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The Emerging Circular Economy Trends of United Arab Emirates (UAE) Universities

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Abstract

This paper examines the emerging circular economy trends in universities in the United Arab Emirates (UAE). The circular economy is a model that aims to reduce waste and maximize the use of resources, promoting sustainable development. The study analyses UAE universities' various initiatives to adopt circular economy practices, including using renewable energy, sustainable building design, and waste reduction strategies. The paper also discusses the challenges and opportunities for implementing circular economy practices in universities in the UAE and highlights examples of circular economy initiatives in various universities. The paper concludes by providing recommendations for universities in the UAE to promote sustainable practices further and contribute to the circular economy movement. The findings of this study provide insights into the emerging circular economy trends in universities in the UAE and offer directions for future research in this area. The ADKAR change management can be adapted to inspire the CE initiatives of the UAE Education sector.

Keywords: Circular economy; eco-design: business education; management education, ADKAR

1. Introduction

The concept of circular economy has been gaining momentum in recent years to promote sustainable development and reduce waste. The United Arab Emirates (UAE) has also recognized the importance of adopting circular economy practices to address environmental challenges and promote sustainable growth. Universities in the UAE are playing a vital role in this transition by implementing circular economy practices and promoting sustainability education. This paper focuses on exploring the emerging trends of the circular economy in universities in the United Arab Emirates (UAE) (Dave et al., 2022). The circular economy is a model that aims to minimize waste and optimize resource usage, thus promoting sustainable development. The study delves into the various initiatives that UAE universities have taken to implement circular economy practices. These initiatives include using renewable energy sources, sustainable building design, and waste reduction strategies (Campra et al., 2021).

This paper explores the emerging trends of the circular economy in universities in the UAE. It aims to provide insights into the initiatives taken by these universities to adopt circular economy practices, the challenges and opportunities they face, and the impact of these practices on sustainable development. The key challenges include the need for more awareness and understanding of circular economy principles, the need for significant investments, and the need for clear regulatory frameworks. However, the study also highlights the benefits of adopting circular economy practices, such as reducing costs, improving the environmental footprint of universities, and promoting innovation and collaboration. The paper also provides examples of circular economy initiatives implemented in various universities in the UAE. These examples range from small-

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scale projects such as composting and recycling to large-scale initiatives such as using renewable energy in campus buildings (Dantas et al., 2021).

The UAE is a rapidly developing country with a growing population, which puts pressure on natural resources and generates significant waste. In response to these challenges, the UAE has launched several initiatives to promote sustainability and reduce waste. One of the most prominent initiatives is the UAE Vision 2021, which aims to promote sustainable development and reduce the country's ecological footprint.

Universities in the UAE have also recognized the importance of adopting circular economy practices to promote sustainability and reduce waste. These universities have implemented various initiatives, such as using renewable energy sources, sustainable building design, and waste reduction strategies. Moreover, universities in the UAE are also promoting sustainability education to raise awareness and encourage students to adopt sustainable practices in their daily lives(Lusk et al., 2020). Despite these efforts, universities in the UAE need help in implementing circular economy practices. These challenges include the lack of awareness about circular economy principles, the need for significant investments, and the absence of clear regulatory frameworks.

Therefore, this paper aims to provide an overview of the emerging circular economy trends in universities in the UAE, analyze the challenges and opportunities for implementing circular economy practices, and offer recommendations for universities to promote sustainable practices further and contribute to the circular economy movement. The paper concludes by offering recommendations to the UAE universities to promote sustainable practices and contribute to the circular economy movement. These recommendations include increasing awareness and education about circular economy principles, developing clear regulatory frameworks, encouraging collaboration among universities, and investing in research and development of circular economy solutions. Overall, this paper provides valuable insights into the emerging circular economy trends in universities in the UAE, highlighting the challenges and opportunities for implementing circular economy practices. The findings of this study offer directions for future research in this area and provide a roadmap for universities in the UAE to promote sustainable practices and contribute to the circular economy movement (Kirchherr et al., 2019).

The UAE education sector is transforming Smart Universities and Smart Education systems. This transformation is spearheaded by the Smart Government initiatives of various Emirates, such as Dubai and Abu Dhabi. The aim is to make the education sector more sustainable, efficient, and effective by reducing paper usage, streamlining administration, and using emerging technologies. One of the most significant changes is the move towards paperless offices and administration. This means universities use digital platforms to record and issue certificates, reducing paperwork and making the process more efficient. This move towards paperless administration is a step towards sustainability, as it reduces paper usage and waste (Mendoza et al., 2019).

The Smart Government initiatives are also promoting emerging technologies such as Blockchain, Cloud-computing, Virtual Reality, AI, and Machine learning in education to further sustainability and standardize education curricula in the UAE. For example, Blockchain technology can securely store education records, making them easily accessible and tamper-proof. Cloud computing can store and access educational resources and data, making it easier for students and teachers to collaborate and share information. Virtual Reality can create immersive learning experiences, making education more engaging and interactive. AI and Machine learning can be used to personalize learning, adapting to the needs and preferences of individual students. These Smart Education initiatives are making the education sector more sustainable and creating opportunities for implementing circular economy initiatives. For example, Blockchain technology can be extended to implement circular economy practices by creating a secure and transparent system for tracking and managing waste. This can help reduce waste and increase the efficiency of recycling and waste management processes (Ghareeb et al., 2020).

Overall, the UAE Education sector's move towards Smart Universities and Smart Education systems is a positive step towards creating a more sustainable and efficient education sector. Emerging technologies and Smart Government initiatives are creating opportunities to implement circular economy practices and promote sustainability in the education sector. (Iyer, 2022).

Given the previous gap analysis, our paper aims to explore the following research questions:

a) What are the current circular economy trends being adopted by UAE universities?

b) What challenges and opportunities do UAE universities face in implementing circular economy practices?

c) How effective are the circular economy initiatives being implemented by UAE universities in promoting sustainability and reducing environmental impact?

d) What are the best practices for implementing circular economy initiatives in UAE universities?

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2. Literature review

The concept of the circular economy is gaining increasing importance in the global economy, focusing on sustainability and resource efficiency. UAE universities also recognise the need to adopt circular economy practices to promote sustainability and reduce environmental impact. This literature review explores UAE universities' emerging circular economy trends and the challenges and opportunities associated with their implementation.

2.1 Circular economy trends in UAE universities

UAE universities are increasingly adopting circular economy practices to promote sustainability and reduce environmental impact. These practices include waste reduction, recycling, and using renewable energy sources. For example, the Masdar Institute of Science and Technology, based in Abu Dhabi, has implemented a zero-waste policy, where waste is reduced and recycled to minimize its environmental impact. Similarly, the American University of Sharjah has implemented a sustainability plan, which includes using renewable energy sources such as solar power and reducing water consumption.

2.2 Challenges and opportunities

The implementation of circular economy practices in UAE universities has its challenges. One major challenge is the need for more awareness and understanding of the circular economy concept among stakeholders, including students, faculty, and administrators. This can hinder the adoption and implementation of circular economy practices. The lack of infrastructure and resources for waste management and recycling can also pose a challenge.

However, several opportunities exist for implementing circular economy practices in UAE universities. The UAE government has committed to promoting sustainability and reducing its environmental impact through initiatives such as the UAE Vision 2021, which aims to achieve a sustainable environment and infrastructure. This allows universities to align their sustainability efforts with the government's objectives and collaborate on circular economy initiatives. UAE universities' emerging circular economy trends demonstrate a commitment to sustainability and resource efficiency. However, the challenges associated with implementing circular economy practices must be addressed to ensure their effectiveness. The opportunities for collaboration with the UAE government on sustainability initiatives provide an avenue for universities to make a significant impact on the circular economy and promote a sustainable future in the UAE

2.3 Gaps in the literature

Despite the growing interest in circular economy practices in UAE universities, gaps in the literature need to be addressed. Most of the available literature is descriptive and based on case studies, which limits our understanding of the impact of these practices on sustainability and resource efficiency. While some studies have identified the challenges associated with implementing circular economy practices in UAE universities, there is a need for more in-depth research on these challenges, including the barriers to adoption and the strategies for overcoming them. The engagement of stakeholders, including students, faculty, and administrators, is critical for the successful implementation of circular economy practices in universities. However, there needs to be more focus on stakeholder engagement in the available literature.

2.4 Circular economy – present and future scenario

The circular economy is a newer concept and not so known till now to most people. Most people are still caught in the linear sustainability economy. The circular economy (CE) model considers a reduction in the negative impact on the environment, thus moving away from the traditional linear business model, where the final product is value creation after reaching its highest consumption point. In the CE, the main goal is to enhance the product's life span, create goods with a long-life cycle and focus on services rather than products (Figure 1). The focus should be on the change management to shift from a linear to a circular economy. The ADKARI model (Figure 2) is a perfect application for this chance management, as

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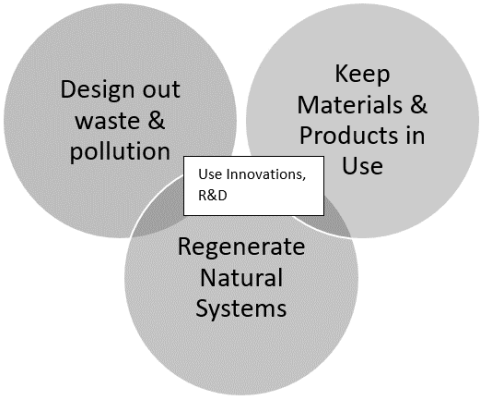
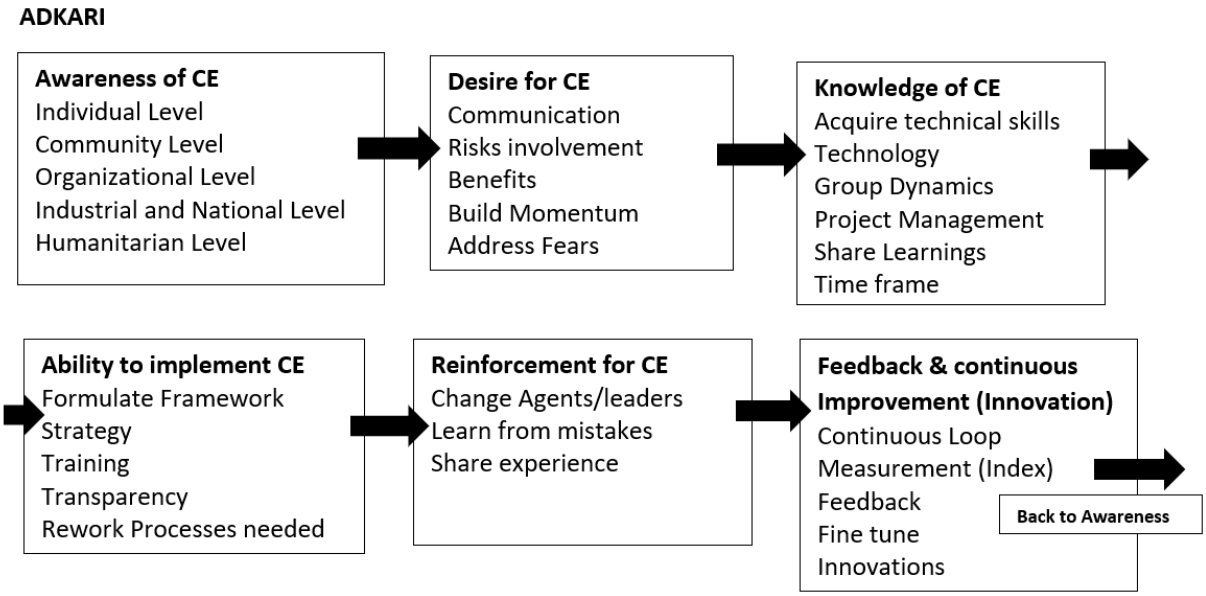
discussed below. The Circular economy has primarily three pillars shown in the figure, and the fourth can use innovations through R&D to achieve the other three (Baars et al., 2021; Iyer et al., 2020).

Figure 1. Innovations and R&D



Source: Authors' elaboration

Figure 2. The ADKARI Model



Source: Authors' elaboration

3. The ADKARI model

3.1 Awareness of circular economy

The circular economy is a concept that aims to promote sustainability by reducing waste and maximizing the use of resources. Awareness of circular economy can be looked at from different levels, including individual, community, organizational, industrial or national level, and humanitarian levels. At the individual level, awareness of the circular economy involves understanding the importance of reducing waste and adopting sustainable practices in daily life, such as recycling, composting, and reducing energy consumption. It also involves promoting the idea of a circular economy to others, such as family and friends, to increase awareness and encourage the adoption of sustainable practices. At the community level, awareness of circular economy involves promoting sustainable practices and adopting circular economy principles in

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local communities. This includes encouraging local businesses to adopt sustainable practices, supporting local recycling programs, and promoting the use of locally sourced products to reduce waste and promote sustainability. At the organizational level, awareness of circular economy involves promoting sustainable practices and using circular economy principles in organizations and businesses. This includes implementing sustainable supply chain practices, reducing waste in production processes, and promoting using renewable energy sources. At the industrial or national level, awareness of circular economy involves promoting the adoption of circular economy principles in industries and at the national level. This includes promoting sustainable manufacturing practices, reducing waste in production processes, and using renewable energy sources to reduce carbon emissions. At the humanitarian level, awareness of circular economy involves promoting sustainable practices in developing countries and using circular economy principles in humanitarian efforts. This includes promoting sustainable agriculture practices, reducing waste in refugee camps, and using renewable energy sources in humanitarian aid efforts. In summary, awareness of circular economy can be promoted at different levels, including individual, community, organizational, industrial or national, and humanitarian levels. This involves promoting sustainable practices, reducing waste, and using renewable energy sources to promote sustainability and reduce environmental degradation (Mukwenda et al., 2019).

3.2 Desire for circular economy

The desire for a circular economy can be driven by various factors, such as communication, risks involvement, benefits, building momentum, and addressing fears. Effective communication is essential in creating a desire for a circular economy. Communication efforts should emphasize the importance of sustainability and the benefits of a circular economy in reducing waste and promoting the efficient use of resources. Communication can be achieved through different channels, such as social media, advertising, public relations, and education programs. Involving stakeholders, such as businesses, governments, and communities, in the circular economy process can help create a desire for the circular economy. By involving stakeholders in the process, they will understand the risks of not adopting sustainable practices and the benefits of a circular economy. Communicating the benefits of a circular economy can create a desire for it. The benefits include reducing waste, conserving natural resources, creating jobs, and reducing greenhouse gas emissions. These benefits positively impact the environment, economy, and society (Kirchherr et al., 2019). Building momentum is important in creating a desire for a circular economy. This can be achieved by creating partnerships, collaborations, and alliances. The momentum created can drive change and inspire others to adopt sustainable practices. Addressing fears related to a circular economy can create a desire for it. Some fears include the loss of jobs, the cost of implementing sustainable practices, and difficulty changing consumer behaviour. Addressing these fears can help stakeholders understand that a circular economy can create new jobs, save costs in the long run, and that change is possible. By doing so, stakeholders will understand the importance of adopting sustainable practices and be motivated to promote a circular economy (Rodriguez, 2020).

3.3 Knowledge of circular economy

Knowledge is the major contributor to CE successful implementation, and for this, the participants need to acquire technical skills, technology know-how, Team dynamics skills, project management skills, collaborate with others to share learnings and within the decided time frame. Knowledge of circular economy requires acquiring technical skills and technology competency. Technical skills refer to using tools, machinery, and other equipment to perform specific tasks. In the context of a circular economy, technical skills are required to design products that can be easily recycled, repaired, or reused. Technical skills are also needed in waste management, recycling, and upcycling processes (Kirchherr et al., 2019). Technology competency refers to the knowledge and ability to use technology to achieve specific goals. In the context of a circular economy, technology competency is essential in developing and implementing innovative technologies that support circular economy principles. This includes using digital platforms to facilitate the exchange of resources and materials, developing smart waste management systems, and using renewable energy sources. Technical skills and technology competency can be acquired through various means, such as training programs, workshops, and educational courses. These programs can help individuals and organizations understand the principles of circular economy, learn about sustainable practices, and gain technical skills and technology competency. In addition, collaboration with other stakeholders can also help in acquiring technical skills and technology competency. Partnerships with technology companies, research institutions, and other organizations can provide access to the latest technologies and knowledge supporting circular economy practices. By doing so, stakeholders can design products that support circular economy principles, implement sustainable practices, and

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create innovative solutions that promote a circular economy. Group dynamics refer to how people interact and work together in a group setting. In a circular economy, group dynamics promote stakeholder collaboration, communication, and teamwork. This includes engaging stakeholders from different sectors and disciplines to work together towards common goals, sharing ideas and perspectives, and building trust and relationships. Project management is also crucial in implementing circular economy practices. This involves setting clear goals, timelines, and budgets and identifying and managing risks and stakeholders. Effective project management ensures that circular economy initiatives are implemented efficiently and effectively. Shared learnings are also important in promoting knowledge of the circular economy. This involves sharing best practices, successes, and challenges among stakeholders. By learning from each other, stakeholders can identify opportunities for improvement and develop more effective circular economy strategies. Finally, a clear time frame is essential in implementing circular economy practices. This involves setting realistic timelines and milestones, monitoring progress and adjusting strategies. A clear time frame ensures that circular economy initiatives are implemented promptly and effectively (Stacy et al., 2021).

3.4 Ability to implement circular economy

Circular Economy is an economic system that aims to eliminate waste and promote the continual use and regeneration of resources. To implement Circular Economy, a formulated framework is needed to establish the principles and guidelines for the process. A strategy is also necessary to identify the areas where Circular Economy can be implemented, such as product design, resource management, and waste reduction. This strategy should be flexible to adapt to changing circumstances and evolving technologies. Training is crucial to ensure that all stakeholders, including employees, suppliers, and customers, understand the principles and practices of the Circular Economy. Transparency is also essential to build trust and accountability among all parties involved. Finally, rework processes are necessary to ensure that any waste generated during the production or consumption cycle is reused or recycled. This can include repurposing materials, repairing products, or recycling waste back into the production process. By adopting this approach, we can promote sustainable and responsible resource use and create a more resilient and equitable economy (Kachian et al., 2018).

3.5 Reinforcement for circular economy

Change agents or leaders are individuals or groups who advocate for and initiate change within an organization or community. They can help promote Circular Economy's principles and encourage others to adopt sustainable practices. By providing leadership and guidance, change agents can help to reinforce the importance of the Circular Economy and ensure that it is integrated into the organization's culture and operations. Learning from mistakes is also an important aspect of reinforcement. When mistakes are made, it provides an opportunity to learn and improve. By analyzing the causes of mistakes and identifying ways to prevent them in the future, organizations can strengthen their commitment to Circular Economy and reinforce the importance of sustainable practices. Sharing experiences is another way to reinforce Circular Economy. Organizations can inspire others to adopt sustainable practices by sharing success stories and best practices. This can be done through case studies, workshops, and other forms of communication. Sharing experiences can also help to build a sense of community and collaboration around the principles of Circular Economy. In summary, reinforcement is critical for successfully implementing the Circular Economy. By leveraging change agents/leaders, learning from mistakes, and sharing experiences, organizations can strengthen their commitment to sustainability and promote the continual use and regeneration of resources. (Khan et al., 2019).

3.6 Feedback and continuous improvement through innovations

The last step that has been suggested and added by the researchers as Improvement in terms of Innovation is the continuous development using R&D. The feedback can be given based on the measurement using the CE index, which is introduced below whether the implementation is going as expected or fine-tuning is required to set it on track. The innovations will start the whole cycle again, spreading awareness to measure the effectiveness of implementation Feedback and continuous improvement are essential for successfully implementing a Continuous Loop in a Circular Economy (Kirchherr et al., 2019). This involves using measurement, feedback, fine-tuning, and innovation to create a more sustainable and efficient system. Measurement is a crucial part of the Continuous Loop process. It involves using an index, such as a sustainability index, to measure the organisation's activities' environmental, social, and economic impacts. By measuring

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these impacts, the organization can identify areas for improvement and track progress over time. Feedback is another essential component of the Continuous Loop process. It involves collecting feedback from stakeholders, such as customers, employees, and suppliers, on the organization's sustainability efforts. This feedback can be used to identify improvement areas and develop new strategies to enhance sustainability. Fine-tuning involves small adjustments to the organization's processes and practices to improve sustainability. This can involve optimizing supply chain efficiency, reducing waste, and reducing energy consumption. By fine-tuning these processes, the organization can reduce its environmental footprint and improve its overall sustainability. Innovation is also important for continuous improvement in a Circular Economy. This involves developing new technologies, products, and services that promote sustainability and reduce waste. Innovation can help to create new markets and opportunities for the organization, while also contributing to more sustainable outcomes. (Jia et al., 2020).

3.7 Circular economy index

A Circular Economy index is a tool that measures an organization's progress towards implementing circular economy principles. This index typically includes a set of indicators that assess the organization's performance in areas such as resource efficiency, waste reduction, and product design. A Circular Economy index could be developed for UAE universities to measure their progress towards implementing circular economy principles. Resource efficiency - measures the university's use of natural resources such as water, energy, and materials. This could include tracking energy consumption, water usage, and waste generation. Waste reduction - measures the university's efforts to reduce waste and increase recycling. This could include tracking the amount of waste generated, the percentage of recycled waste, and implementing waste reduction strategies such as composting and reusing materials. Product design - measures the university's efforts to design products and services that promote circularity. This could include tracking the use of sustainable materials, implementing product design strategies such as modular design, and developing new circular products and services. Stakeholder engagement - measures the university's efforts to engage stakeholders (such as students, faculty, and staff) in circular economy principles. This could include tracking the implementation of circular economy education programs, using circular economy messaging in marketing and communications, and developing circular economy partnerships with local businesses and organizations. This can help to promote sustainable practices and support the transition towards a more circular economy in the UAE (De Oliveira et al., 2021).

4. Alternative solutions to problems by leveraging the prospects

UAE Universities can contribute to the CE prospects by leading a lot of initiatives. Some of the above-illustrated initiatives are already work in progress, and some are suggestions from the industry to the sector to contribute more (Figure 3).

Figure 3. Education sector in UAE

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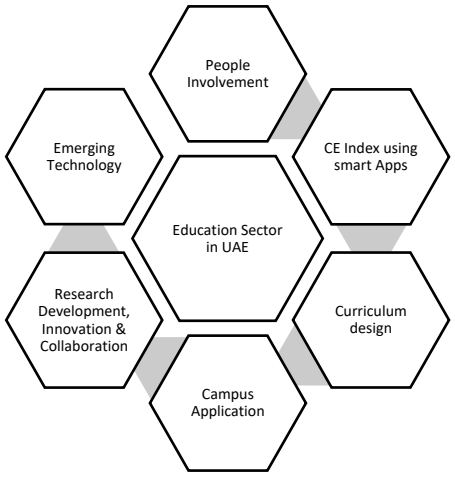

Source: Author's elaboration

4.1 Curriculum design for the circular economy

Curriculum design for the Circular Economy is the process of developing educational programs and courses that equip students with the knowledge, skills, and values needed to understand and apply circular economy principles in their future careers (Kleba et al., 2020).

i. Identify learning objectives: This step involves determining what knowledge and skills students should acquire through the curriculum. Learning objectives should be specific, measurable, achievable, relevant, and time-bound.
ii. Select relevant topics: This step involves selecting topics that are relevant to the Circular Economy, such as resource efficiency, waste reduction, product design, and sustainable business practices. Topics should be aligned with the learning objectives.
iii. Develop learning activities: This step involves creating learning activities that engage students and enable them to apply circular economy principles. Activities could include case studies, problem-based learning, and group projects.
iv. Choose relevant teaching methods: This step involves selecting teaching methods that are appropriate for the learning objectives and activities. Teaching methods could include lectures, discussions, and experiential learning.
v. Incorporate assessment strategies: This step involves developing assessment strategies that measure student learning and achievement of the learning objectives. Assessment strategies could include exams, essays, and presentations.
vi. Integrate technology: This step involves integrating technology into the curriculum to enhance student learning. The technology could be used for online learning, virtual simulations, and collaborative work.
vii. Review and revise: This step involves reviewing and revising the curriculum to ensure it is up-to-date, relevant, and aligned with the learning objectives.

Curriculum design for the Circular Economy should be interdisciplinary and incorporate a range of subjects, including engineering, business, environmental science, and social sciences. By integrating circular economy principles into the curriculum, students can develop the knowledge and skills to promote sustainable practices and support the transition towards a more circular economy (Nunes et al., 2018).

4.3 Research & development, collaborations & innovations

Research and development (R&D) and collaborations & innovations can be vital in ensuring a circular economy in UAE universities. UAE universities can invest in R&D to develop sustainable technologies that promote the circular economy. For example, the Masdar Institute of Science and Technology or Khalifa University in Abu Dhabi has developed renewable energy technologies such as solar panels and wind turbines. UAE universities can collaborate with industry partners to develop innovative solutions that promote the circular economy (Kirchherr et al., 2019). For example, the Dubai Electricity and Water Authority (DEWA) has partnered with the American University of Dubai to develop a solar-powered air

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conditioning system. UAE universities can implement circular business models that promote product reuse, repair, and recycling. For example, the Dubai Future Accelerators program has partnered with universities to develop circular business models for waste management. UAE universities can educate students and raise awareness about the importance of the circular economy. For example, the University of Dubai has implemented a sustainability-focused curriculum that teaches students about sustainable business practices and the circular economy. UAE universities can provide funding for circular economy projects that promote sustainable practices. For example, the Abu Dhabi Sustainability Week funds research and development projects promoting sustainability and circular economy. R&D and, collaborations & innovations can ensure a circular economy in UAE universities by developing sustainable technologies, collaborating with industry partners, implementing circular business models, educating students, and providing funding for circular economy projects. By promoting a circular economy, UAE universities can contribute to a sustainable future for the UAE and the world. (Brown et al., 2019).

4.4 Emerging technology usage

Emerging technology usage can play a significant role in supporting the Circular Economy in UAE Universities. IoT is a network of devices connected to the internet that can communicate with each other. In universities, IoT technology can monitor and optimize resource consumption, such as energy and water usage. This can help universities reduce waste and promote a circular economy (Kirchherr et al., 2019). 3D printing is a technology that allows objects to be created by adding layers of material. In universities, 3D printing can create objects from recycled materials, reducing waste and promoting a circular economy. Blockchain is a decentralized digital ledger that records transactions securely and transparently. In universities, blockchain technology can track the provenance of materials, ensuring that they are sustainably sourced and promoting a circular economy. AI is the use of computer systems to perform tasks that would normally require human intelligence. In universities, AI can be used to optimize resource consumption, predict maintenance needs, and identify opportunities for waste reduction, promoting a circular economy. AR is a technology that overlays digital information into the real world. In universities, AR can be used to create immersive educational experiences that teach students about sustainable practices and the circular economy. Emerging technology usage can support UAE universities' Circular Economy by optimising resources, reducing waste, promoting sustainable sourcing, and creating immersive educational experiences. By leveraging the power of technology, UAE Universities can contribute to a sustainable future for the UAE and the world. (Jose et al., 2020).

4.5 People involvement

People's involvement is crucial for enhancing Circular Economy in UAE Universities. People's involvement is necessary to encourage participation in circular economy initiatives. Students, faculty, and staff need to be engaged in the planning and implementing of circular economy initiatives, and their feedback needs to be considered. People's involvement is necessary to implement behavioural changes that support circular economy initiatives. Students, faculty, and staff must be educated on sustainable practices and provided with the necessary tools and resources to implement them. People's involvement is necessary to encourage innovation in circular economy initiatives (Kirchherr et al., 2019). Students, faculty, and staff can contribute to developing new technologies, processes, and practices that support circular economy principles. People involvement is necessary to promote collaboration between different departments and stakeholders in the university. Circular economy initiatives require the collaboration of various departments, including facilities management, procurement, and sustainability. People's involvement is necessary to enhance the Circular Economy in UAE Universities. By promoting awareness, encouraging participation, implementing behavioural changes, encouraging innovation, and promoting collaboration, UAE Universities can contribute to a sustainable future for the UAE and the world. The implementation and success of the CE project depend on the People involved and their wholehearted participation. First, the people need to convince of the need for the CE requirements, importance and benefits, which proper training and workshops on the topics can augment. The People's involvement can be consolidated by introducing extrinsic and intrinsic rewards to motivate them (Bonato et al., 2018).

4.5 Circular economy using smart app

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The CE Index is a tool that measures the extent to which Circular Economy principles are being implemented in an organization. A smart application can collect data on circular economy practices in UAE universities. This can help identify areas where improvements can be made and track progress over time. Using a smart application to track CE Index, UAE universities can increase awareness of circular economy principles among students, faculty, and staff. This can encourage greater participation and a culture of sustainability (Kirchherr et al., 2019). A smart application can help identify areas where innovation can be applied to improve circular economy practices. This can lead to new technologies, processes, and practices supporting circular economy principles. Using a smart application to track CE Index can give UAE universities a clear picture of their progress towards circular economy goals. This can help identify areas where improvements can be made and track progress over time. A smart application can facilitate collaboration between different departments and stakeholders in UAE universities. UAE universities can work together to improve their circular economy practices by providing a platform for sharing data and ideas. CE Index using a smart application, can boost Circular Economy in UAE Universities by improving data collection, increasing awareness, encouraging innovation, monitoring progress, and facilitating collaboration. Using such a tool, UAE universities can contribute to a sustainable future for the UAE and the world. The CE Index development can be a major contribution to the area of existing knowledge and help in measuring the Organization's current initiatives on a standardized scale compared to the other Industrial initiative and can make suggestions to implement more projects. The Index will induce competitiveness among the various organizations and help the cause of CSR and CE (Figure 4) (Upadhyay et al., 2021).

Figure 4. Sustainable Development Goals (SDGs)

Source: Author's elaboration

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Table 1. Sustainability Development Goals[1] (SDGs)

SDG No.	Description of how the UAE Education sector can develop this SDG
1.	Eradicate Poverty by Education, which UAE Education sector can contribute
2.	Make Learners employable and as Entrepreneurs
3.	Train People on Well-Being and Health and spread awareness and run Research Projects.
4.	Standardized Common Circular Economy Curriculum
5.	Gender Equality exemplary practices at the UAE Education sector organizations
6.	Awareness and Experimental learning at the Campus
7.	Implement Projects on campus & Collaborate with Industry, Design Curriculum for these projects
8.	UAE education can develop Research, encourage innovativeness in renewable energy, tie-up with Industry to partner more projects
9.	UAE Education is recognized as economic contributor as education Hub for the Middle East and the many collaborations with the industry, is leading the way forward
10.	UAE Education lead Research & Development initiatives and implement Innovations that will contribute to CE and to build Infrastructure for such future initiatives.
11.	UAE Education can spread awareness and initiatives for building Smart cities and communities like Dubai and Abu Dhabi.
12.	The Collaboration with the Industry the UAE Education sector can lead initiatives towards responsible consumption and production of goods, products, services to CE and away from the linear economy.
13.	The UAE Education can build Ecological, Economical Curriculum to spread awareness of the Human action on Nature and the subsequent climate changes.
14.	The UAE Education can spread awareness of the impact of Human activities affecting Ocean lives and actions to avoid such impact.
15.	The UAE Education can spread awareness of the impact of Human activities affecting lives on Land and actions to avoid such impact.
16.	Institutes like UNEP, WHO should educate the people in collaboration with Government like UAE, involving the Education sector to spread Peace & Justice.
17.	The UAE Education collaborates with the Public and Private Companies to achieve CE goals leading to sustainability in Business.

Source: Author's elaboration

The SDGs of the UN shown in Table 1 can be extended to be the Circular Economy initiatives for the UAE Education sector. The above table shows the contribution of the UAE education sector towards the SDGs, making them CE goals that can be reworked as Circular Economy Development Goals (CEDGs) in the future (Rodriguez-Anton et al., 2019). The Circular Economy of UAE Universities can contribute to several Sustainable Development Goals (SDGs) set by the United

[1] https://sdgs.un.org/

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Nations. The Circular Economy of UAE Universities can promote responsible consumption and production by reducing waste and promoting the reuse and recycling of materials (SDG 12). The Circular Economy of UAE Universities can contribute to climate action by reducing greenhouse gas emissions through renewable energy, energy-efficient technologies, and sustainable practices (SDG 13- Climate Action). The Circular Economy of UAE Universities can provide quality education by integrating Circular Economy principles and practices into the curriculum, providing students with the knowledge and skills needed to build a sustainable future (SDG 4- Quality Education). The Circular Economy of UAE Universities can promote innovation and infrastructure development by encouraging the adoption of new technologies and processes that support Circular Economy principles (SDG 9- Industry, Innovation, and Infrastructure). The Circular Economy of UAE Universities can contribute to sustainable cities and communities by promoting renewable energy, reducing waste, and encouraging sustainable practices (SDG 11- Sustainable Cities and Communities). The Circular Economy of UAE Universities can foster partnerships by collaborating with local communities, businesses, and government agencies to promote sustainable practices and achieve the SDGs (SDG 17- Partnerships for the Goals). In summary, the Circular Economy of UAE Universities can contribute to several SDGs, including responsible consumption and production, climate action, quality education, industry, innovation, infrastructure, sustainable cities and communities, and partnerships for the goals (Kirchherr et al., 2019).

5. Barriers that need to be overcome for successful CE projects implementation

While implementing Circular Economy projects in UAE Universities can bring numerous benefits, several barriers must be addressed to ensure their success. One of the primary barriers to implementing Circular Economy projects in UAE Universities is a need for more awareness among stakeholders about the benefits of Circular Economy. Without a clear understanding of the principles and advantages of the Circular Economy, stakeholders may not see the value in investing in such projects (Kirchherr et al., 2019). The limited budget is another significant barrier to implementing Circular Economy projects in UAE Universities. Circular Economy projects often require significant investment in new technologies and processes, which may not be feasible for universities with limited financial resources. Resistance to change is another barrier to implementing Circular Economy projects. Some stakeholders may be resistant to change and unwilling to adopt new practices or technologies that support Circular Economy principles. Implementing Circular Economy projects requires specialized expertise and knowledge. UAE Universities may need to gain in-house expertise, making it challenging to implement Circular Economy projects successfully. Implementing Circular Economy projects in UAE Universities requires collaboration between stakeholders, including faculty, staff, and students. With collaboration, it can be easier to achieve the desired outcomes. To overcome these barriers, UAE Universities must invest in awareness-raising campaigns, allocate adequate budgets, provide training and capacity building to staff and students, and foster a culture of collaboration and innovation. By addressing these barriers, UAE Universities can successfully implement Circular Economy projects and contribute to a more sustainable future. The United Nations should recognize the CE development programs; the UN support will force governments to follow suit. The UAE government must announce policies that exempt and give concessions to Organizations developing CE initiatives. The individual mindset can be shifted by spreading awareness of employee benefits, importance, and individual rewards. The employees' participation in implementing these CE projects will accelerate and ensure their success. The major barriers are culture, lack of knowledge, lack of resources, and lack of priority for organizations to implement CE projects. The UAE Education sector should navigate these barriers successfully (Hart et al., 2019).

6. Discussion and conclusion

The objectives have been met and established. The SDGs of the UN can be extended to be the Circular Economy initiatives in the various sectors, as the study has shown for the UAE Education sector. The objective of suggesting CE initiatives to be implemented by the UAE Education sector has been met. The main contribution has been the management change perspective used to ensure the CE initiatives' successful implementation. The suggestions and recommendations will help Managers successfully implement CE initiatives with government policy support. The contribution of this study is the addition of innovation and a continuous feedback loop added to the ADKAR management change model. Quantitative and Qualitative studies can confirm these findings in future research and use other change management models to spearhead these

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CE initiatives in the Education sector and other sectors. "The Emerging Circular Economy Trends of UAE Universities" research makes several theoretical contributions to the field of circular economy.

a. Firstly, the research contributes to understanding the adoption of circular economy practices in the higher education sector. The study explores UAE universities' current circular economy practices, which provides valuable insights into the strategies universities can adopt to reduce their environmental impact and achieve sustainability goals. Secondly, the research contributes to the literature on the circular economy by identifying emerging trends in the circular economy practices of UAE universities. By analyzing the data collected from the survey, the research identifies several emerging trends universities can adopt to promote circular economy practices. These emerging trends include the use of renewable energy, the development of circular business models, and the adoption of sustainable procurement practices. Thirdly, the research contributes to developing a circular economy framework for the higher education sector. The study proposes a framework universities can use to guide their circular economy practices. The framework includes three key components: circular design and production, circular consumption and waste management, and circular business models and collaborations. Overall, "The Emerging Circular Economy Trends of UAE Universities" research provides a valuable contribution to understanding circular economy practices in the higher education sector, identifies emerging trends, and proposes a framework universities can use to guide their circular economy practices.

b. Firstly, the research provides practical implications for universities to adopt circular economy practices. The study identifies several emerging trends, such as the use of renewable energy, sustainable procurement practices, and circular business models. Universities can use this information to develop strategies to reduce their environmental impact, promote sustainability, and achieve sustainability goals. Secondly, the research has policy implications for policymakers promoting circular economy practices in higher education. The study proposes a framework that policymakers can use to guide universities in adopting circular economy practices. Policymakers can use this framework to develop policies and regulations encouraging universities to adopt circular economy practices. Thirdly, the research has practical and policy implications for the wider community. By adopting circular economy practices, universities can become leaders in promoting sustainable practices and reducing their environmental impact. This can inspire other businesses and institutions to adopt circular economy practices, leading to wider adoption of sustainable practices in the community. Overall, the research "The Emerging Circular Economy Trends of UAE Universities" has practical and policy implications for universities, policymakers, and the wider community in promoting circular economy practices and achieving sustainability goals.

8. Recommendations for future research

Further empirical research is needed to assess the effectiveness of circular economy practices in UAE universities. This research should focus on the impact of these practices on sustainability and resource efficiency. There is a need for more in-depth research on the challenges associated with implementing circular economy practices in UAE universities. This research should identify the barriers to adoption and the strategies for overcoming them. Future research should focus on stakeholder engagement, including the attitudes and perceptions of students, faculty, and administrators towards circular economy practices. This research should also explore the role of stakeholder engagement in the successful implementation of these practices. Comparative analysis of circular economy practices in UAE universities with universities in other countries can provide insights into the best practices and strategies for implementation. Future research should focus on the long-term impact of circular economy practices in UAE universities, including their impact on sustainability and resource efficiency. This can help universities assess their sustainability efforts' effectiveness and make adjustments as needed.

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