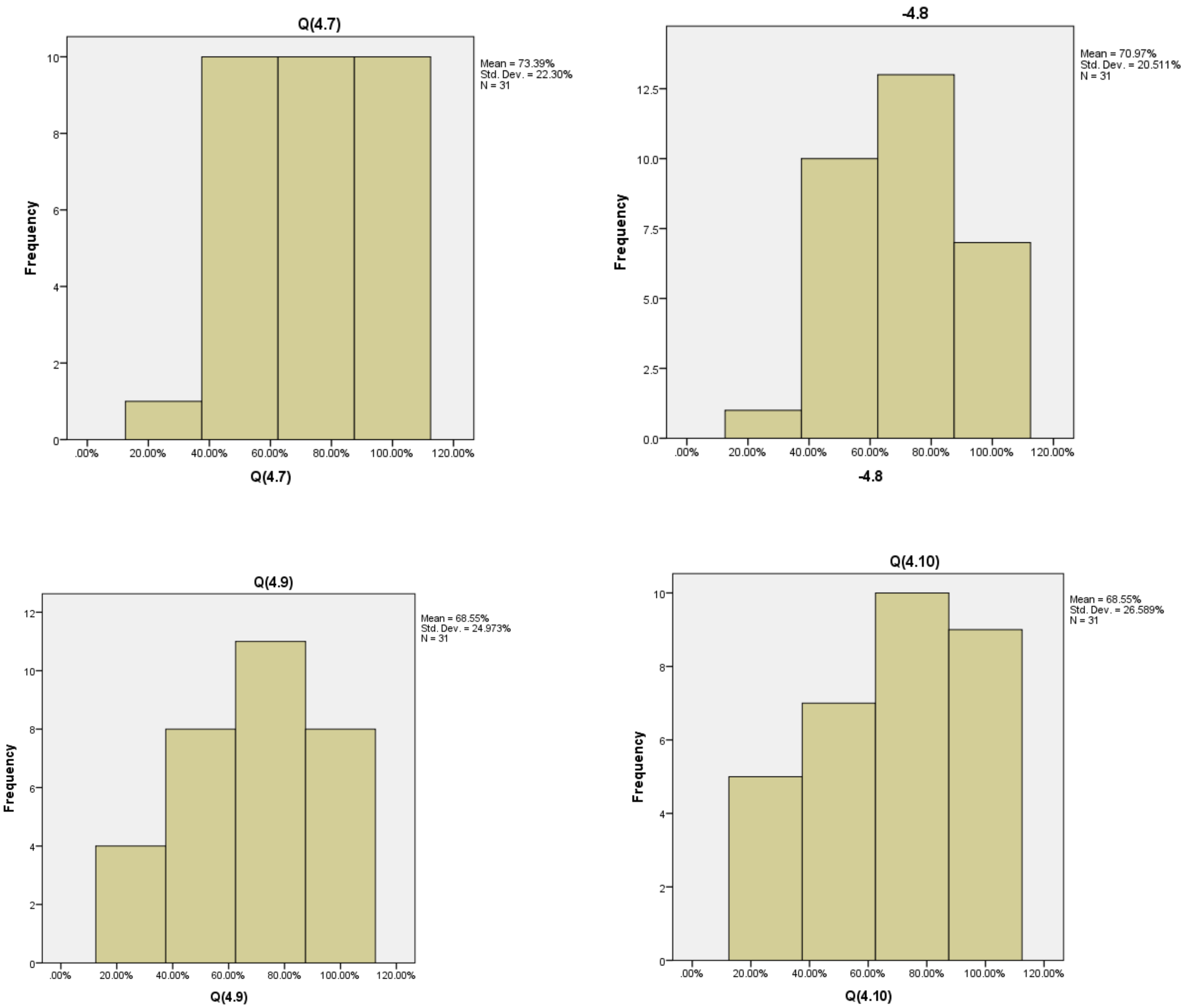


Figure 9: Frequencies for Q 4.7-Q4.10

5.5.2 Q5: How important are the following functional performance drivers affect attributes to the project value created by green building designs?

Several functional performance attributes of GB were examined with respect to their importance as perceived by participants including They include maintaining the building's adaptability; suitability for growth; increasing ease of use; upgrading the building's efficiency; facilitating accessibility; maintaining security, health, and safety; ensuring convenience; satisfying all building requirements and regulations; making sure that the building design follows established standards; reducing the risk of failure; and increasing the strength and stability of the building. Other functional performance attributes of GBs include ensuring favorable superstructure performance; ensuring favorable exterior construction performance; ensuring favorable roofing performance; ensuring interior construction performance; ensuring mechanical functional performance; and ensuring electrical functional performance. Table 7 presents a summary of their responses. The results show that all these attributes are perceived as important in GB designs.

	Mean %	Rating	n	percent
Maintain Adaptability Of The Building (Q5.1)	75.00 (SD = 21.40)	25.00%	2	6.5
		50.00%	5	16.1
		75.00%	15	48.4
		100.00%	9	29.0
Be Suitable For Growth (Q5.2)	79.84 (SD = 24.51)	25.00%	3	9.7
		50.00%	3	9.7
		75.00%	10	32.3
		100.00%	15	48.4
Increase Ease Of Use (Q5.3)	79.84 (SD = 21.81)	25.00%	2	6.5
		50.00%	3	9.7
		75.00%	13	41.9
		100.00%	13	41.9

Upgrade Efficiency Of The Building (Q5.4)	85.48 (SD = 19.12)	25.00%	1	3.2
		50.00%	2	6.5
		75.00%	11	35.5
		100.00%	17	54.8
	Mean %	Rating	n	percent
Allow/Ease Of/Control/Secure Accessibility (Q5.5)	78.23 (SD = 28.68	0.00%	1	3.2
		25.00	2	6.5
		50.00%	6	19.4
		75.00%	9	29.0
		100.00%	13	41.9
Maintain Security, Health And Safety (Q5.6)	77.42 (SD = 23.58)	0.00%	1	3.2
		25.00%	3	9.7
		50.00%	3	9.7
		75.00%	8	25.8
		100.00%	16	51.6
Ensure Convenience (Q5.7)	80.65 (SD =30.07)	25.00%	2	6.5
		50.00%	6	19.4
		75.00%	10	32.3
		100.00%	13	41.9
Meet All Building Regulations And Requirements (Q5.8)	78.23 (SD = 29.39)	25.00%	2	6.5
		50.00%	1	3.2
		75.00%	4	12.9
		100.00%	5	16.1
Ensure Designed Elements Are As Per Standards (Q5.9)	60.94 (SD = 31.87)	0.00%	2	6.5
		25.00%	1	3.2
		50.00%	4	12.9
		75.00%	8	25.8
		100.00%	16	51.6
Reduction Of Risk Failure (Q5.10)	66.94 (SD = 29.14)	0.00%	2	6.5
		25.00%	3	9.7
		50.00%	10	32.3
		75.00%	4	12.9
		100.00%	12	38.7
Increases Stability And Strength Of The Building (Q5.11)	75.00 (SD = 30.27)	0.00%	2	6.5
		25.00%	2	6.5
		50.00%	9	29.0
		75.00%	9	29.0
		100.00%	9	29.0
Ensure Superstructure/Infrastructure Functional Requirements Meet A Favorable Level Of Building Performance (Q5.12)	78.23 (SD = 25.61)	0.00%	2	6.5
		25.00%	1	3.2
		50.00%	7	22.6
		75.00%	6	19.4

	Mean %	Rating	n	percent
Ensure Roofing Closure Functional Requirements Meet A Favorable Level Of Building Performance (Q5.14)	75.00 (SD = 19.36)	50.00%	8	25.8
		75.00%	11	35.5
		100.00%	12	38.7
Ensure Interior Construction Functional Requirements Meet A Favorable Level Of Building Performance (Q5.15)	83.26 (SD = 20.60)	50.00%	9	29.0
		75.00%	13	41.9
		100.00%	9	29.0
Ensure Mechanical Functional Requirements Will Meet A Favorable Level Of Building Performance. (Q5.16)	83.06 (SD = 20.80)	50.00%	7	22.6
		75.00%	8	25.8
		100.00%	16	51.6
Ensure Electrical Functional Will Meet A Favorable Level Of Building Performance (Q5.17)	75.00 (SD = 30.27)	50.00%	7	22.6
		75.00%	7	22.6
		100.00%	17	54.8

Table 7: Functional Performance Drivers

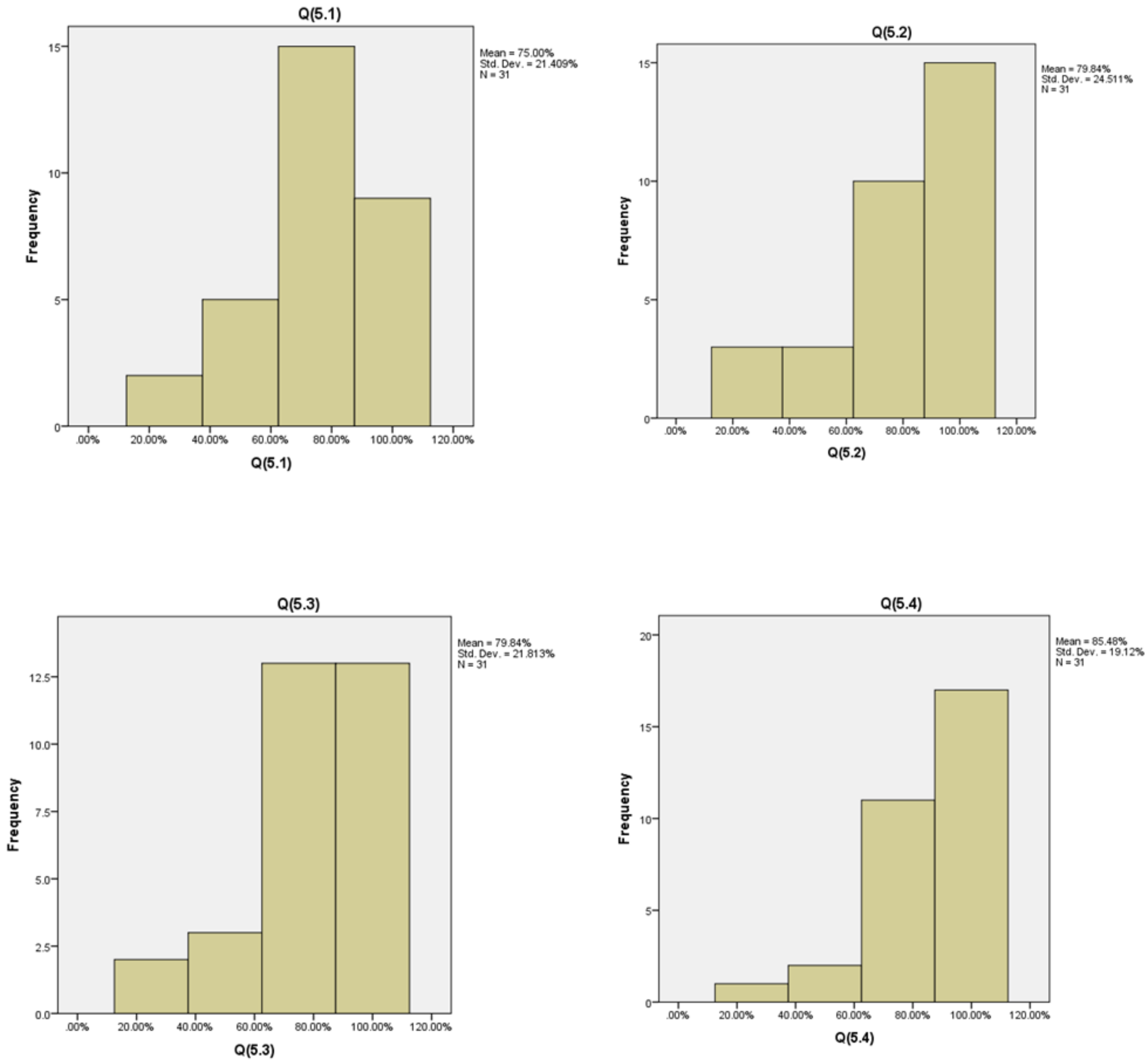


Figure 10: Frequencies for Q5.1-Q5.4

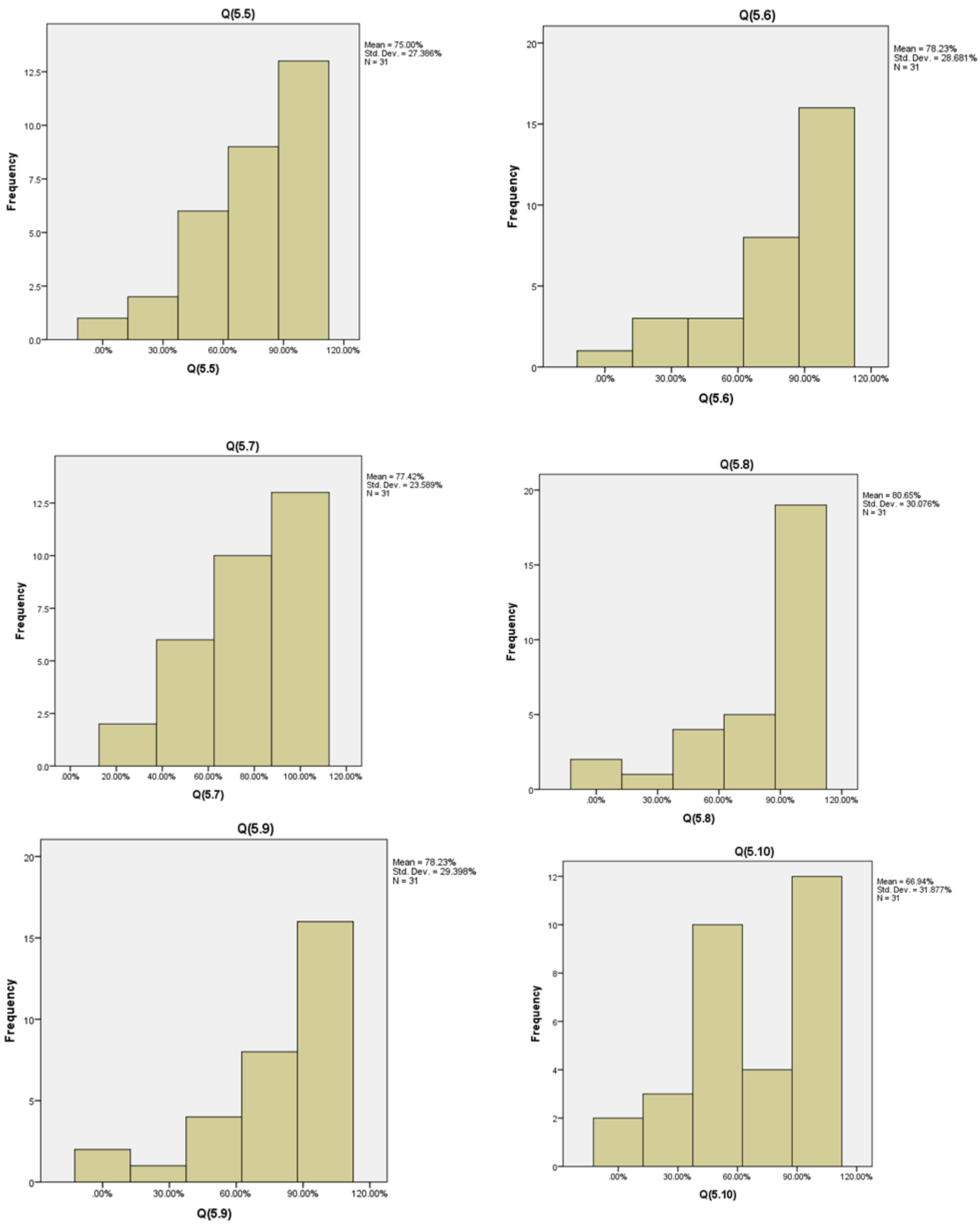


Figure 11: Frequencies for Q5.5-Q5.10

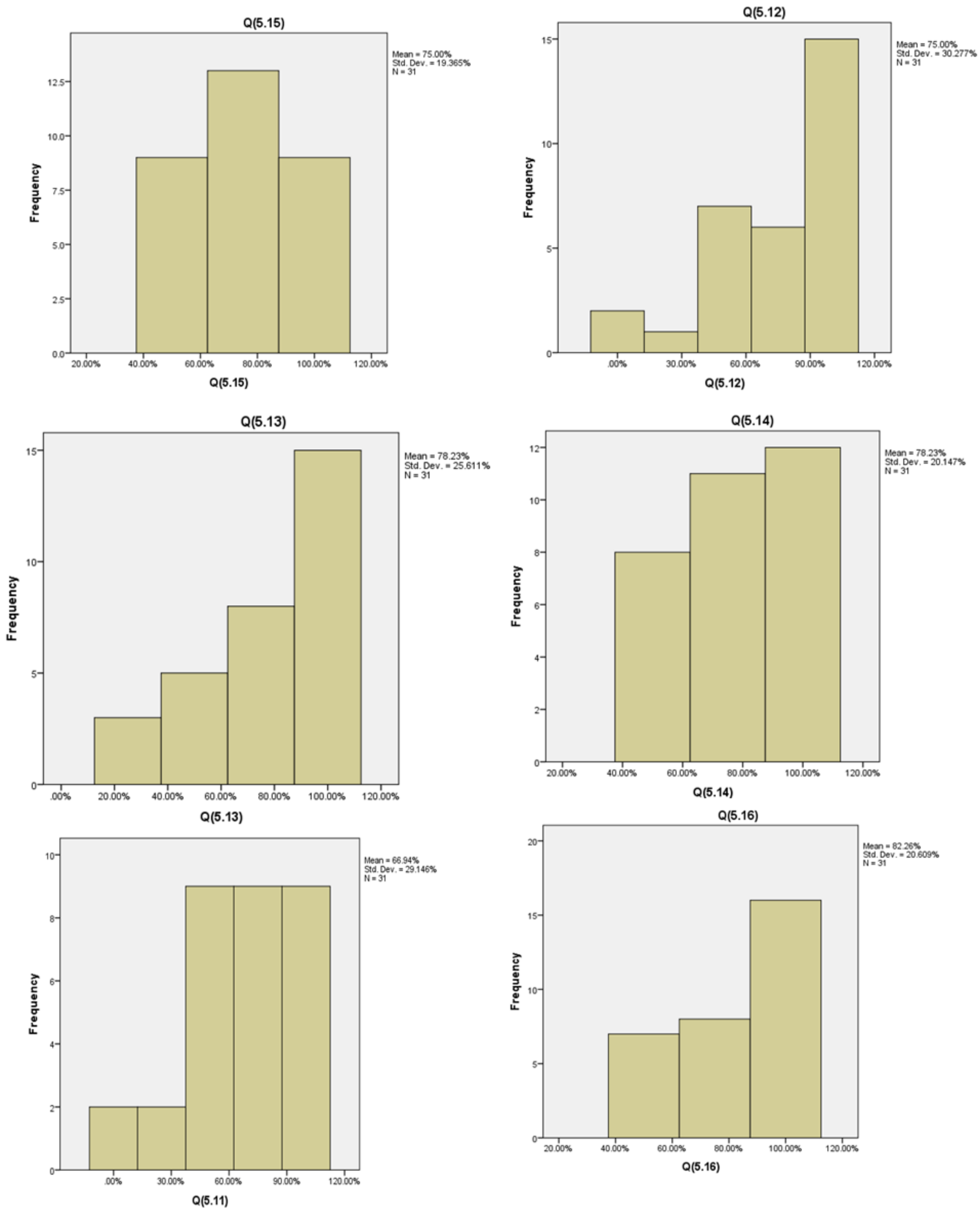


Figure 12: Frequencies for Q5.11-Q5.16

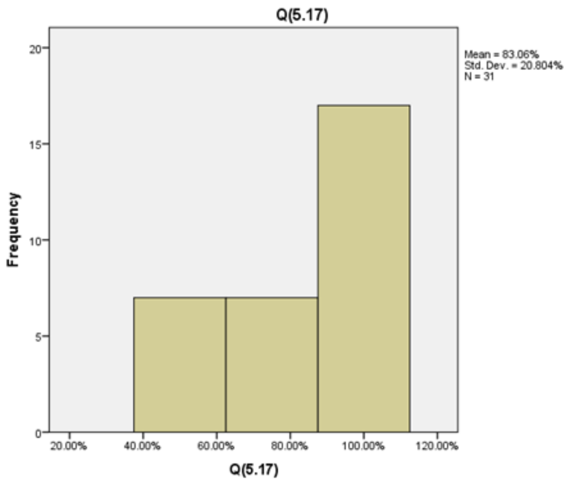


Figure 13: Frequency for Q 5.17

5.5.3 Q6: How important are the following operational performance driver's attributes to the project value created by green building designs?

Attributes of operational performance were also examined with respect to their perceived importance in GB designs from the perspective of the participants. Table 8 below shows the responses from participants regarding the perceived importance of the attributes including reducing energy consumption; maintaining energy efficiency; easy maintaining, managing, cleaning and operating equipment; suitability for telecommunications; easing security operations; improving waste management; and managing operational risk (reducing failure). All these operational performance attributes of GB design were perceived by the respondents to be important in the UAE.

	Mean %	Rating	n	percent
Reduce/Save Energy Consumption(Q6.1)	83.06 (SD = 18.69)	25.00%	5	16.1
		50.00%	11	35.5
		75.00%	15	48.4
		100.00%	5	16.1
Maintain Energy Efficiency (Q6.2)	83.87 (SD = 20.09)	25.00%	2	6.5
		50.00%	1	3.2
		75.00%	12	38.7
		100.00%	16	51.6
Equipment Are Easy To Maintain, Manage, Clean And Operate (Q6.3)	79.84 (SD = 22.74)	25.00%	2	6.5
		50.00%	4	12.9
		75.00%	11	35.5
		100.00%	14	45.2
Suitable For Telecommunications (Q6.4)	75.81 (SD = 22.81)	25.00%	2	6.5
		50.00%	6	19.4
		75.00%	12	38.7
		100.00%	11	35.5
Help Ease Security Operations(Q6.5)	70.97 (SD = 28.20	0.00%	2	6.5
		50.00%	10	32.3
		75.00%	8	25.8
		100.00%	11	35.5
Improve Waste Management (Q6.6)	81.45 (SD = 22.33)	25.00%	1	3.2
		50.00%	6	19.4
		75.00%	8	25.8
		100.00%	16	51.6
Manage Operation Risk. (Reduce Failure) (Q6.7)	74.19 (SD = 26.20)	25.00%	3	9.7
		50.00%	8	25.8
		75.00%	7	22.6
		100.00%	13	41.9

Table 8: Operational Performance Drivers

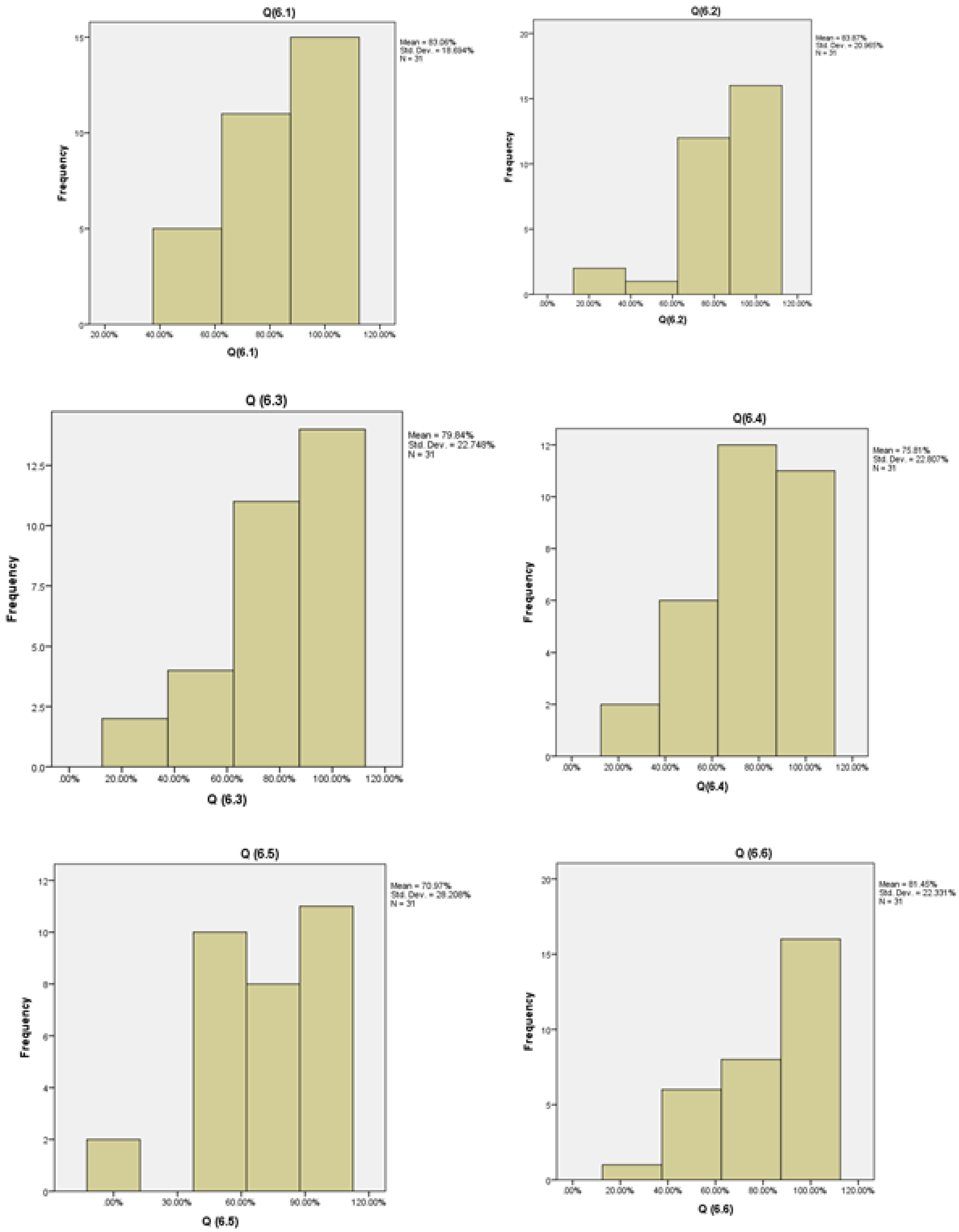


Figure 14: Frequency for Q 6.1-Q 6.6

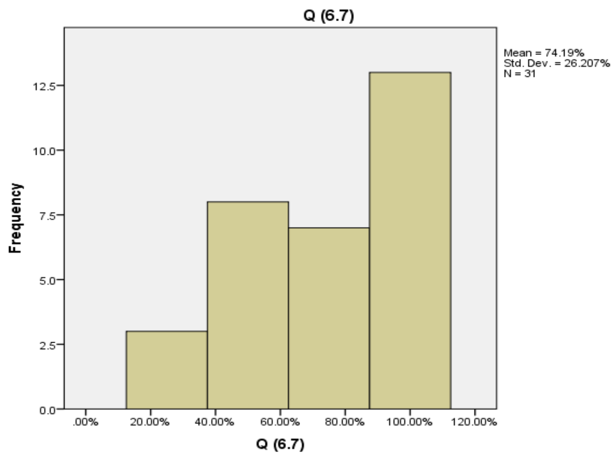


Figure 15: Frequency for Q 6.7

5.5.4 Q7: How important are the following environmental performance driver's attributes to the project value created by green building designs?

The responses from participants regarding the importance of environmental attributes are presented in Table 9. All the environment performance attributes were perceived to be important in GB design.

	Mean %	Rating	n	percent
Low Carbon Environment (Q7.1)	87.90 (SD = 18.11)	50.00%	4	12.9
		75.00%	7	22.6
		100.00%	20	64.5
Save Energy Consumption (Q7.2)	91.94 (SD = 13.52)	50.00%	1	3.2
		75.00%	8	25.8
		100.00%	22	71.0
Maintain Natural Light, Ventilation Into The Building (Q7.3)	85.48 (SD = 23.07)	25.00%	2	6.5
		50.00%	3	9.7
		75.00%	6	19.4
		100.00%	20	64.5
Manage Air Quality Used In The Building (Q7.4)	86.29 (SD = 18.07)	50.00%	4	12.9
		75.00%	9	29.0
		100.00%	18	58.1
Reduce Polluted Weight (Q7.5)	81.45 (SD = 21.37	25.00%	1	3.2
		50.00%	5	16.1
		75.00%	10	32.3
		100.00%	15	48.4
Use Of The Reusable Resources. (Q7.6)	81.45 (SD = 19.33)	50.00%	6	19.4
		75.00%	11	35.5
		100.00%	14	45.2
Use Of Low Maintenance, Durable And Environment Friendly Material For The Building (Q7.7)	82.26 (SD =18.47)	50.00%	5	16.1
		75.00%	12	38.7
		100.00%	14	45.2
Ensure Lighting And Ventilation Functional Will Meet A Favorable Level Of Building Performance (Q7.8)	87.90 (SD = 14.24)	50.00%	1	3.2
		75.00%	13	41.9
		100.00%	17	54.8
Conserve Water Resources. (Q7.9)	83.87 (SD = 21.93)	25.00%	2	6.5
		50.00%	2	6.5
		75.00%	10	32.3
		100.00%	17	54.8
Maximize Building Adaption To The Future Natural/Climate Changes (Q7.10)	82.26 (SD = 21.59)	50.00%	8	25.8
		75.00%	6	19.4
		100.00%	17	54.8

Table 9: Environment Performance Drivers

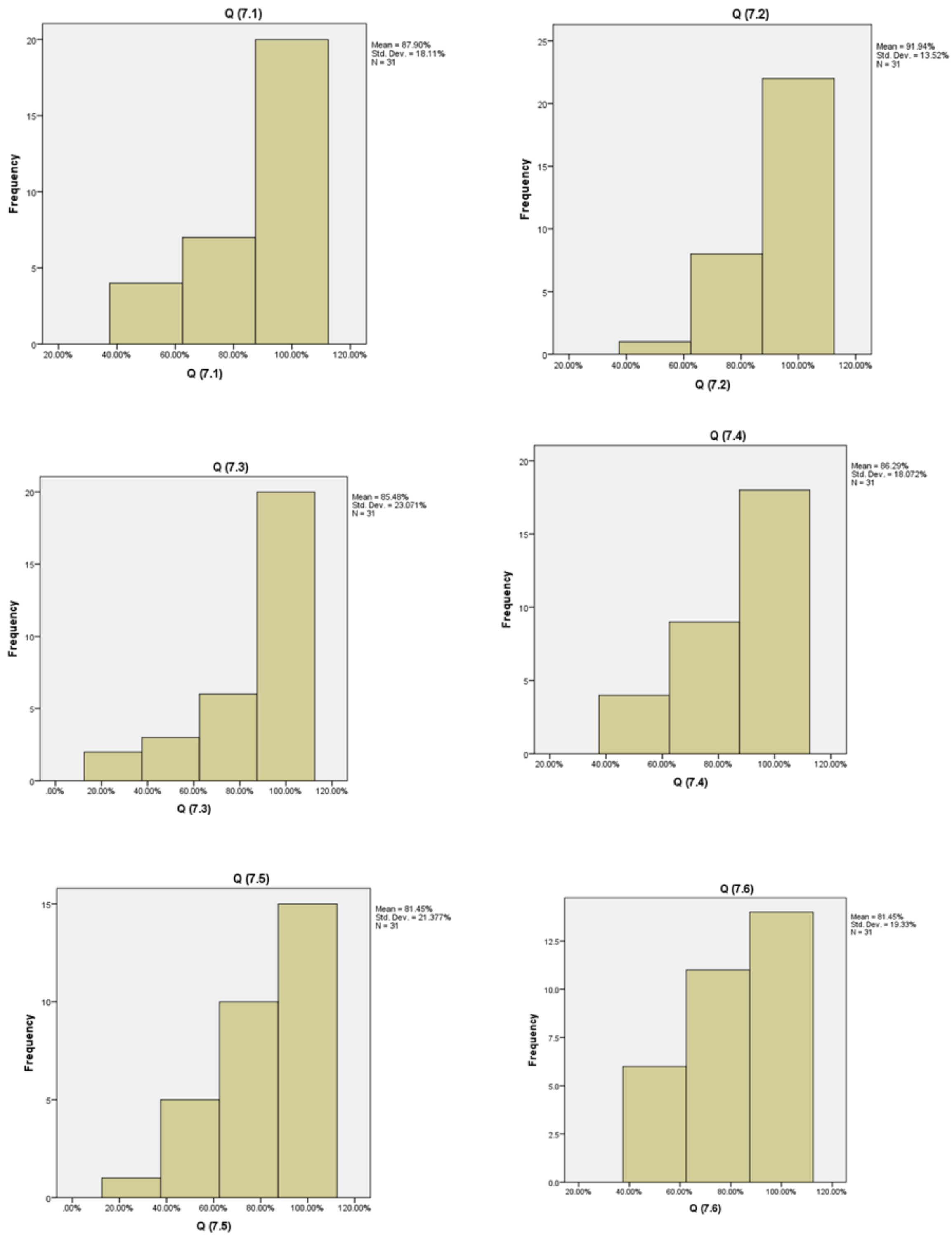


Figure 16: Frequencies for Q 7.1 – Q 7.6

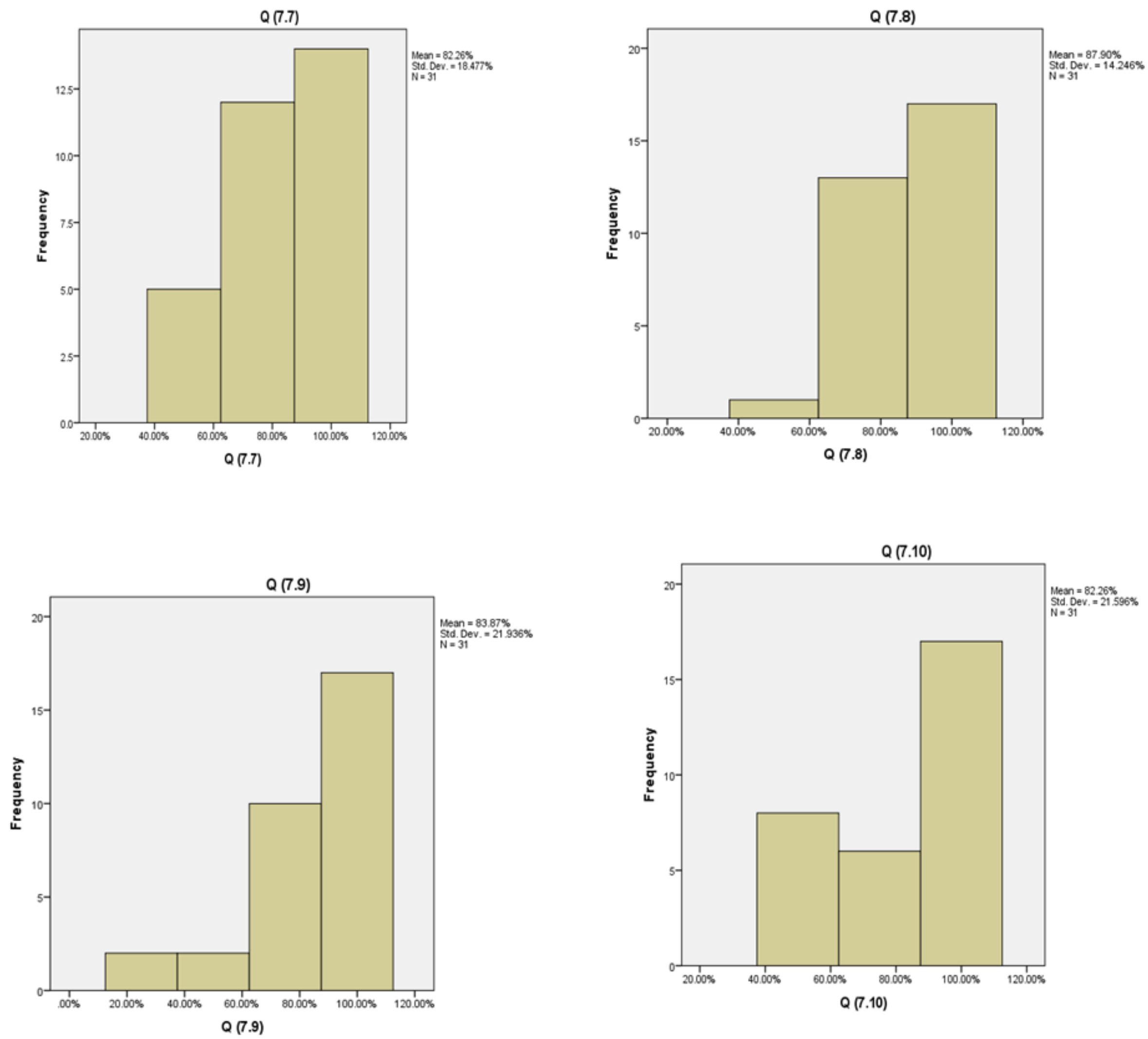


Figure 17: Frequencies for Q 7.7-Q7.10

5.5.5 Q8: How important are the following management performance drivers attributes to the project value created by green building designs?

The importance of management performance attributes driving the adoption of GB in UAE was also examined. The findings of the survey on this aspect are presented in Table 10. The results indicate that all the management attributes are important in driving GB adoption in the UAE including include maximizing project management efficiency and delivery; enhancing risk management; maximizing organizational efficiency; ensuring that project objectives are achieved; increasing stakeholders interaction; and leading work design and delivery planning.

	Mean %	Rating	n	percent
Maximize Project Management Efficiency And Delivery (Q8.1)	75.81 (SD = 26.99)	25.00%	4	12.9
		50.00%	5	16.1
		75.00%	8	25.8
		100.00%	14	45.2
Enhance Risk Management (Q8.2)	73.39 (SD = 22.30)	25.00%	3	9.7
		50.00%	4	12.9
		75.00%	16	51.6
		100.00%	8	25.8
Maximize Organizational Efficiency (Q8.3)	72.58 (SD = 29.12)	25.00%	5	16.1
		50.00%	7	22.6
		75.00%	5	16.1
		100.00%	14	45.2
Ensure Achieving Project Objectives (Q8.4)	77.42 (SD = 26.10)	25.00%	3	9.7
		50.00%	6	19.4
		75.00%	7	22.6
		100.00%	15	48.4
Increase Stakeholders Interaction (Q8.5)	66.94 (SD = 25.32	25.00%	5	16.1
		50.00%	7	22.6
		75.00%	12	38.7
		100.00%	7	22.6
Lead Work Design And Delivery Planning. (Q8.6)	79.84 (SD = 18.73)	25.00%	6	19.4
		50.00%	13	41.9
		75.00%	12	38.7
		100.00%	6	19.4

Table 10: Management Performance Drivers

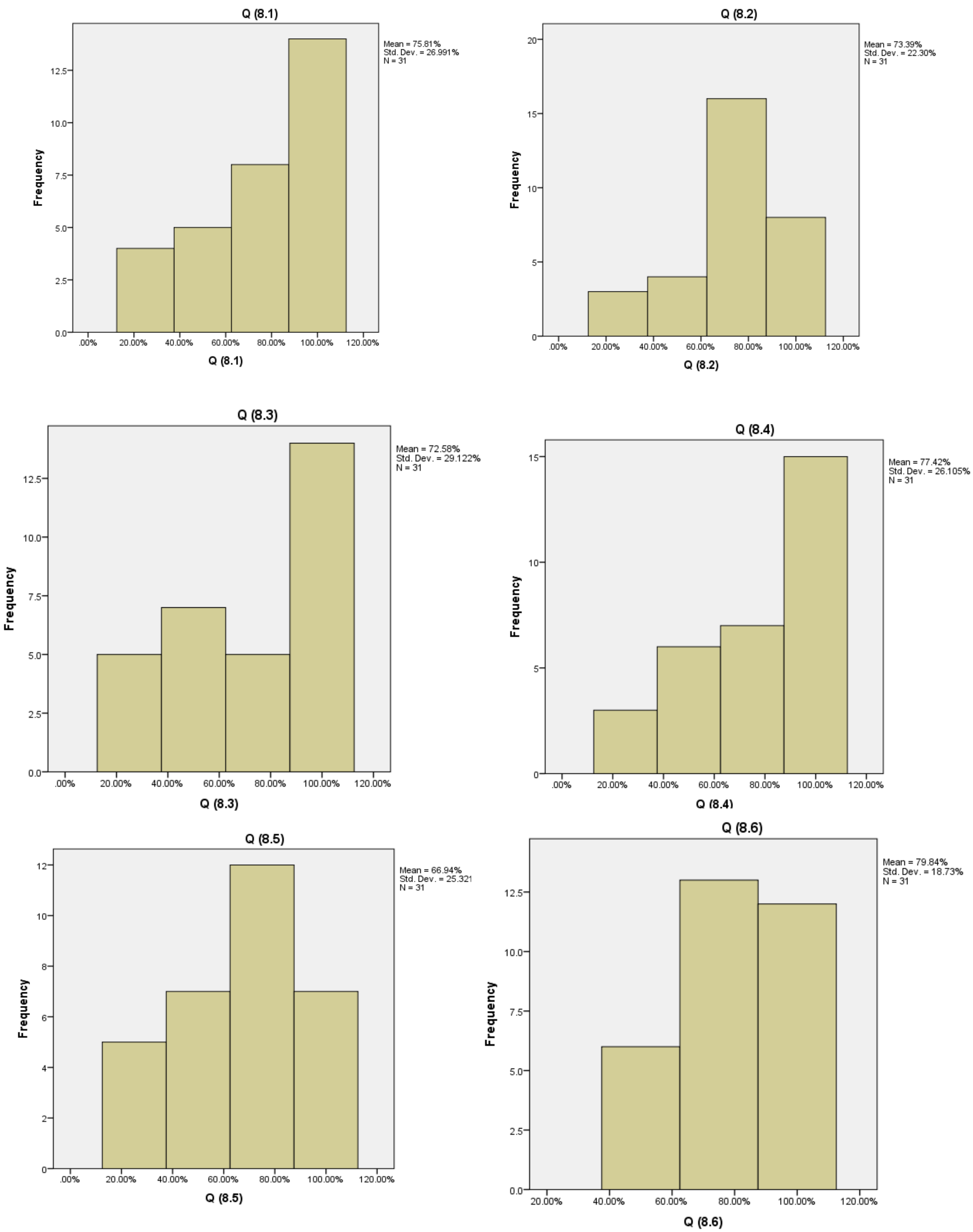


Figure 18: Frequencies for Q 8.1-Q 8.6

5.6 Q9: After implementing green building system, what beneficial returns will mostly impact on your company?

Participants were asked to rate the beneficial returns that are most likely to affect their organization in terms of financial benefits/cost reduction; maximizing property value, lessee demand, company reputation, personal beliefs, codes and regulations, and environmental interest. These findings are summarized in Table 11. All these impacts were reported to be beneficial for the participants' organizations.

	Mean %	Rating	n	percent
Financial Benefits/Cost Reduction/Maximize Value Of Property (Q9.1)	75.00 (SD = 26.61)	25.00%	3	9.7
		50.00%	8	25.8
		75.00%	6	19.4
		100.00%	14	45.2
Lessee Demand (Q9.2)	70.97 (SD = 25.89)	25.00%	4	12.9
		50.00%	7	22.6
		75.00%	10	32.3
		100.00%	10	32.3
Company Reputation (Q9.3)	84.68 (SD = 29.12)	25.00%	2	6.5
		50.00%	4	12.9
		75.00%	5	16.1
		100.00%	20	64.5
Personal Beliefs (Q9.4)	75.00 (SD = 24.15)	0.00%	1	3.2
		25.00%	1	3.2
		50.00%	5	16.1
		75.00%	14	45.2
		100.00%	10	32.3
Codes And Regulations (Q9.5)	87.90 (SD = 21.28	25.00%	1	3.2
		50.00%	4	12.9
		75.00%	4	12.9
		100.00%	22	71.0
Environment Interest (Q9.6)	88.71 (SD = 16.88)	50.00%	3	9.7
		75.00%	8	25.8
		100.00%	20	64.5

Table 11: Beneficial returns of implementing green building systems

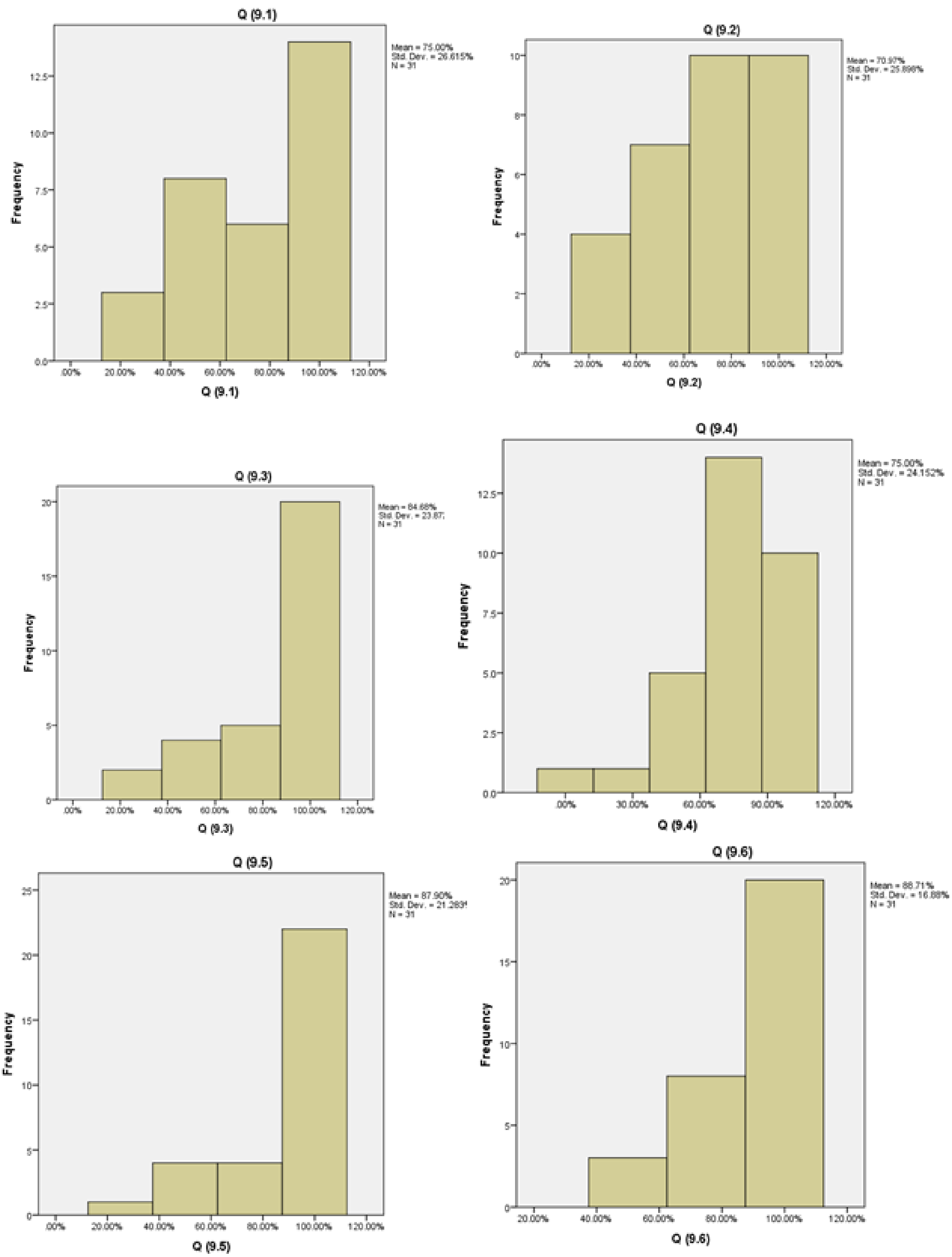


Figure 19: Frequencies for Q 9.1-Q 9.6

5.7 Q10: How would you evaluate your implementation to each category of "al Sa'fat" evaluation system in UAE?

Respondents evaluated the implementation of the each category of the Al Sa'fat evaluation system in the UAE including the general requirements, Bronze Sa'fa requirements, Silver Sa'fa Requirements, Gold Sa'fa Requirements, and Platinum Sa'fa Requirements, which are summarized in Table 13. All these requirements received favorable evaluations that were above average.

	Mean %	Rating	n	percent
General Requirement. (Q10.1)	83.87 (SD = 23.76)	25.00%	2	6.5
		50.00%	4	12.9
		75.00%	6	19.4
		100.00%	19	61.3
Bronze Sa'fa Requirements.(Q10.2)	75.00 (SD = 24.15)	25.00%	2	6.5
		50.00%	8	25.8
		75.00%	9	29.0
		100.00%	12	38.7
Silver Sa'fa Requirements (Q10.3)	70.97 (SD = 25.89)	0.00%	1	3.2
		25.00%	2	6.5
		50.00%	7	22.6
		75.00%	12	38.7
		100.00%	9	29.0
Gold Sa'fa Requirements (Q10.4)	68.55 (SD = 31.60)	0.00%	1	3.2
		25.00%	6	19.4
		50.00%	5	16.1
		75.00%	7	22.6
		100.00%	12	38.7
Platinum Sa'fa Requirements (Q10.5)	67.74 (SD =34.27	0.00%	2	6.5
		25.00%	6	19.4
		50.00%	4	12.9
		75.00%	6	19.4
		100.00%	13	41.9

Table 12: Implementation of Al Sa'fat requirements

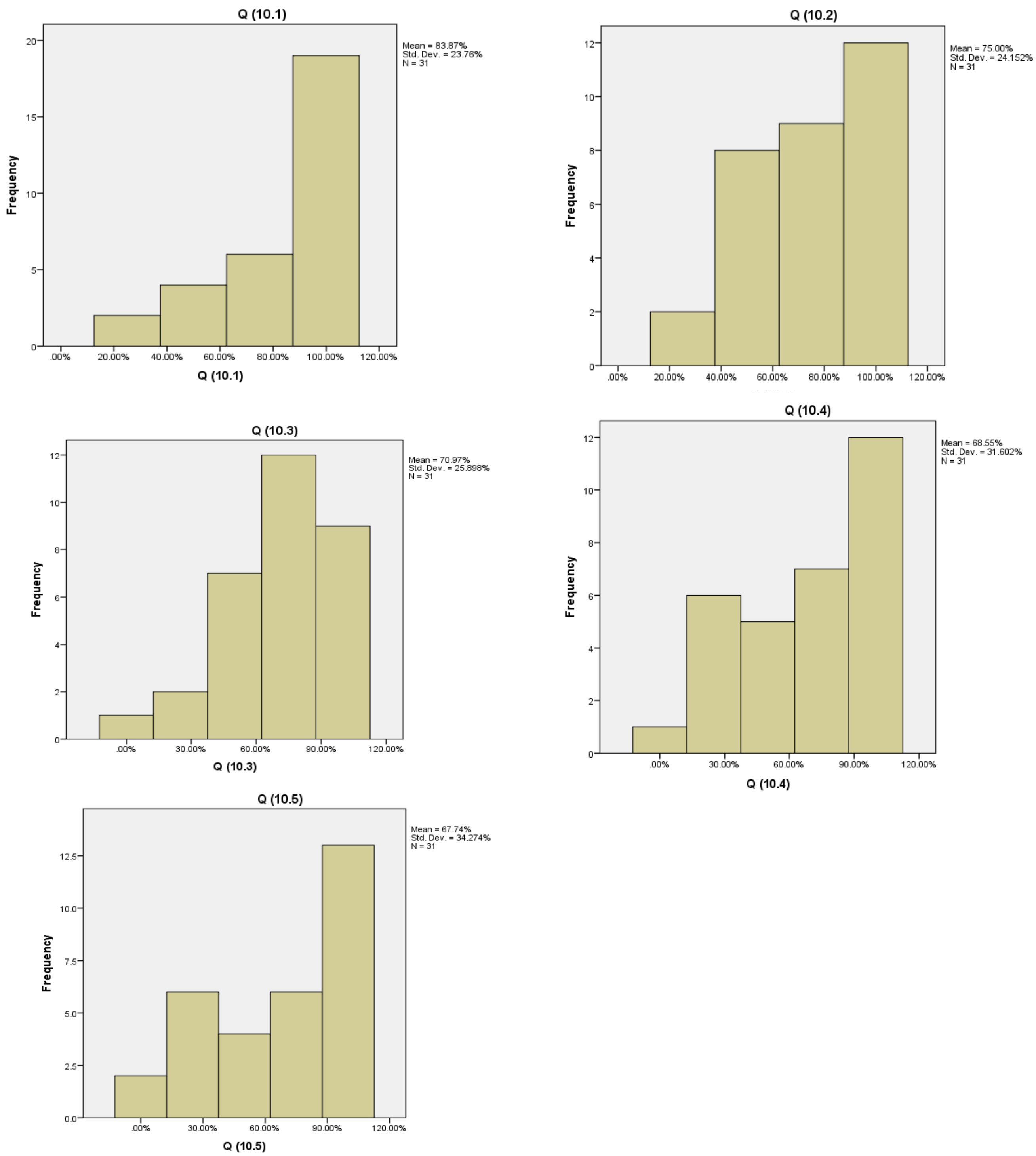


Figure 20: Frequencies for Q 10.1 - Q10.5

5.8 Q 11: How could you increase the consultant team, managers, authorities and public awareness about "Al Sa'fat" evaluation system in UAE?

Respondents were requested to rate the various ways that could be used to enhance the awareness about the Al Sa'fat evaluation system among consultants, managers, authorities, and the public. They evaluated training, outreach and partnerships; print advertising; internet ads; broadcast; news release; trade shows; and website. Their evaluations are presented in Table 13, which shows that all of the strategies to enhance GB awareness were favorably evaluated.

	Mean %	Rating	n	percent
Training, Outreach And Partnerships.(Q11.1)	96.77 (SD = 10.68)	50.00%	1	3.2
		75.00%	2	6.5
		100.00%	28	90.3
Print Advertising (Q11.2)	70.16(SD = 26.94)	25.00%	4	12.9
		50.00	9	29.0
		75.00%	7	22.6
		100.00%	11	35.5
Internet Ads (Q11.3)	78.23 (SD = 23.04)	25.00%	2	6.5
		50.00%	5	16.1
		75.00%	11	35.5
		100.00%	13	41.9
Broadcast (Q11.4)	79.84 (SD = 24.51)	25.00%	1	3.2
		50.00%	9	29.0
		75.00%	4	12.9
		100.00%	17	54.8
News Release (Q11.5)	79.03 (SD = 24.23	25.00%	2	6.5
		50.00%	6	19.4
		75.00%	8	25.8
		100.00%	15	48.4
Tradeshows. (Q11.6)	77.342 (SD = 24.45)	25.00%	2	6.5
		50.00%	7	22.6
		75.00%	8	25.8
		100.00%	14	45.2
Web Site (Q11.7)	84.68 (SD =21.09)	25.00%	1	3.2
		50.00%	4	12.9
		75.00%	8	25.8
		100.00%	18	58.1

Table 13: Ways of Increasing Al sa'fat awareness among consultants, managers, authorities, and the public

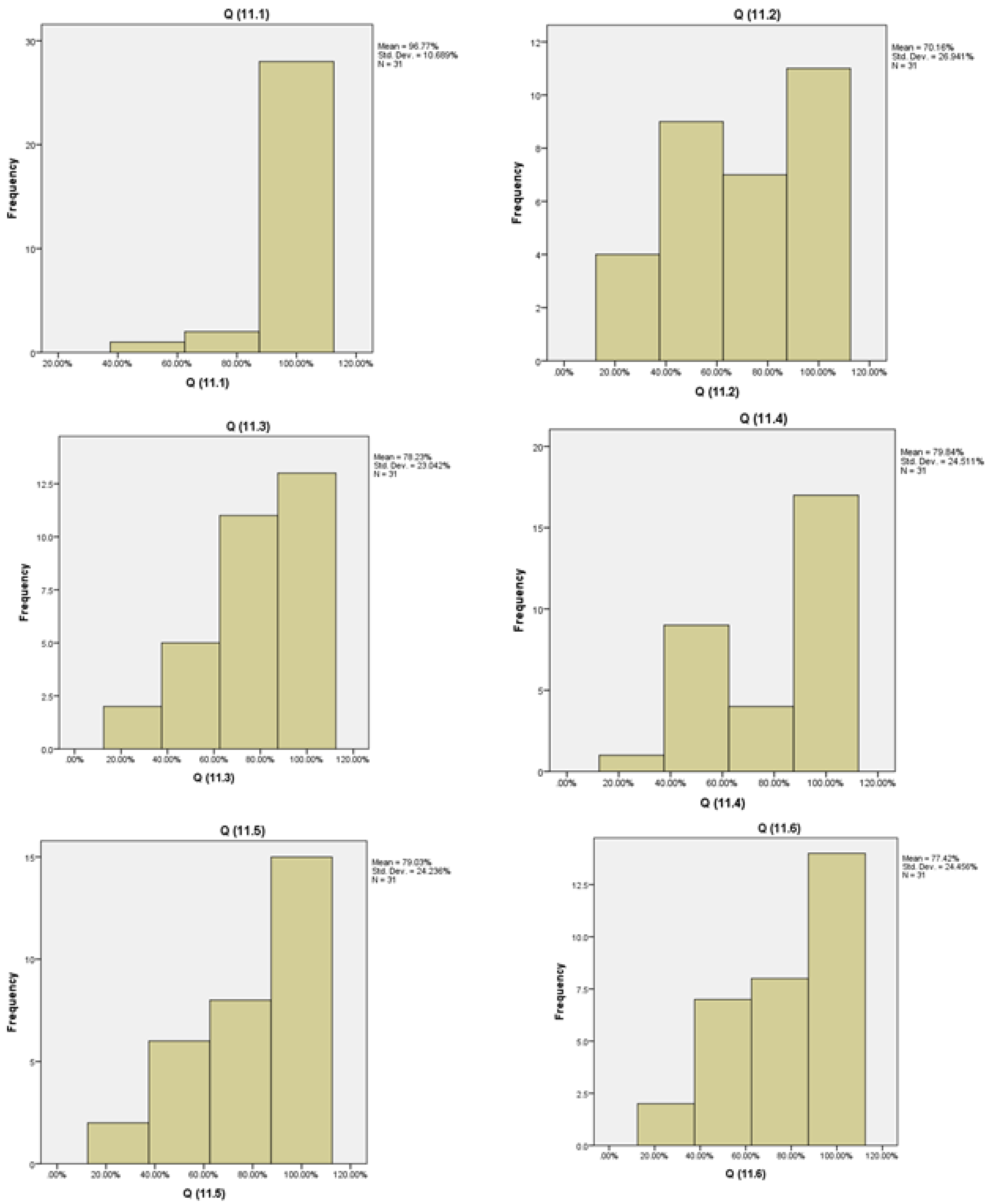


Figure 21: Frequencies for D 11.1 - Q 11.6

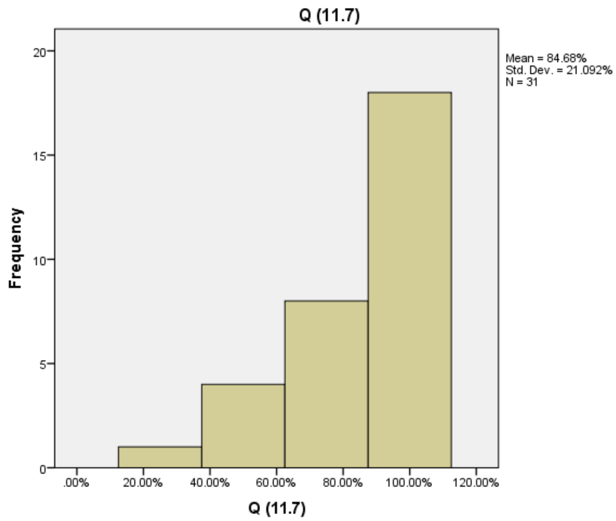


Figure 22: Frequency for Q 11.7

5.9 Q12: If a client is about to implement green building system on his/her property, which of below listed factors would matter in order of priority from your perspective and understanding?

Respondents evaluated the factors to be prioritized in the implementation of GBs including saving occupancy cost, increasing property value, decreasing obsolescence, maintaining healthier indoor air quality, increasing rent payment, and marketing prospect. Their evaluations are summarized in Table 14, which showed that all the factors will be prioritized in GB implementation.

	Mean %	Rating	n	percent
Saving Occupancy Cost Q12.1)	86.29 (SD = 19.19)	50.00%	5	16.1
		75.00%	7	22.6
		100.00%	19	61.3
Increase Value Of Property (Q12.2)	80.65 (SD = 23.01)	25.00%	2	6.5
		50.00	4	12.9
		75.00%	10	32.3
		100.00%	15	48.4
Decrease Obsolescence (Q12.3)	64.52 (SD = 22.14)	25.00%	3	9.7
		50.00%	12	38.7
		75.00%	11	35.5
		100.00%	5	16.1
Maintain Healthier Indoor Air Quality. (Q12.4)	80.65 (SD = 23.01)	25.00%	2	6.5
		50.00%	4	12.9
		75.00%	10	32.3
		100.00%	15	48.4
Increase Rent Payment.(Q12.5)	66.94 (SD = 28.42	25.00%	5	16.1
		50.00%	11	35.5
		75.00%	4	12.9
		100.00%	11	35.5
Marketing Prospect (I.E., Enhance Building O Better Company Image). (Q12.6)	75.00 (SD = 28.13)	0.00%	1	3.2
		25.00%	3	9.7
		50.00%	4	12.9
		75.00%	10	32.3
		100.00%	13	41.9

Table 14: Important Factors for Clients Seeking to implement green building

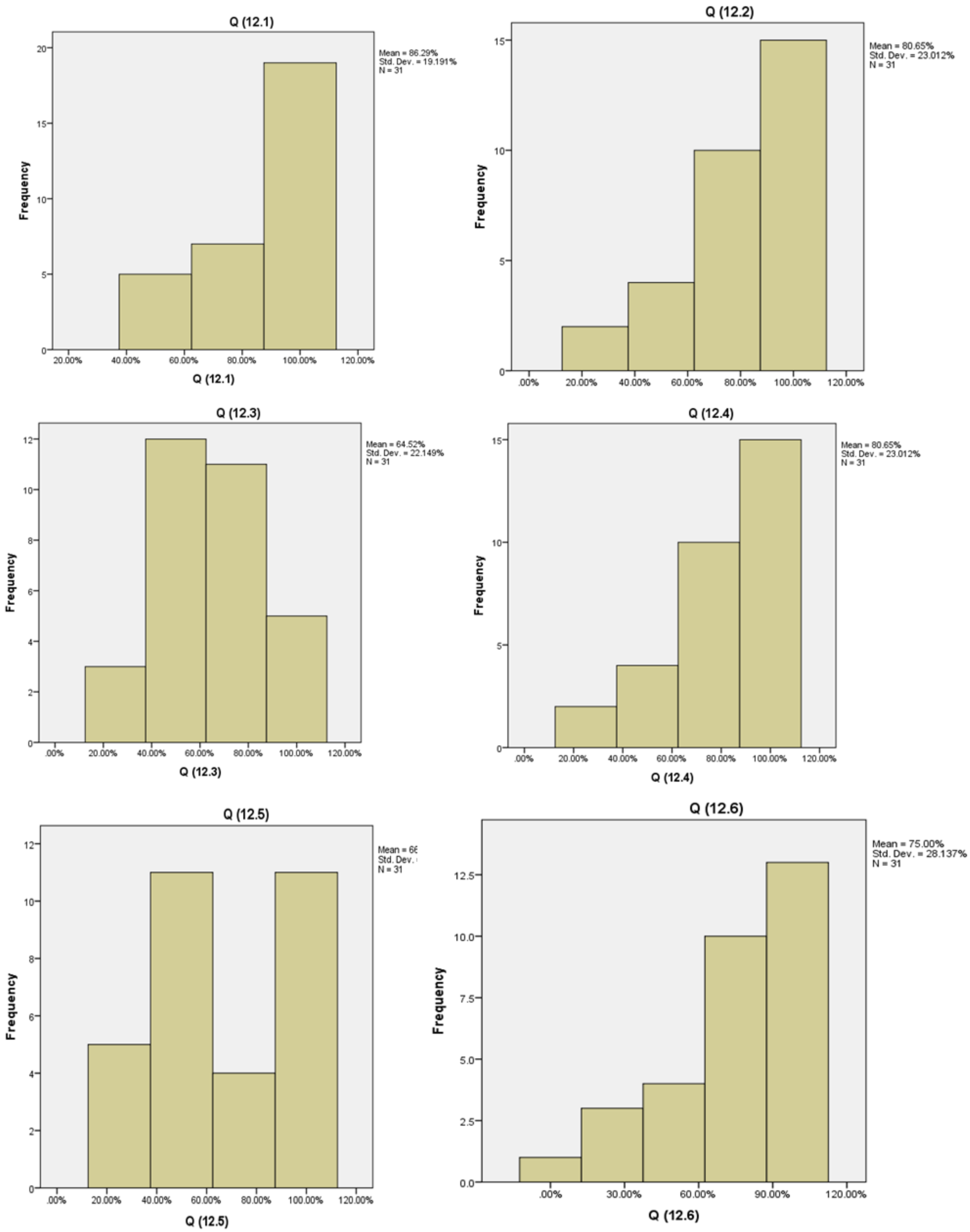


Figure 23: Frequencies for Q 12.1 - Q 12.6

5.10 Q13. From your experience and profession, how could a company enhance its cooperation to save energy/water and generate better features that help with implementation of green building system?

Respondents were asked for their views on how companies can enhance their cooperation to save water and energy to facilitate in implementing GB systems. They evaluated a number of aspects including more subsidies, enhancing advertising, change of legislation, issuance of building completion certification, products availability, and energy efficiency reporting, in which they evaluated favorably in helping with implementing GB systems. The responses are presented in Table 15.

	Mean %	Rating	n	percent
More Subsidies (Q13.1)	86.29 (SD = 19.19)	50.00%	6	19.4
		75.00%	11	35.5
		100.00%	14	45.2
Enhancing Advertising (Q13.2)	80.65 (SD = 23.01)	50.00%	8	25.8
		75.00%	12	38.7
		100.00%	11	35.5
Change Of Legislation (Q13.3)	64.52 (SD = 22.14)	0.00%	1	3.2
		25.00%	6	19.4
		50.00%	9	29.0
		75.00%	15	48.4
		100.00%	1	3.2
Issuance Of Building Completion Certification. (Q13.4)	80.65 (SD = 23.01)	0.00%	2	6.5
		25.00%	2	6.5
		50.00%	5	16.1
		75.00%	6	19.4
		100.00%	16	51.6
Products Availability Q13.5)	66.94 (SD = 28.42	50.00%	3	9.7
		75.00%	13	41.9
		100.00%	15	48.4
Energy Efficiency Reporting(Q13.6)	75.00 (SD = 28.13)	50.00%	5	16.1
		75.00%	5	16.1
		100.00%	21	67.7

Table 15: how organizations can implement green building systems

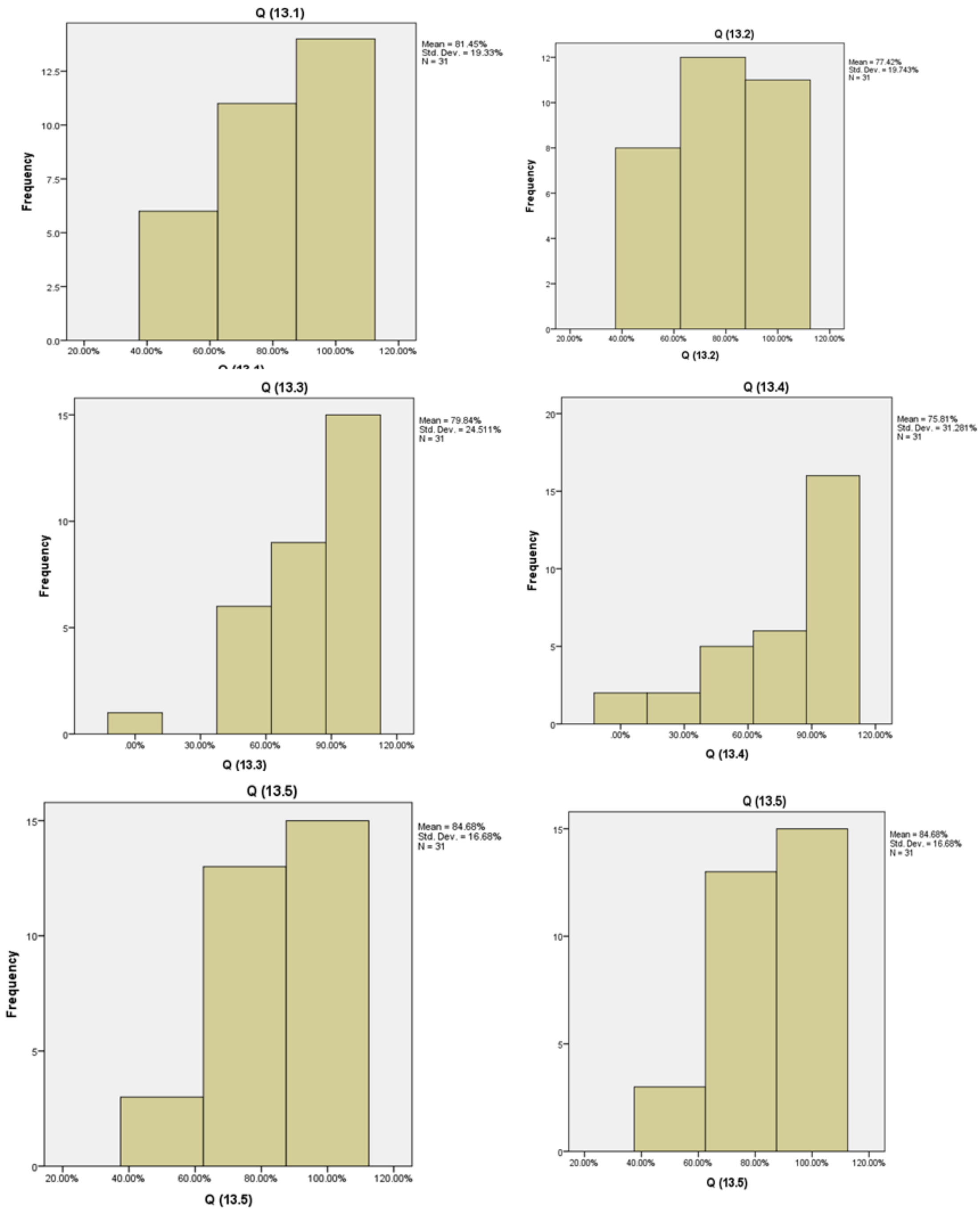


Figure 24: Frequencies for Q 13.1 Q 13.5

5.11. Q 14: Is your company planning to take a dynamic part in green building development in the future?

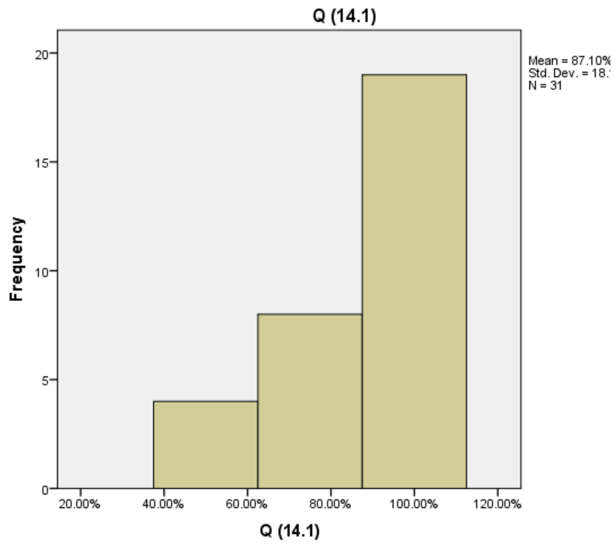
Respondents evaluated whether their organization is playing a dynamic role in GB development in the future. Their responses indicated that the companies in the UAE have adopted plans to engage in GB development in the future (M = 87.10, SD = 18.11). See Table 16.

5.12. Q 15: Is there any need to increase the consultant team, managers, authorities and client awareness about "Al Sa'fat" certification system?

Respondents evaluated the need to increase awareness of Al Sa'fat certification system among authorities, managers consultants and clients. The findings suggest an extreme need for increasing the awareness of this evaluation system (M = 91.13, SD = 16.51). See Table 16.

	Mean %	Rating	n	percent
Is your company planning to take a dynamic part of the green building development in the future? (14.1)	86.29 (SD = 19.19)	50.00%	4	12.9
		75.00%	8	25.8
		100.00%	19	61.3
Is there any need to increase the consultant team, managers, authorities and client awareness about "al Sa'fat" Certification system? 15.1	80.65 (SD = 23.01)	50.00%	3	9.7
		75.00%	5	16.1
		100.00%	23	74.2

Table 16: Future need for green building



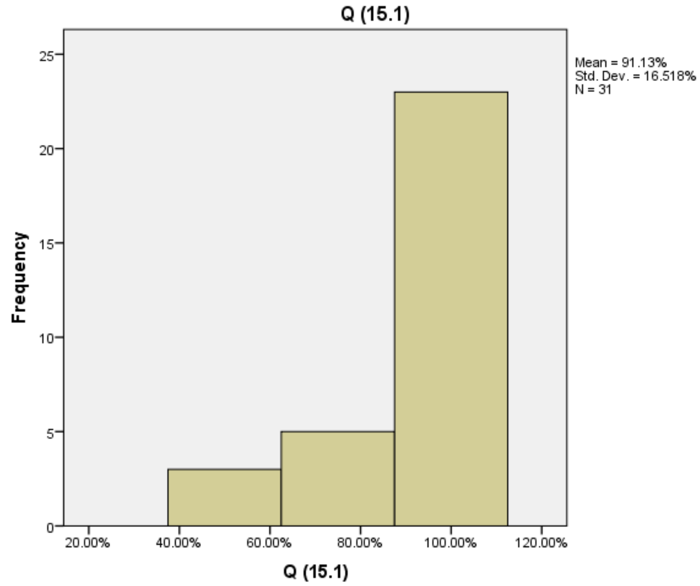


Figure 25: Frequencies for Q 14.1 and Q 15.1

Chapter 6: Discussion

This study sought to identify the key drivers influencing GB in the UAE construction industry. The findings provided important insights regarding the implementation of GBs in UAE.

6.1 Applicability of GB in Building Developments in UAE

With respect to the applicability of GB in building developments in the country, the results of the research indicated that applicability of GB systems in new buildings and mixed-use building was high. GB applicability in existing buildings in the UAE is moderate. This was expected because the Al Sa'fat evaluation system applied to newly constructed and existing buildings. However, the findings show that the applicability of GB systems in additional, extension, or refurbishments to existing buildings is low, which was expected because the Al Sa'fat evaluation system is only applicable to buildings of this type that need a building permit. As a result, those that do not require building permits are less likely to be adhere to the Al Sa'fat evaluation system.

6.2 Readiness in Understanding GB Development in UAE

This research also examined the level of readiness in understanding GB development in UAE. In this respect, it was found that the level of readiness in GB understanding was high among consultants, contractors, master developers, clients, researchers, and learners. This readiness stems from the diverse benefits that GBs offer the various stakeholders in the construction industry. Moreover, the government has played a major role in promoting GB practices such as developing eco-standards and implementing sustainability initiatives. UAE has implemented a number of initiatives aimed at increasing the number of sustainable buildings. One of those such efforts is the implementation of building codes like the Estidama Rating System used in Abu Dhabi, which requires all new buildings to accomplish at least Pearl 1 certification whereas government buildings are required to have at least 2 Pearls (Abbas 2018; Al Abbar 2017). The Dubai Municipality adopted the GB Regulations and Specifications (GBRS) for all newly constructed buildings within the emirate (Flanders 2016). These regulations have resulted in considerable developments with respect to the adoption of GB practices (PR Newswire 2016). In addition, these regulations have been further reinforced following the adoption of Al Sa'fat, which is a new building system adopted by the Municipality of Dubai, which has played a pivotal role in energizing the efforts aimed at promoting sustainable building practices (Flanders 2016). Dubai boasts as being the only city in the Middle East and North Africa (MENA) region to have joined the Building Efficiency Accelerator (BEA) programme with the aim of doubling the energy efficiency rate by 2030 (PR Newswire 2016). The BEA program is part of the Sustainable Energy for All initiative of the United Nations. The commitment exhibited by the UAE government has been cited as a key driver for the adoption of GB practices in the UAE (Flanders 2016). The government has been at the forefront in encouraging de-carbonized economic diversification by focusing on the generation of renewable energy and establishing demand side targets (Flanders 2016; Abbas 2018). Besides the aforementioned regulations, the retrofitting efforts like the Abu Dhabi Tarsheed program and the Dubai's Etihad ESCO are helping to encourage the adoption of GB practices in the country. With these developments, the level of readiness for GB is expected to be high.

6.3 Development of GB Attributes in the UAE's GB Codes

This study also examined the development of GB attributes in the GB codes in the UAE. The results showed that the attributes of ventilation and air quality, building fabric and systems, generation and renewable system, water efficient fittings, microclimate and outdoor comfort, neighborhood pollution, access and mobility, thermal comfort, environmental impact assessment, and hazards materials are well developed in the GB Codes. This finding is consistent with the aspects covered in the UAE GB specifies the minimum threshold requirements needed to achieve water efficiency and energy efficiency, improve the quality. Moreover, all the GB attributes deemed important in the UAE constitute crucial aspects of GB design, which can be explained by the hot and dry climate in the UAE that compels builders and designers to take into account the aforementioned attributes.

6.4 Performance Drivers influencing GB in the UAE

Various performance drivers influencing the adoption of GB in the UAE were also explored including financial performance, functional performance, operational performance, environmental performance, and management performance attributes.

6.4.1 Financial Performance Drivers

In terms of financial performance drivers, improving economic efficiency, improving economic lifetime, increasing ROI, help in cut cost process of capital, increasing efficiency of Capex, positively influencing cost efficiency to the building, reducing payable fee, boosting sale prices, boosting rental prices, boosting occupancy rates, and improving economic efficiency were rated favorable indicating the important role they play in GB adoption in the UAE. In the literature, GB has been associated with various financial indicators including boosting the efficiency of its economy; increasing economic lifetime of a building; guaranteeing a solid ROI due to the increased demand for sustainable structures; increasing property market valuation; and increasing occupancy rates, rental prices, and sales prices because certified GBs have lower operational costs and offer improved environmental quality, which makes them attractive to individual and corporate buyers.

6.4.2 Functional Performance Drivers

The functional performance drivers were also rated favorably with respect to their importance in adding value to GB projects. They include the building's adaptability; suitability for growth; increasing ease of use; upgrading the building's efficiency; facilitating accessibility; maintaining security, health, and safety; ensuring convenience; satisfying all building requirements and regulations; making sure that the building design follows established standards; reducing the risk of failure; and increasing the strength and stability of the building. Other functional performance attributes of GBs include ensuring favorable superstructure performance; ensuring favorable exterior construction performance; ensuring favorable roofing performance; ensuring interior construction performance; ensuring mechanical functional performance; and ensuring electrical functional performance. These aspects are important because GBs are designed to be flexible and adaptable to the surrounding environment. These buildings are also designed with users in mind. Moreover, they are designed in such a way that they can be upgraded to increase a building's efficiency and ensure that health, security and safety of occupants is maintained.

6.4.3 Operational Performance Drivers

The operational performance drivers of GB were also reported to be an important in GB implementation in the UAE. These aspects of operational performance included reducing energy consumption; maintaining energy efficiency; easy maintaining, managing, cleaning and operating equipment; suitability for telecommunications; easing security operations; improving waste management; and managing operational risk (reducing failure). GBs should be energy efficient through reducing lighting, cooling, and lighting loads using climate and site attributes as well as the adoption of renewable energy sources. In addition, it is imperative to ensure that the equipment can be cleaned, managed, and maintained with ease to ensure high performance for GBs.

6.4.4 Environmental Performance Drivers

Similarly, environmental performance drivers were evaluated as being important in GB designs. They include achieving a low carbon environment; saving energy consumption; maintaining natural light and ventilation into the building; managing the quality of air in the building; reducing pollution; using renewable resources; using low maintenance, durable, and environment-friendly building materials; conserving water resources; and ensuring adaptability of the building to future climate/natural changes. These environmental performance drivers emanate from the expected environmental benefits associated with GB practices, which include reducing water wastage; conserving natural resources; reducing GHG emission to create a low carbon environment; and reduce pollution. Environmental performance drivers are key in UAE because of the high GHG emissions because of an economy that is dependent on fossil energy.

6.4.5 Management Performance Drivers

The management performance drivers were also reported to be important in GB adoption in the UAE. These management performance drivers were favorably rated including: maximizing project management efficiency and delivery; enhancing risk management; maximizing organizational efficiency; ensuring that project objectives are achieved; increasing stakeholders interaction; and leading work design and delivery planning. The importance of performance drivers come from the fact that UAE organizations are constantly looking for ways to improve their performance, and GB practices offers an approach to achieve this goal since GBs encourage learning, productivity, and comfort, which in turn facilitates organizational management.

6.5 Impacts of Implementing GB Practices in Organizations

The reported impacts of GB in organizations by the respondents included financial benefits/cost reduction; maximizing property value, lessee demand, company reputation, personal beliefs, codes and regulations, and environmental interest. The cost-saving attribute of GB practices is well acknowledged due to the reduction in energy and water usage. GBs also increase the market valuation of a property. Moreover, lessee demand in GB is high because such buildings have lower operational costs and offer improved environmental quality. Adopting GB practices also helps to augment an organization’s reputation as a steward of the environment, which in turn translates to profitability because consumers are increasingly becoming environment-conscious. GBs practices also seek to ensure that the organization complies with the building codes and regulations issues by the government, which subsequently reduces liability.

6.6 Level of Implementation of Each Category of the Al Sa’fat Evaluation System

The findings of the study showed that the general requirements, Bronze Sa’fa requirements, Silver Sa’fa Requirements, Gold Sa’fa Requirements, and Platinum Sa’fa Requirements of the Al Sa’fat evaluation system have been well implemented in the UAE. This is because the development of Al Sa’fat drew upon established GB rating systems used internationally and considers various categories when assessing the environmental soundness of a building including the quality of indoor air, management of waste, efficiency of water use, and energy conservation among other aspects. Further, it has been praised for incorporating a performance-based approach for accomplishing the efficiency of buildings. The methodology underlying the evaluation criteria in the Al Sa’fat system is similar to the successful GB rating systems used in other parts of region. Following the implementation of this rating system, the

Dubai Municipality hopes to accomplish the desired goals relating to improvements in resource use, water, and energy efficiency. For developers to achieve the standards mandated in this GB rating system, they will need to adopt innovative construction approaches such as using GB systems and materials to help them maximize efficiency with respect to the use of water and energy. Such an approach will ultimately result in overall positive outcomes for the energy supply chain as well encourage the use of alternative energy.

6.7 Important Considerations for Clients When Implementing GB Designs

The results showed that the important considerations for clients in adopting GB designs include saving occupancy cost, increasing property value, decreasing obsolescence, maintaining healthier indoor air quality, increasing rent payment, and marketing prospect. GB designs have been associated with low operational costs, which is one of the reasons for high occupancy rates of these buildings. Moreover, the property value of GB is higher than that of standard buildings, which is the reason for increased popularity of these buildings in the real estate sector. Through retrofitting, the obsolescence of a building is increased. GB designs also seek to improve the quality of indoor air.

Chapter 7: Conclusion

7.1 Summary of Findings

The study offered valuable insights regarding the implementation of GB systems in the UAE. The first aspect examined was the applicability of GB system, which was reported as high in new and mixed used buildings, moderate existing buildings, and low in extensions and refurbishment of existing buildings. This research also surveyed the level of readiness in understanding GB development in UAE, and it was found that the level of readiness in GB understanding was high among consultants, contractors, master developers, clients, researchers, and learners. The development of GB attributes in the UAE was examined, and the results indicated that the attributes of ventilation and air quality, building fabric and systems, generation and renewable system, water efficient fittings, microclimate and outdoor comfort, neighborhood pollution, access and mobility, thermal comfort, environmental impact assessment, and hazards materials are well developed in the GB Codes.

Performance drivers of GB were studied. The important financial performance drivers for GB include improving economic efficiency, improving economic lifetime, increasing ROI, help in cut cost process of capital, increasing efficiency of Capex, positively influencing cost efficiency to the building, reducing payable fee, boosting sale prices, boosting rental prices, boosting occupancy rates, and improving economic efficiency. The important functional performance drivers include: the building’s adaptability; suitability for growth; increasing ease of use; upgrading the building’s efficiency; facilitating accessibility; maintaining security, health, and safety; ensuring convenience; satisfying all building requirements and regulations; making sure that the building design follows established standards; reducing the risk of failure; increasing the strength and stability of the building; ensuring favorable superstructure performance; ensuring favorable exterior construction performance; ensuring favorable roofing performance; ensuring interior construction performance; ensuring mechanical functional performance; and ensuring electrical functional performance. The operational performance drivers found important include: reducing energy consumption; maintaining energy efficiency; easy maintaining, managing, cleaning and operating equipment; suitability for telecommunications; easing security operations; improving waste management; and managing operational risk (reducing failure). The important environmental performance drivers include: achieving a low carbon environment; saving energy consumption; maintaining natural light and ventilation into the building; managing the quality of air in the building; reducing pollution; using renewable resources; using low maintenance, durable, and environment-friendly building materials; conserving water resources; and ensuring adaptability of the building to future climate/natural changes. Lastly, the management performance drivers deemed important in the UAE comprised of maximizing project management efficiency and delivery; enhancing risk management; maximizing organizational efficiency; ensuring that project objectives are achieved; increasing stakeholders interaction; and leading work design and delivery planning The reported impacts of GB in organizations by the respondents included financial benefits/cost reduction; maximizing property value, lessee demand, company reputation, personal beliefs, codes and regulations, and environmental interest.

The findings of the research also indicated that the general requirements, Bronze Sa’fa requirements, Silver Sa’fa Requirements, Gold Sa’fa Requirements, and Platinum Sa’fa Requirements of the Al Sa’fat evaluation system have been remarkably implemented in the UAE. The findings showed that the important considerations for clients in adopting GB designs include saving occupancy cost, increasing property value, decreasing obsolescence, maintaining healthier indoor air quality, increasing rent payment, and marketing prospect.

7.2 Recommendations

The findings of the research highlight the various ways in which GB awareness in the UAE can be enhanced. The results show the most favored ways of enhancing GB awareness include training, outreach and partnerships; print advertising; internet ads; broadcast; news release; trade shows; and websites. By leveraging these communication channels, the UAE government can increase awareness of GB practices among stakeholders in the construction industry. Moreover, from the findings, the government can use more subsidies, enhance advertising, change legislation, issue of building completion certification, ensure products availability, and adopt energy efficiency reporting to solidify GB practices in the country.

7.3 Key Conclusions

- Applicability of GB system was high in new and mixed used buildings, moderate existing buildings, and low in extensions and refurbishment of existing buildings.
- Level of readiness in GB understanding was high among consultants, contractors, master developers, clients, researchers, and learners.
- The attributes of ventilation and air quality, building fabric and systems, generation and renewable system, water efficient fittings, microclimate and outdoor comfort, neighborhood pollution, access and mobility, thermal comfort, environmental impact assessment, and hazards materials are well developed in the GB Codes
- Financial, performance, operational, management, and functional attributes are important in GB implementation in the UAE.

- Requirements of the Al Sa'fat evaluation system have been remarkably implemented in the UAE.

7.4 Research Contribution

- The research provided an in-depth insight into the current state of GB implementation in the UAE including applicability, readiness, GB attributes development, performance drivers, and Al Sa'fat implementation.
- Saving occupancy cost, increasing property value, decreasing obsolescence, maintaining healthier indoor air quality, increasing rent payment, and marketing prospect are important when implementing GBs in Dubai for clients
- The study also shows how GB awareness can be enhanced through leveraging multiple communication channels

7.5 Research Limitation

- Use a small sample size; hence, limited generalizability of the study findings.
- Using structured data collection methods that hindered participants from providing detailed responses.
- Self-reported nature of the questionnaire makes it difficult to ascertain the honesty in participant responses.

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Appendix: Survey

QUESTIONNAIRE SURVEY

Your participation in this research paper will be highly appreciated and considered for further development.

The main purpose of this survey is to identify the key drivers influencing green building within the industry of construction in uae, and examine either those drivers are being changed with time or not.

Kindly understand that your input will be used only for an academic purpose and your response will have a high level of confidentiality.

Respondent Details:

Respondent Name: ____

Gender:

☐ Male ☐ Female

Age:

☐ Less Than 25 ☐ 25-35 ☐ 35-45 ☐ 45-55 ☐ 55 and Above

Nationality:

☐ UAE ☐ Arab ☐ Asian
☐ American ☐ European ☐ Others

Education Level:

☐ High School ☐ Bachelor's ☐ Masters
☐ PHD

Career Level:

☐ Junior ☐ Mid-Level ☐ Senior

Organization Type:

☐ Government ☐ Semi Government ☐ Private

Industry Role:

☐ Consultant ☐ Contractor ☐ Client
☐ Others

Years of Experience in Construction Industry:

☐ Less Than 5 ☐ 5-10 ☐ 10-15
☐ 15-20 ☐ 20 And Above

Statement	100%	75%	50%	25%	0%
1. How applicable is the "green building system" in below developments within UAE?					
All New Buildings.					
Mixed Use Buildings.					
Buildings That Has (Change Of Use).					
Existing Buildings.					
Additional, Extension Or Refurbishment To Existing Building.					
2. How will you evaluate the readiness of below list in understanding the green building development in UAE?					
Consultant / Contractor.					
Master Developer.					
Authorities.					
Client / End User					
Researcher / Learners.					
3. How will you rate the development of each below listed attributes of green building codes in UAE?					
Ventilation And Air Quality.					
Building Fabric And Systems.					
Generation And Renewable System.					
Water Efficient Fittings.					
Microclimate And Outdoor Comfort.					
Neighborhood Pollution.					
Access And Mobility.					
Thermal Comfort.					
Environment Impact Assessment.					
Hazards Materials.					
4. How important are the following financial performance attributes to the project value created by green building designs?					
Improve Economic Efficiency.					
Improve Economic Lifetime.					
Increase Return On Investment.					
Help In Cut-Cost Process Of Capital.					
Increase Efficiency Of The Capital Expenditure (Capex).					
Positively Influence Cost Efficiency To The Building.					
Reduce Payable Fee.					
Boost Sale Prices.					
Boost Rental Prices.					
Boost Occupancy Rates					
Improve Economic Efficiency.					
5. How important are the following functional performance drivers affect attributes to the project value created by green building designs?					
Maintain Adaptability Of The Building.					
Be Suitable For Growth.					
Increase Ease Of Use.					
Upgrade Efficiency Of The Building.					
Allow/Ease Of/Control/Secure Accessibility.					
Maintain Security, Health And Safety.					
Ensure Convenience.					
Meet All Building Regulations And Requirements.					
Ensure Designed Elements Are As Per Standards.					

Statement	100%	75%	50%	25%	0%
Reduction Of Risk Failure					
Increases Stability And Strength Of The Building.					
Ensure Superstructure/Infrastructure Functional Requirements Meet A Favorable Level Of Building Performance.					
Ensure Exterior Construction Meet A Favorable Level Of Building Performance.					
Ensure Roofing Closure Functional Requirements Meet A Favorable Level Of Building Performance.					
Ensure Interior Construction Functional Requirements Meet A Favorable Level Of Building Performance.					
Ensure Mechanical Functional Requirements Will Meet A Favorable Level Of Building Performance.					
Ensure Electrical Functional Will Meet A Favorable Level Of Building Performance.					
6. How important are the following operational performance driver's attributes to the project value created by green building designs?					
Reduce/Save Energy Consumption.					
Maintain Energy Efficiency					
Equipment Are Easy To Maintain, Manage, Clean And Operate.					
Suitable For Telecommunications.					
Help Ease Security Operations.					
Improve Waste Management.					
Manage Operation Risk. (Reduce Failure).					
7. How important are the following environmental performance driver's attributes to the project value created by green building designs?					
Low Carbon Environment.					
Save Energy Consumption					
Maintain Natural Light, Ventilation Into The Building.					
Manage Air Quality Used In The Building.					
Reduce Polluted Weight.					
Use Of The Reusable Resources.					
Use Of Low Maintenance, Durable And Environment Friendly Material For The Building.					
Ensure Lighting And Ventilation Functional Will Meet A Favorable Level Of Building Performance.					
Conserve Water Resources.					
Maximize Building Adaption To The Future Natural/Climate Changes.					
8. How important are the following management performance drivers attributes to the project value created by green building designs?					
Maximize Project Management Efficiency And Delivery.					
Enhance Risk Management.					
Maximize Organizational Efficiency.					
Ensure Achieving Project Objectives.					
Increase Stakeholders Interaction.					
Lead Work Design And Delivery Planning.					
9. By implementing green building system, what beneficial returns will mostly impact on your company?					
Financial Benefits/Cost Reduction/Maximize Value Of Property					
Lessee Demand.					

Statement	100%	75%	50%	25%	0%
Company Reputation.					
Personal Beliefs.					
Codes And Regulations.					
Environment Interest.					
10. How will you evaluate your implementation to each category of "al sa'fat" evaluation system in UAE?					
General Requirement.					
Bronze Sa'fa Requirements.					
Silver Sa'fa Requirements.					
Gold Sa'fa Requirements.					
Platinum Sa'fa Requirements.					
11. How to increase the consultant team, managers, authorities and public awareness about "al sa'fat" evaluation system in UAE?					
Training, Outreach And Partnerships.					
Print Advertising.					
Internet Ads.					
Broadcast.					
News Release.					
Tradeshows.					
Web Site.					
12. If client is about to implement green building system in his/her property, what of below listed factors will matter in priority from your perspective and understanding?					
Saving Occupancy Cost.					
Increase Value Of Property					
Decrease Obsolescence.					
Maintain Healthier Indoor Air Quality.					
Increase Rent Payment.					
Marketing Prospect (I.E., Enhance Building O Better Company Image).					
13. From your experience and profession, how could a company enhance its cooperation to save energy/water and generate better features that help into implementation of green building system?					
More Subsidies					
Enhancing Advertising					
Change Of Legislation					
Issuance Of Building Completion Certification					
Products Availability					
Energy Efficiency Reporting					
14. Is your company planning to take a dynamic part of the green building development in the future?					
Agreement Level					
15. Is there any need to increase the consultant team, managers, authorities and client awareness about "alSa'fat" certification system?					
Agreement Level					
Additional Comments:					