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Evaluation of the Circular Economy Potential in Improving Sustainability in the Construction Industry in the UAE

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Abstract
The civil engineering and construction industry is usually highlighted as primary contributing factors for resource consumption and scarcity. Many researchers perceive that as a normal event with the respect to the high demand for construction that comes concerning the growing world population. As a consequence of this demand, a need for resources and energy efficiency becomes extremely critical and vital. The circular economy could be presented as one of the potential factors to regulate the construction industry with a circular business model. The reason that the professionals highly suggest this mechanism is due to its suitability with the vibrant and dynamic nature of the construction industry that usually causes a communication gap between the main stakeholders. The literature shows that this could be a result of a lack of collaboration and creating unnecessary complex steps that affect the productivity and durability of the business. Hence, a need for a holistic and integrated framework is necessary to regulate and manage the flow work of resources and energy efficiency process. In this study, the Sustainability Development Goals (SDGs) will be highlighted as major key performance indicators to ensure the accuracy and feasibility of the circular economy. Through this study, the survey and the interviews showed that three areas could be considered as challenging to be applied to circular economy in construction in The United Arab Emirates (UAE): regulatory factors, economic factors, and technological factors.

Keywords:
Circular economy, Sustainability, Policy, Evaluation

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1. Introduction & Background

Sustainability is a keyword and a popular topic in many industrial sectors due to its robust effect in the long term. There are multiple definitions of sustainability, and all these convey the importance of sustaining and maintaining the current resources to satisfy the needs of tomorrow. According to many of the scholars who promote sustainability (Huovila & Koskela, 1998), construction could be one of the toughest industries to apply this concept although there is huge potential. This is due to the evident scattered nature of the construction sector, where external and internal factors could affect the communication in the chain of command. For example, according to Glass et al. (2012), one of the major challenges for the execution of sustainability in the construction industry is scarce social and industry awareness on the true concept of sustainability. For more illustration, numerous shareholders, investors, and stakeholders in construction manufacturing do not possess adequate basic knowledge on sustainability. This could be due to many reasons but, according to the author, the fear of extra cost is an additional burden that is not allowing people to take sustainability more seriously and incorporate it into construction businesses strategy.

The terminology of sustainability was presented to deliver the means for handling the type of difficulties regarding the weakening association between our global ecology and constant economic development in which sustainability as a concept shows that ways in economic development could be comprehended while taking supposed environmental and social parameters into consideration. As stated by different scholars, sustainability (Rogers, 2012) as a concept is ill-defined, undefined or contradictorily defined. When the word sustainability is used, the first issue that appears is "what sustainability was applied to", for determining the link between global ecology and economic development. Sustainability explicitly highlights artificial or human-made structures and systems. These systems are commonly labelled in terms of purpose, objective and adjustment, and can mimic natural practices without being natural elements (Zsoka et al., 2013). According to authors (Brulle, 2010; Brown, 2009; Nurse, 2008), the latest studies and increased understanding of sustainable development have improved the significance of sustainable development terminology, which has earned status over the past decade. It supports the terms such as cleaner manufacture, pollution avoidance, pollution management, and minimization of resource usage, eco-design, and zero waste. These words are in frequent use in scientific studies, articles, workbooks, sustainability reports of organizations, governmental policy frameworks, and the public media streams (Haugh and Talwar, 2010; Roseland, 2012; Catellani and Sala, 2010). The application of these terminologies is highly dependent on their description and acknowledgement, rather than on the domain of concept. However, some of these terminologies are, enabling diversity from the others. In addition, differences amongst the term usage, based on the geographic location, exist that often lead to vague definitions of the terms and their practice.

2. Literature Review

2.1. Sustainability as Concept

Sustainability is a complicated and puzzling hypothesis where its definition can have many forms. For example, according to the literature review (Moore et al., 2017, Alwan et al., 2017), there are more than 60 classifications that explain sustainability to its operational role. For more illustration, environmentalists, economic experts, and demographics, all had their preferred personal view of sustainability. Yet mostly they did not consider other industrial viewpoints. Therefore, there is a need for a more tangible and clearer concept for sustainability through a different approach. As a result, it can be said that that the essence of "sustainability" cannot be easily determined or defined. Therefore, the dynamics of the concept, its direction and its evolution are the topic of this investigation until now as shown in Table 1.

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Table 1: Definitions of Sustainability

	Definition of Sustainability	The Main Theme
1	"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."	Economic 1987 by the Brundtland Commission (Keeble,1988).
2	The continued satisfaction of basic human needs-- food, water, shelter--as well as higher-level social and cultural necessities such as security, freedom, education, employment, and recreation [that is, as suggested by Maslow (1970	Social (Cox, 1987)
3	Integration of environmental, social, human, and economic goals in policies and activities.	Social/ Economic/Environmental (Holistic) Eggenberger, M., & Partidário, R. (2000)
4	Sustainability simply is all about thinking about others in all aspects.	Social/ Economic/Environmental (Holistic) Dr Alex Bell, Carmarthen Business School
5	Sustainability demands the ways of living, working and being that enables people all over the world to lead healthy, fulfilling, and economically secure lives without destroying the environment and without endangering the future welfare of people and the planet	Social/ Economic/Environmental (Holistic) Reclaiming the definition of Sustainability (Johnston et al., 2007).
6	Capacity to monitor the state of natural systems.	Economic Carpenter, S. R., & Gunderson, L. H. (2001).
7	The economic system was currently dependent on growth in material consumption within a world of finite resources.	Economic Dietz, R., & O'Neill, D. (2013).
8	"Sustainability demands turning and charting a new course that will improve the quality of our lives and the lives of our children while restoring the gift of natural systems upon which our lives depend.	Social/ Economic/Environmental (Holistic) National Research Council. (1999).
9	People are not subject to conditions that systematically undermine their capacity to meet their needs.	Social Missimer, M., Robèrt, K. H., Broman, G., & Sverdrup, H. (2010).

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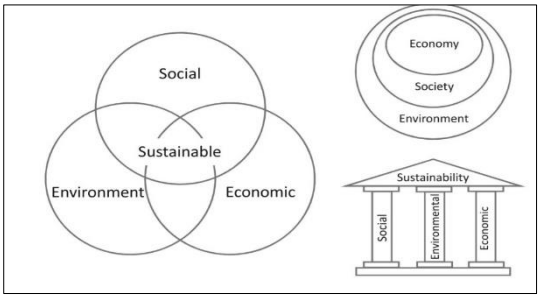

Figure 1: Purvis et al. (2019).

Sustainability as a concept has been accepted by the United Nations as an administrative value for economic, environmental, and social growth that hopes to achieve the needs of the present without compromising the ability of future generations. According to many authors (Berkes and Folke, 1994), sustainability involves the safety and security of the ecosystem and ecological resources as well as delivering social and economic prosperity to the current and successive generations. From the social aspect, sustainability is seen as a major guideline basis for the modern society which includes a durable and moral connection of present generations and the next one. These three scopes of sustainability as shown in Fig.1 have been signified as pillars of the sustainability concept that show the requirement of responsible development concerning the holistic ecosystem. For example, sustainable construction encourages a decrease in the utilization of non-renewable energy supplies thereby reducing economic investments.

In addition, enhancing human capital investment can holistically foster sustainability. However, to fulfil this possibility the development of such capital requirements is to be connected to sustainability education for all stakeholders.

2.2. The Four Unsustainability Concepts

Many sustainability scholars (Bocken, and Short, 2021), agree that as there are main themes or pillars for sustainability. Additionally, there is also a theme for the "unsustainability concept". For example, the root causes of unsustainability can be divided into four areas:

1. Extracting a large number of materials from earth's curst
2. The huge volume of chemical substances created by society
3. Physical inhabit nature's ability to run cycles
4. Social barriers to people in meeting their basic needs

As such, different scholars suggest that governments can play a critical role in solving these four root cases via clear and strict policies. For instance, governments should be anticipated to put policies to reduce excessive demand for the limited natural resources and introduce incentives for sustainability for greener commercial projects. By doing this our government will be an inclusive one that helps all the stakeholders to not abuse the four root causes of sustainability. And the result would be both in the economic scale and social aspects to reach the optimum of the sustainable business model as shown in Fig 2.

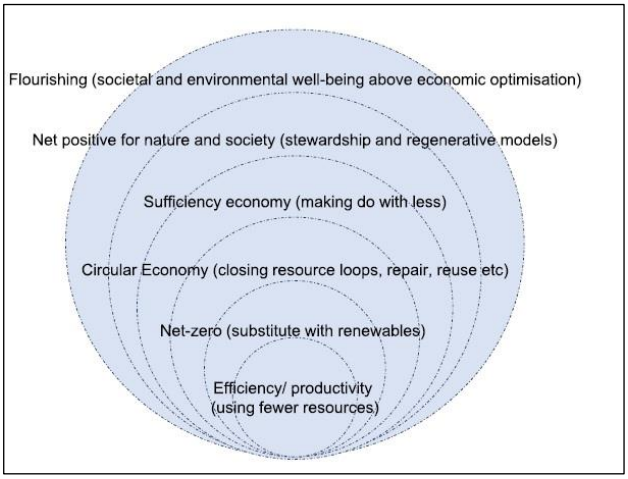

Figure 2: Sustainable business Model Hierarchy Bocken, N. M., & Short, S. W. (2021).

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Many scholars (Kirveennummi et al., 2013), believe that the government can reach this level of maturity in sustainability if they use inclusive governance systems. For more illustration, this system can motivate all stakeholders to deliver through access to economic mechanisms and post which, this can be a major positive encouragement towards better sustainability on all three aspects. It is important to know that there may be some losses in the short term on the economic dimension of sustainability during the transition in the process. An inclusive progression and methodology have the potential to be an active apparatus for getting the real transition from the unsustainability root causes to a healthy sustainability concept.

2.3. Circular economy

Sustainability in the construction industry should highlight three main scopes; social, economic and environmental to the conventional viewpoint, in which the main challenge could be the economical aspect. For example, the social aspect usually highlights the matters that are associated with the improvement of people's quality of life. On another side, the economic aspect shows the economic issues such as employment rate, Market supply-demand dynamic, life costing cyclic, production rate, etc. For the environmental part, it includes the following phases in the construction project's life:

1. Design stage
2. Construction stage
3. Operation sate
4. Maintenance stage
5. End life stage
6. Deconstruction and waste management

Many scholars consider that the influence of the construction industry towards sustainability as a concept is a global demand and challenge at the same time. This applies to both developed and developing countries. For example, it could be more challenging for the construction industry in the developed countries due to the lack of resources and the efficiency of the supply chain systems. To illustrate that, conventional challenges of developing countries are; poor finical power, water scarcity, unhealthy sanitation systems, corruption and inefficient infrastructure system. However, from a positive point of view that many sustainability scientists believe, in developing countries, there is more potential to build a green system from scratch that can last for a long time for the construction industry (Hendiani & Bagherpour, 2019). These systems could signify the accountability of the infrastructure towards development with sustainable patterns. Construction industry phases such as designing the construction, operation, etc., have substantial influences on society and its surrounding environment. For instance, the over usage of natural capital and energy resources, and water supplies are some illustrations of these applications. There are several risks and opportunities for growth related to sustainability execution in the construction landscape.

One of the key sustainability challenges in construction is the financial power within environmental management. As such, according to many sustainable scholars, stable financial capital is a challenging process, where the adoption of formal environmental management schemes within these construction companies could be expensive if it is applied in the wrong manner. Broadly speaking, experimental indication displays that the most substantial dangers related to environmental management include an increase in expenses, lack of ecological awareness and education. In addition, from a management perspective, other factors such as inefficient supply chain system that includes green materials and clean technologies can play a significant role in enhancing the sustainability implementation in the construction industry in addition to poor environmental legislation knowledge, poor communication, and lack of commitment.

To have more depth in the circular economy policy in EU, guidelines for supply efficiency, integrating elements of Circular Economy, can be dated back to the 1980s and 1990s in German structured policymaking, essentially prejudiced by the captivating then-new notion of the

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closed-loop economy (Shibieka et al., 2019). For example, as a result of that, during the last 20 years, the strategic resource plan track of EU progressively moved towards the sustainable usage of natural capital, increasing supply effectiveness in the business economy, and encouraging the recovering and prevention of industrial by products, while at the same time it supports the economic growth movement as shown in Fig 3.

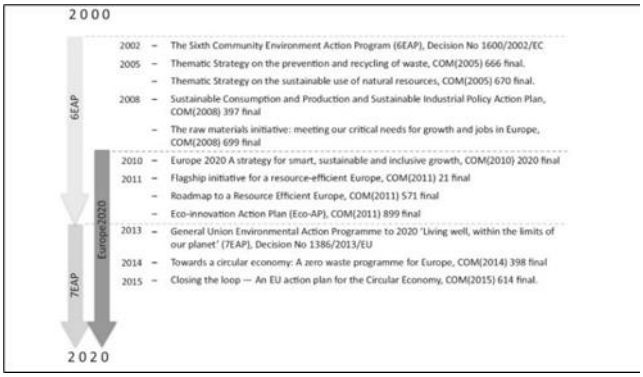

Figure 3: Circular Economy policies development from 2000-2020 (Milios, 2018).

On the other hand, the policy scholars see that the circular economy policy could have another classification than the one illustrated in Fig.3, which is associated with the product life cycle. For example, scholars such as Damato et al., (2020), suggest having clear policies for reuse, repair, and remanufacturing, which significantly enhanced the public procurement, product durability and circulation in short loops. For illustration, in the structure of the Circular Economy, the definitive aim is to preserve the essential value of the products by employing high-quality items during the circulation phase. As a result, according to many experts such as De Abreu et al. (2018), this is the required mindset that the construction organization should have as the backbone of its circular economy policy scheme to increase the material circulation in short loops. Authors such as Ferronato et al. (2019), highlight the importance of considering the durability and reparability of the product in the design stage. For example, in the construction industry, durable construction materials should be designed to last long and to function in their maximum capacity for resource efficiency by preserving their operational effectiveness as long as possible and simultaneously promoting their users by saving the organization capital and investments. Yet, to have a holistic policy around the durability concept in the construction industry, it is highly vital to associate it with the reparability concept. For instance, from a circular economy view, durability is inseparably associated with the reparability concept of the construction product and it is critical to have an integrated design, where companies use these two elements together as design features. This would help to sustain, improve, and recycle a product. In this regard, durability and reparability concepts are measured and seen as a uniting factor to serve the sustainable development in the construction industry (Taušová et al., 2019).

2.4. Sustainability Challenges in UAE Construction Industry

Regardless Of the enormous volume of green changes in the Middle East to enable the sustainability concept in the industrial sector, still, there are serious challenges for adequate implementation of sustainability. For example, in addition to financial consequences, time, effort, and planning should be considered. From ecological limitations to man-made difficulties, Middle Eastern nations have tried to find the assets to recognize and execute the concept of sustainability. A key ecological dilemma in the Middle East is the scarcity and security of water. According to the studies, (Saleh & Alalouch, 2015), the Middle East region only has 1% of the world's available freshwater, concerning the elevated hot and dry climate. Under such tough environmental conditions, it is evident that excessive population expansion, poverty and the subsequent deprivation of natural resources do not assist in guiding governments' advances towards a 'greener' portfolio (Siew, 2015) .

Additionally, the Middle East area is confronted with several varieties of encounters when it comes to attaining

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substantial sustainability purposes such as lack of cultural awareness. To its advantage, the Middle East region has a higher rate of literacy among its population, in which a large number of provincial residents chasing secondary and higher education (Salama and Hana, 2010). For example, the United Nation Development Program (UNDB) has classified countries besides the Human Development Indexes (HDIs) where these indexes include different aspects of sustainability, well-being, quality of life, education level and life expectancy. These indexes show that Gulf Cooperation Council (GCC) countries, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates, have high (HDIs). To illustrate that, GCC countries are rich with hydrocarbon resources, yet, according to (Al Naqbi. 2018) that human development and natural wealth are not necessarily correlated with high interest and awareness levels in sustainability. For instance, many countries have high HDIs but their chief emphasis is on the leisure industry, which directly subsidizes their GDPs and may have negatively impacted sustainable development.

From a different perspective, after the year 2010, the Middle East region has witnessed some dogmatic instability that results in consequent economic weights to solve. As such, the public seems to tend towards the belief that they would accept the suffering of the environmental pollution and lack of sustainable resources than be suffered due to a civil war. To illustrate more, this is a pattern faced by some of the Middle East governments in the area when executing sustainable development goals (SDGs).

An additional obstacle is that countries with extremely high HDI, such as The Kingdom of Saudi Arabia (KSA) and the UAE are confronted with, is trying to impact overconsumption attitudes. Although these developed countries have a strong green building rating system, and sustainability infrastructure system levels seem too high compared with other middle east countries, other countries, do have a challenge with for overconsumption economic behaviour (Elchalakani et al., 2014, Moshood, 2020).

For better illustration, UAE's water consumption has reached 265,550 litres per capita per day (Kazim, 2010) in which substantially surpasses the world's average consumption. This is especially challenging. For example, the countries that consume more water in general than people staying in countries that are abundant in surface water and have other alternatives such as groundwater and aquifers that may be refilled. In this point, it is important to highlight that there have been significant accomplishments in the region with the execution of sustainability concept via green building construction codes, yet there is still a key test in handling the existing construction units that were built before the rise of the awareness towards sustainability in the infrastructure.

The construction industry is a chief contributor to the UAE's Gross Domestic Product (GDP) after the oil and gas industry. Consequently, rising cities such as Dubai have to plan along with a sustainability vision to reduce the ecological impacts and the earth resource reduction. The sustainable construction industry in the UAE is growing with amplified awareness in adapting green structures concerning ecological aspects (Al-Hajj& Hamani, 2011). Nevertheless, it has been recognized that the efficiency of employing structure ecological sustainability evaluation approaches differs considerably with numerous aspects. For example, the most two famous building sustainability assessments are Pearl Building Rating (PBR) and Al Safat Rating methods. However, even with these systems in place, many scholars and experts in UAE construction see that there are many challenges towards implementing sustainability in the industry. For instance, starting with organization challenges, a key challenge to senior management within the construction industry was observed as the actual or perceived financial associated with sustainability (Al-Hyari, 2017). It is hard for the senior management to see implementing sustainability is good for the construction business also. Due to that, the real change should start with the policy, law and regulations of the organization in which emphasises the importance of sustainability as a way of function so that it can be integrated as a core element in the culture.

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In addition to that, there are market challenges towards sustainability implementation in the construction industry. To illustrate, the construction industry is a very fragmented industry where this nature of work makes implementing sustainability hard, as such many governments recommended having holistic sustainability governance in the construction industry (Hamani and Al-Hajj, 2015). This mentality will help the profession in the construction industry to understand that construction is not only about "build" yet it has a social and environmental aspect.

3. Research Methodology

3.1. Research Design

The aim of this study is to evaluate the performance and implementation of sustainability in the construction industry in the UAE. To do so, two objectives should be studied; evaluating critically the present and future challenges of sustainability implementation in the construction industry and providing a holistic understanding of circular economy policy in the construction industry. These objectives contain variety of aspects; managerial, engineering and social in which each objective has unique approach to be attained. For the first objective, Knowing the current and future challenges, many sustainability scholars (Asif, 2016, Sim et al., 2015) used the questionnaire as methodology to determine the sustainability challenges in the construction industry in the UAE.

In this study, the similar method will be utilized and a survey will be employed to explore the difference factors that can play major and minor roles to effect of the implementation of the sustainability in the construction industry in the UAE. Additionally, this survey will try to provide a comprehensive understanding via descriptive questions that have exploratory attributes to have more accurate insights. For example, this investigation highlights and includes the behavioural characteristics of the individual employee in the construction industry such as the assessment and compliance of the sustainability systems.

For more illustration, according to many sustainability scholars such as Brochner et al., (1999), that compliance to sustainability via assessments approaches is a vigorous indicator of the green performance in the construction industry. The authors highlight that in heavy industries such construction, studying the sustainability compliance process through assessment methods should aid to show technical and managerial defects that have a straight influence on the green decision-making mechanism in the construction industry.

3.2. Questionnaire

The questionnaire was designed for all the staffs who working on the major construction projects in the industry at the UAE development plans. Mainly, there are three main groupings for the construction companies in the UAE industry:

1. Owners (mostly are public sectors),
2. Contractors, (shared between public and private sectors)
3. Vendors (mostly from the private sectors)

Most of construction development projects are located in two Emirates; Abu Dhabi and Dubai especially in the free zone's areas. As such, most of the questionnaires in this study where circulated towards the construction companies in the both Emirates that have accessible communications tools in their offices and construction sites. In-person appointments were obligatory (with some restrictions due COVID-19) to confirm that the wanted employees from senior management, middle management and site workers level receive and understand the questionnaires. In this research, 12 personal trips to different construction companies, including 5 in Abu Dhabi and 7 Dubai were conducted to distribute the questionnaires either in the offices and sites.

3.3. Data Analysis Approach

The interview structure will be highlighted different areas: generic individual information, sustainability understanding, procedural and managerial challenges,

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culture and behavioural challenges towards sustainability. The beginning questions aims to expose the general interviewee's background in sustainability in construction and how he/she is engaged in the construction activities through various undertaken responsibilities. Following this, generic questions about sustainability performance and implementation, other questions will be asked to determine the employee view about the present sustainability procedures alongside all the possible threats in the construction industry for green performance. Additionally, in this questionnaire, the emphasis will be about why many major construction companies do not pay the essential attention towards the sustainability principles and measures e.g. not informing the procedures and lack of implementing the sustainability values.

The interview will also examine the interviewee's opinion about the government's role in ensuring the effectiveness of the organization sustainability procedural systems in the ongoing construction projects. 10 main interviews will be conducted in this study in which the goal of having these interviews is to identify the root causes for the practical influences that are affecting the implementation sustainability performance in the construction industry. Many sustainability scholars use the interview approach as a technique at the investigational stage in the construction industry. For instance, Abidin (2010) used the interview methodology to expose the significant aspects that increase the gap between the site workers and senior managers with respect to the sustainability performance.

4. Presentation of the results

4.1. Introduction

The survey in this study starts with demographic enquiries e.g. age and gender position in which these types of questions will deliver a holistic idea in the outcome of results in the discussion phase. The mainstream of the replies in this questionnaire came from construction organizations that are located in Abu Dhabi and Dubai. In this questionnaire we have distributed the questionnaires to 60 employees in which:

- S: 20 of them are holding senior management role in the construction organization (project manager and higher)
- M: 20 of them are holding middle management role construction organization (Site Engineer and equivalent)
- W: 20 of them are site workers and end-users.
- Alpha value of 0.05

4.2. Statistical significance: Cross-tabulation and chi-square

There are several social and sustainability scholars in the construction prefer to use the Cross-tabulation and chi-square approach due to its benefits and accuracy in the construction area (Wildemuth, 2016, Kjaer et al., 2019):

- One important benefit of utilizing Cross-tabulation and chi-square method in a review is, it's easy to calculate and comprehend.
- It excludes misperception as primary statistics that can sometimes be difficult to comprehend and understand.
- It is direct and easy to comprehend the ideas even from a complex data.
- It delivers capable statistics on two or more variables across numerous landscapes with simplicity.
- The most central benefit of employing Cross-tabulation and chi-square approach for survey examination is the simplicity of using any statistics e.g. nominal, ratio, etc.

4.3. Presentation of major results

Table 2: The age.

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The chi-square statistic is 15.1242. The p-value is .000625. The result is significant at $p < .05$.

As shown in Table 2, that, the senior management in the construction companies usually are above 50 years old and this is a very interesting point, because on another hand, most of the workers are between 20-30 years old. This difference in the generation era can play critical role in the sustainability implementation.

Employee	S	M	W
Strongly Disagree	6	6	7
Disagree	4	5	3
Agree	8	7	2
Strongly Agree	2	3	8

Table 2: Sustainability KPIs are always reported in your company.

Employee	S	M	W
Strongly Disagree	1	4	6
Disagree	2	5	9
Agree	9	6	2
Strongly Agree	8	5	3

The chi-square statistic is 13.266. The p-value is .000694. The result is significant at $p < .05$.

As shown in Table 3, most of the workers in the site believe that there are no proper monitoring and recording for the sustainability KPIs and that may be related to the green bonus that are associated with the green performance. To explain, if sustainability performance was recorded the whole team members will lose the bonus even the higher management who has usually a big bonus if they achieve the required green perforce.

Age/Employee	S	M	W
Under 20	1	2	6
20-30	3	2	3
30-40	3	6	3
40-50	5	8	4
Above 50	8	2	4

Table 3: Dose your company has weak sustainability system.

The chi-square statistic is 14.1012. The p-value is .000665. The result is significant at $p < .05$.

As shown in Table 4, it was interesting that to see there are good number of the workers do not believe that they have a good system in the sustainability although most of them have a basic education. Yet, in the other hand most of senior management believe they do have good system that support the sustainability implementation.

Table 4: Your company provides enough training to ensure sustainability competencies level between its employees.

Employee	S	M	W
Strongly Disagree	5	2	12
Disagree	4	2	5
Agree	6	7	1
Strongly Agree	5	9	2

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The chi-square statistic is 17.2965. The p-value is .000988. The result is significant at $p < .05$.

As shown in Table 5, that both of the senior and middle management believe that they do provide an enough sustainability training for their workers. Yet this is not what shows when the workers respond to this question. This difference in believe could affect the sustainability culture in the organization.

The mainstream of the survey respondents' range between 26-52 years old, and work with owners and contractors' organizations at the construction field in the UAE between Abu Dhabi and Dubai Emirates. Most respondents hold a basic education, but this depends mostly on the position they hold at the organization. The yields of the study clarify several optimistic and undesirable features regarding the implementation process of sustainability system that are experienced at the construction sites. For example, several replies specify that the existence negative exercise, such as un-evident leadership in construction site and week theoretical Sustainability process that is in the place among the organization producers.

For instance, the result of the survey depicts how most senior management believe that they have strong sustainability procedures. Yet, instantaneously, as can be shown from the results, many of the sustainability practical procedures need to be updated to aid workers into implementing the safety practices. Furthermore, the results of this questionnaire shed a key challenge in implementation of sustainability examination that raises many queries: How can construction organizations improve the application of examination and assessment to enhance the implementation of sustainability? Avoiding these questions will impact the sustainability decision-making mechanism and shows on the critical role of having a robust monitoring mechanism to guarantee the sustainability in the workplace.

Apart from the sustainability procedural challenges exposed in the survey results, there are some machinal challenges in implementing sustainability towards the equipment safety at the construction sites. For instance, many workers do not believe that their equipment or operation methodology are designed with respect to sustainability and this explains why construction waste has a very high rate in the UAE. This could be the first obvious gap between the point views about sustainability between the management and end-users. These gaps become even more pronounced when the questionnaire examines the behavioural safety aspect at the construction activities. This is vital because even if all technical aspects of sustainability are evaluated without considering the behavioural aspects and attributes, it will not be operative to assure the implementation of sustainability at the construction sites.

This questionnaire exposes several areas that directly influence the sustainability implementation systems, especially the sustainability assessment, varying from engineering to managerial features. Yet, additional examination is essential to comprehend the factors behind why these challenges occur inside the construction companies, predominantly between senior management. Such a study will aid achieve the goal of this study i.e. providing an integrated outline to enhance sustainability implementation systems such as circular economy in the construction industry. This can be approached via interviewing construction specialists who hold a holistic view relating to the current challenges against sustainability implementation systems.

For the interviews, it is noticeable how some interviewees have more information regarding sustainability and its implementation application from the theory perspective than others. For instance, some interviewee elucidates that the major weakness in sustainability assessment is that most construction organizations deal with it as a procedure which requires to be finalized and recognized without proper monitoring of its applications. However, in comparison to other interviewee, the justify the difficulty of applying the sustainability examination due to the multifaceted language of the procedures that most construction labors cannot comprehend because of their education

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background. At the same time, almost all interviewees approve on the vital role of the participation of the construction labors in the sustainability discussion as a pair of new eyes that can aid regulate all the possible threats towards sustainability in the construction process. Interviewees showed different systematic views concerning the procedural challenges of sustainability implementation in the construction companies. To illustrate, one of the interviewees (5) believes most senior administrations work very hard in the sustainability procedures especially at the early stage of the construction company to get the international green credentials in order to improve the branding standing only to abandon it later on.

This statement can be related to the interviewee (7) view regarding the lack of training for the construction end users towards the understanding sustainability procedures and how to apply them in the site. For instance, constant emphasis and consideration towards procedural assistances is obligatory for the construction labors as the technical competency. As result, when a lack of procedural familiarity between construction labors occurs it specifies a weak sustainability administration. This can be observed from numerous acts at the construction site such as the struggle of construction labors to have full access to the sustainability procedures. These undesirable applications can be replaced by healthier ones via noticeable communication between the senior management and the employees in the organization. As recommended by numbers of interviewees, having an explicit focus group ensures the implementation of the sustainability requirements. In addition, this focus group can also manage the sustainability polices training courses that should be offered out on a for the construction labors.

For the behavioral aspect, there were numerous reasons elucidated by both interviewees. For instance, many interviewees hold that the senior management has a limited comprehension about the implementation of sustainability nation where actions such as poor planning and lack of green awareness can disturb the behavioral sustainability of the employees, especially construction labors. According to Dietz and Neill (2013) such a vulnerable sustainability mentality is associated to the organization's sustainability procedures being mistranslated by senior management. Due to that, such, Dietz and Neill suggest conducting examinations frequently to know the worker fulfilment with the sustainability implementation at the construction site and how it can be enhanced. This common interaction between end-users and management would aid create a philosophy with open channels for communication to enhance the sustainability. As a consequence, proper monitoring for the behavioral aspect can be functional to deliver an efficient sustainability values and principles at the construction site to organizations office. Most of the interviewees approve the idea about the vital role of the employee behavioral in creating the sustainability culture in which interviewee (7) highlights that poor wellbeing strategy can interrupt the sustainability presentation of the worker. This can be improved, if the senior management

5. Discussion and Conclusion

5.1. Discussion of results

This study tried to answer the question about why the construction industry is suffering from lack of implementation in the construction industry. Looking back at the literature reviews, there were several theories in which each one of them had its own principles and reasons to explain the delay and challenges of having an effective sustainable construction industry. For example, many theories in the technical aspect suggest that there is a need for adapting new technologies such as new raw construction materials especially in the main two construction materials: concrete and steel. However, after conducting the questionnaire and the interviews, it appears having healthy green materials cannot give any push for sustainability if there is no commercial value behind it. This explains why many of the answers both in the questionnaire and interviews, were highlighting the need to conduct life costing analysis and life assessment analysis when we use any new materials in the

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construction process. In addition, for clean technology such as carbon capture, there is a need to provide a proper and updated training for workers in the site, simply because they are the one who is in the front line to implement and monitor the Carbon emission as a key sustainability indicator.

However, as the data shown from results shows, there is a lack of proper training that covers sustainability as concept and application in most construction companies. As such, having a sustainable culture in the construction organization from offices to the site will be a challenge. For that, we found many of the interviewee's emphasis on the idea or notion of the difference between looking sustainable and being sustainable in the construction industry. This shows that using advanced technology alone is not enough for the construction industry challenges in the UAE.

Due to that, having the required leadership role is very critical to support the implementation sustainability in the construction industry which was shown in both: the literature review and result data. It was very interesting that that data shows most of the workers in the site believe in the "lead by example" concept and it will really help them to believe that sustainability is not only a KPI to achieve, but a value within the organization itself. As such, we can understand why there are many comments from the construction workers to have a direct meeting with the senior management to share their inputs which will give them the feeling of contribution and belonging. As a result, when there are construction workers who have been trained and educated about sustainability and at the same time they are participating with senior management in the decisions that are associated with sustainability implementation, then using advanced technology will be an adding value to enhance sustainability performance of the construction organization.

In addition, in terms of regulations, both the senior management and construction workers highlight the need to have clear and robust sustainability policies and regulations that would be presented as a clear path for everyone in the industry. One of the interesting points is that many of these regulations are so complex to be illustrated to the construction workers due to their limited education and here, the senior management should interfere to make sure this sustainability is simple and can be understood via their end-users to ensure the healthy sustainability culture inside the organization. As such, the need of having a holistic solution that combines all the different aspects, such as managerial, technical and procedural, is a key solution to have effective implementation of the sustainability in the construction. In the literature review, using circular economy was one of the holistic approaches that can help the construction industry to have better implementation regarding the sustainability challenges. In addition, the interviewees mentioned that there is another misunderstood idea about using the "extra cost" of using the circular business model in construction. As shown in the literature review, the circular economy usually costs more than the usual or linear capital investment, yet as many of the engineers and workers highlight that, in the long run the maintenance cost will be less which will reduce the total cost significantly. As such, many responses either in the interviews or questionnaires suggest using life costing analysis as a tool with the circular economy business model.

5.2. Conclusion and Recommendation

Through this research attempts to enhance the sustainability performance at construction industry in the UAE via exposing the current challenges and provide potential solutions such as circular economy. As can be seen from the literature review, many construction scholars explicate their sustainability struggles with current implementation applications in the industry and the needs for a holistic method. The purpose of this investigation is to include all dynamic attributes that can cause and impact the implementation of the sustainability in the construction sites. Practical, managerial, and social features were examined with respect to the different factors that play a critical role in the oil and gas industry. Several global sustainability initiatives could not deliver a

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holistic viewpoint to recognize the complete opportunity of implementing sustainability the construction industry in the UAE. To have a unified interpretation for better sustainability implementation, an integrated investigation should be conducted such circular economy approach. To regulate the potential sustainability threats at the construction organization, all the staffs in the organization have been examined via a questionnaire that was circulated as a part of the methodology work in this study.

Revealing the current sustainability challenges in the construction organization' sustainability culture was a vibrant phase towards identifying the significant essentials that had to be reinforced in order to enhance the sustainability implementation. There were unanticipated points raised up via both senior management and site workers, providing a sight at the several challenges towards the sustainability implementation strategy. For example, both senior management and site workers specify some defects in the practical skills, due to the lack of sustainability exercise or communication between construction organizations. Additionally, this phase of the study elucidates the variance mindset between senior employees and site workers in how the sustainability and organizational measures should be applied. A chief encounter arose in the social feature especially from the senior management side. For more illustration, most executives who participated in the survey, lacked sustainability vision when it came to how sustainability culture and climate are associated with site workers behavioral and mindset.

The practical work in this research; survey, and interviews helped to expose critical essentials, as demonstrated in analysis. The results provide the need of conceptual plans that satisfy industrial concerns such construction industry to implement sustainability. Simultaneously, through this study, sustainability scholars specify the importance of linking other features such as people behavioral and organization culture as part of sustainability integrity. Additionally, in depth, the results show new features of behavioral safety during the sustainability assessment, confirming the behavioral communication between the seniors and juniors' employees. Thus is, an open channel for both managers and workers will be established to enhance the sustainability implementation.

As the in the interview stage, it highlighted that when the behavioral examination is used in the sustainability assessment, the senior employs green performance awareness towards their construction industry fundamentals is amplified. This, in turn, it has the potential to improve the profitability in the long run for construction organizations. As shown in the Framework, these comprehensive features of sustainability implementation provide a better strategy for sustainability implementation in the construction industry. Due to the practicality of the civil engineering and construction field, especially in the infrastructure, there is a necessity to study how these results of this study will be implemented and employed with the current markets. The participants explained that the potential positive impact of circular economy in playing a holistic role in implementing sustainability in the construction industry. For instance, the participants highlighted that the construction firms should have a sustainability strategy that includes all employee groups from senior to site workers. Additionally, according to the participants in this study that they suggested continuous actions to the site workers feedbacks towards sustainability which advances the implementation process. Furthermore, to enhance the green performance, the participants recommended numerous healthy practices under the circular economy umbrella that must be applied laterally with regular construction actives.

This research observes the sustainability presentation and implementation at the construction industry in the UAE. The participants of this study highlight the need of a cohesive method that encloses vigorous features to improve the sustainability system execution. As was displayed in literature review stage, sustainability in construction is a very vibrant arena that needs a sequential development. For instance, according to many

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construction scholars (Carpenter, et al., 2001), that to have a significant construction development, the sustainability occurrence in construction should be restructured regularly with respect to other factors e.g. technology and policies. As result, this research suggest the next recommendations that can deliver the potential for other scholars to employ the conceptual results of this study.

- ***Creating proper governess system that suits the circular economy in the construction industry***

Having dynamic governess system for the circular economy in the construction industry will help the construction organization to have a clear road map and reference that help them to implement sustainability regardless to the changing variables in the construction industry.

- ***Studying in depth the role of human factor in the circular economy***

As shown in research that the behavioral aspect plays a critical role in the implementation the sustainability as healthy culture in the construction organization. For that, studying human factors with respect the circular economy system will be a good start and coloration for better sustainability implementation via the circular economy in the construction industry.

References

1. Abidin, N. Z. (2010). Investigating the awareness and application of sustainable construction concept by Malaysian developers. Habitat international, 34(4), 421-426.
2. Ali Sayyad and Jameel Maki. MEASUREMENT OF ANGLE BETWEEN SUBSPACES IN DIRECT SUM DECOMPOSITION. *IJADT.* 2022. Vol. 1(2):91-99. DOI: 10.54878/IJADT.174
3. Al-Hajj, A., & Hamani, K. (2011). Material waste in the UAE construction industry: Main causes and minimization practices. Architectural engineering and design management, 7(4), 221-235.
4. AL-Hyari, A. M. (2017). The Integration of Sustainability in Project Management and Its Impact on UAE Construction Projects Performance (Doctoral dissertation, The British University in Dubai (BUiD)).
5. Al-Naqbi, A. K., & Alshannag, Q. (2018). The status of education for sustainable development and sustainability knowledge, attitudes, and behaviors of UAE University students. International Journal of Sustainability in Higher Education.
6. Alwan, Z., Jones, P., & Holgate, P. (2017). Strategic sustainable development in the UK construction industry, through the framework for strategic sustainable development, using Building Information Modelling. Journal of Cleaner Production, 140, 349-358.
7. Asif, M. (2016). Growth and sustainability trends in the buildings sector in the GCC region with particular reference to the KSA and UAE. Renewable and Sustainable Energy Reviews, 55, 1267-1273.
8. Berkes, F., & Folke, C. (1994). Linking social and ecological systems for resilience and sustainability. Beijer International Institute of Ecological Economics, The Royal Swedish Academy of Sciences.
9. Bocken, N. M., & Short, S. W. (2021). Unsustainable business models-Recognising and resolving institutionalised social and environmental harm. Journal of Cleaner Production, 312, 127828.
10. Brown, J. (2009). Democracy, sustainability and dialogic accounting technologies: Taking pluralism seriously. Critical Perspectives on Accounting, 20(3), 313-342.
11. Brochner, J., Ang, G. K., & Fredriksson, G. (1999). Sustainability and the performance concept: encouraging innovative environmental technology in construction. Building Research & Information, 27(6), 367-372.
12. Brulle, R. J. (2010). From environmental campaigns to advancing the public dialog:

Emirati Journal of Civil Engineering and Applications
Vol 1 Issue 1 (2023) 4 - 20
DOI: 10.54878/EJCEA.442

Available at www.emiratesscholar.com

Environmental communication for civic engagement. Environmental Communication, 4(1), 82-98.

13. Carpenter, S. R., & Gunderson, L. H. (2001). Coping with Collapse: Ecological and Social Dynamics in Ecosystem Management: Like flight simulators that train would-be aviators, simple models can be used to evoke people's adaptive, forward-thinking behavior, aimed in this instance at sustainability of human-natural systems. BioScience, 51(6), 451-457.
14. Castellani, V., & Sala, S. (2010). Sustainable performance index for tourism policy development. Tourism management, 31(6), 871-880.
15. Cox, R. (1987). The rich harvest of Abraham Maslow. Motivation and personality, 245-271.
16. DAmato, D., Veijonaho, S., & Toppinen, A. (2020). Towards sustainability? Forest-based circular bioeconomy business models in Finnish SMEs. Forest policy and economics, 110, 101848.
17. De Abreu, M. C. S., & Ceglia, D. (2018). On the implementation of a circular economy: The role of institutional capacity-building through industrial symbiosis. Resources, Conservation and Recycling, 138, 99-109.
18. Dietz, R., & O'Neill, D. (2013). Enough is enough: Building a sustainable economy in a world of finite resources. Routledge.
19. Eggenberger, M., & Partidário, M. R. (2000). Development of a framework to assist the integration of environmental, social and economic issues in spatial planning. Impact assessment and project appraisal, 18(3), 201-207.
20. Elchalakani, M., Aly, T., & Abu-Aisheh, E. (2014). Sustainable concrete with high volume GGBFS to build Masdar City in the UAE. Case Studies in Construction Materials, 1, 10-24.
21. Elsir Saad, Hessa Alzaabib and Hessa Alzaabib et al. E-Learning Success Factors from Business Perspective. *IJADT.* 2022. Vol. 1(2):75-90. DOI: 10.54878/IJADT.173
22. Ferronato, N., Rada, E. C., Portillo, M. A. G., Cioca, L. I., Ragazzi, M., & Torretta, V. (2019). Introduction of the circular economy within developing regions: A comparative analysis of advantages and opportunities for waste valorization. Journal of environmental management, 230, 366-378.
23. Glass, J. (2012). The state of sustainability reporting in the construction sector. Smart and sustainable built environment.
24. Hamani, K., & Al-Hajj, A. (2015, July). A conceptual framework towards evaluating construction contractors for sustainability. In The construction, building and real estate research conference of the Royal Institution of Chartered Surveyors RICS COBRA AUBEA (pp. 8-10).
25. Haugh, H. M., & Talwar, A. (2010). How do corporations embed sustainability across the organization?. Academy of Management learning & education, 9(3), 384-396.
26. Hendiani, S., & Bagherpour, M. (2019). Developing an integrated index to assess social sustainability in construction industry using fuzzy logic. Journal of cleaner production, 230, 647-662.
27. Huovila, P., & Koskela, L. (1998, August). Contribution of the principles of lean construction to meet the challenges of sustainable development. In 6th Annual Conference of the International Group for Lean Construction. Guaruja, São Paulo, Brazil (pp. 13-15).
28. Johnston, P., Everard, M., Santillo, D., & Robèrt, K. H. (2007). Reclaiming the definition of sustainability. Environmental science and pollution research international, 14(1), 60-66.
29. Kazim, A. (2010). Strategy for a sustainable development in the UAE through hydrogen energy. Renewable Energy, 35(10), 2257-2269.
30. Keeble, B. R. (1988). The Brundtland report:'Our common future'. Medicine and war, 4(1), 17-25.

Emirati Journal of Civil Engineering and Applications
Vol 1 Issue 1 (2023) 4 - 20
DOI: 10.54878/EJCEA.442

Available at www.emiratesscholar.com

31. Keyi Wu and Borja Garcaí de Soto. Spatio-temporal planning simulation of temporary elevators in construction using a game engine. *IJADT.* 2022. Vol. 1(1):59-74. DOI: 10.54878/IJADT.102
32. Kirveennummi, A., Mäkelä, J., & Saarimaa, R. (2013). Beating unsustainability with eating: four alternative food-consumption scenarios. Sustainability: Science, Practice and Policy, 9(2), 83-91.
33. Kjaer, L. L., Pigosso, D. C., Niero, M., Bech, N. M., & McAloone, T. C. (2019). Product/service-systems for a circular economy: The route to decoupling economic growth from resource consumption?. Journal of Industrial Ecology, 23(1), 22-35.
34. Milios, L. (2018). Advancing to a Circular Economy: three essential ingredients for a comprehensive policy mix. Sustainability Science, 13(3), 861-878.
35. Moshood, T. D. (2020). Emerging challenges and sustainability of industry 4.0 era in the Malaysian construction industry. TD Moshood, AQ Adeleke, G. Nawanir, WA Ajibike, RA Shittu, Emerging Challenges and Sustainability of Industry, 4, 1627-1634.
36. Moore, J. E., Mascarenhas, A., Bain, J., & Straus, S. E. (2017). Developing a comprehensive definition of sustainability. Implementation Science, 12(1), 1-8.
37. Missimer, M., Robèrt, K. H., Broman, G., & Sverdrup, H. (2010). Exploring the possibility of a systematic and generic approach to social sustainability. Journal of Cleaner Production, 18(10-11), 1107-1112.
38. National Research Council. (1999). Our common journey: a transition toward sustainability. National Academies Press.
39. Nurse, K. (2006). Culture as the fourth pillar of sustainable development. Small states: economic review and basic statistics, 11, 28-40.
40. Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: in search of conceptual origins. Sustainability science, 14(3), 681-695.
41. Rogers, P. P., Jalal, K. F., & Boyd, J. A. (2012). An introduction to sustainable development. Earthscan.
42. Roseland, M. (2012). Toward sustainable communities: Solutions for citizens and their governments. New Society Publishers.
43. Salama, M., & Hana, A. R. (2010, September). Green buildings and sustainable construction in the United Arab Emirates. In Proc. 26th Annual ARCOM Conference (pp. 1397-1405).
44. Saleh, M. S., & Alalouch, C. (2015). Towards sustainable construction in Oman: Challenges & opportunities. Procedia Engineering, 118, 177-184.
45. Shibieka, A. I., Raheem, T. B. A., & Hittini, B. Y. (2019). Exploring Challenges of Adopting Sustainability Assessment Methods in UAE-Perspectives of Project Professionals.
46. Sim, Y. L., & Putuhena, F. J. (2015). Green building technology initiatives to achieve construction quality and environmental sustainability in the construction industry in Malaysia. Management of Environmental Quality: An International Journal.
47. Taušová, M., Mihaliková, E., Čulková, K., Stehlíková, B., Tauš, P., Kudelas, D., & Štrba, Ľ. (2019). Recycling of Communal Waste: Current State and Future Potential for Sustainable Development in the EU. Sustainability, 11(10), 2904.
48. Wildemuth, B. M. (Ed.). (2016). Applications of social research methods to questions in information and library science. ABC-CLIO.
49. Zsóka, Á., Szerényi, Z. M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. Journal of Cleaner Production, 48, 126-138.