

## TOWARDS A SUSTAINABLE FUTURE: GENDER EQUALITY AND DIGITAL TRANSFORMATION IN BAHRAIN'S CIRCULAR ECONOMY

### RUMO A UM FUTURO SUSTENTÁVEL: IGUALDADE DE GÊNERO E TRANSFORMAÇÃO DIGITAL NA ECONOMIA CIRCULAR DO BAHREIN

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#### Abstract

Gender inequalities in economic opportunities are worsening daily, demanding action from various stakeholders. In light of this situation, digital transformation tools and the integration of a gender perspective into the circular economy can contribute to narrowing this gap. Thus, this paper aims at investigating the role of gender equality and digital transformation in promoting a sustainable circular economy in Bahrain. This is an in-depth qualitative study based on the collection of primary data from relevant fields. Interviews were conducted with 15 policymakers and officials in Bahraini government agencies concerned with sustainability, circular economy, digital transformation, and women's empowerment and gender equality. Thematic analysis was used to analyze the data extracted from the interviews. The results show that the role of gender equality in achieving circular economy is represented by inclusive decision-making process women's economic empowerment gender-responsive policies female leadership in sustainability, and women's technological skills. While the role of digital transformation in achieving circular economy is realized through financial inclusion digital platforms for circular practices, technological infrastructure, and technological innovation. Given the aforementioned conclusions, this study recommends the need to providing opportunities, programs, and platforms to qualify, train, and update the skills of Bahraini women in the fields of digital transformation. On the other side, the Bahraini government must allocate sufficient and appropriate budgets to finance digital transformation projects and initiatives, and seek external funding sources such as partnerships, grants, and loans.

#### Resumo

*As desigualdades de gênero nas oportunidades econômicas estão se agravando a cada dia, exigindo ação por parte de várias partes interessadas. À luz dessa situação, as ferramentas de transformação digital e a integração de uma perspectiva de gênero na economia circular podem contribuir para diminuir essa lacuna. Assim, este artigo tem como objetivo investigar o papel da igualdade de gênero e da transformação digital na promoção de uma economia circular sustentável no Bahrein. Trata-se de um estudo qualitativo aprofundado, baseado na coleta de dados primários de áreas relevantes. Foram realizadas entrevistas com 15 formuladores de políticas e funcionários de órgãos governamentais do Bahrein envolvidos com sustentabilidade, economia circular, transformação digital, empoderamento das mulheres e igualdade de gênero. A análise temática foi utilizada para analisar os dados extraídos das entrevistas. Os resultados mostram que o papel da igualdade de gênero na consecução da economia circular é representado pelo processo de tomada de decisão inclusivo, empoderamento econômico das mulheres, políticas sensíveis ao gênero, liderança feminina em sustentabilidade e habilidades tecnológicas das mulheres. Já o papel da transformação digital na consecução da economia circular é realizado por meio da inclusão financeira, plataformas digitais para práticas circulares, infraestrutura tecnológica e inovação tecnológica. Dadas as conclusões acima mencionadas, este estudo recomenda a necessidade de fornecer oportunidades, programas e plataformas para qualificar, treinar e atualizar as habilidades das mulheres do Bahrein nas áreas de transformação digital. Por outro lado, o governo do Bahrein deve*



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*alocar orçamentos suficientes e adequados para financiar projetos e iniciativas de transformação digital e buscar fontes de financiamento externas, como parcerias, subsídios e empréstimos.*

**Palavras-chave:** Igualdade de gênero. Transformação digital. Economia circular. Bahrein.

## 1 INTRODUCTION

In recent decades, the world has witnessed a growing array of environmental, economic, and social challenges resulting from unbalanced economic growth and reliance on a linear economic model (Oppong & Mathibe, 2024). This model depends on vast quantities of natural resources and energy, operating on a cycle of extraction, production, consumption, and disposal (Pastore & Tommaso, 2024). This cycle depletes natural resource bases and degrades ecosystems, threatening the future of humanity. These economies transform consumer goods into waste in a short period. The problem of waste is one of the most significant global issues, indeed one of the greatest challenges facing humanity today (Bakır & Aral, 2025). It affects numerous sectors and portends serious financial and environmental consequences if not addressed properly (Kukovič & Radević, 2024). This problem is linked to how societies produce and consume, posing a threat to human health. With the increasing global population and rising incomes, the demand for products will increase, and production and consumption processes will expand, leading to a significant rise in waste. This, in turn, depletes and wastes natural resources (Hysa *et al.*, 2020). This reality has driven societies to seek sustainable solutions. The concept of the circular economy emerged as a modern economic model aimed at preserving natural resources for future generations (Rashid *et al.*, 2025). This model is based on the principle of reusing waste and converting it into usable materials instead of disposing of it. This contributes to reducing the environmental impact and creating added value from waste, minimizing waste of materials and goods, and maximizing their utilization (Baldassarre & Carrara, 2025). This involves reducing consumption, waste, and resulting emissions, while maximizing the use of all raw materials, energy, and resources through recycling,

reuse, remanufacturing, and upgrading processes instead of waste (Oppong & Mathibe, 2024). The circular economy is considered a sustainable economic model, achieving long-term sustainable development (Baca-Neglia *et al.*, 2025). It strives to achieve intergenerational justice in the distribution of gains and wealth, guiding countries towards the optimal use of limited resources and energy conservation to improve the quality of human life without harming the environment (Lamba *et al.*, 2024).

Digital transformation is a crucial enabler of the circular economy by integrating advanced digital technologies to improve resource efficiency, enhance traceability, and support closed-loop production systems (Ilić *et al.*, 2022). This facilitates the creation of sustainable value and fosters continuous innovation across industrial and organizational systems in the transition towards long-term economic and environmental sustainability (Chung *et al.*, 2025). Digital transformation is one of the most important drivers of economic growth and sustainable development, and it has become an urgent necessity in light of the challenges and opportunities facing the world in the 21st century (Trushkina & Prokopyszyn, 2021). It has encompassed all areas and sectors, including the state's administrative apparatus, which is the backbone of good governance and sustainable development (Krchová & Höesová, 2021). Digital transformation inherently involves using digital technologies to redesign workflows for greater efficiency and effectiveness (Chung *et al.*, 2025). The idea is not simply to replicate an existing service in digital form, but to transform that service into something significantly better. Digital transformation can encompass many different technologies, but currently, cloud computing, the Internet of Things (IoT), big data, and artificial intelligence are among the most prominent. Most digital transformation projects are a means for large, established organizations to compete with digitally advanced and highly skilled competitors, as these projects tend to be large-scale and ambitious (Tanveer *et al.*, 2025).

Gender equality and digital transformation are deeply interconnected, as inclusive access to digital technologies, skills development, and leadership opportunities empowers women and underrepresented groups to actively participate in and shape digital innovation processes (Ye & Cai, 2024). One of the Sustainable Development Goals (SDGs) is the need to empower and include women in developing countries (Gupta *et al.*, 2024). This will enable women to work within the new social division of labor, in line with the demands of the digital or networked economy and the feminist movements that

advocate for gender equality and increased female participation in the workforce. It is expected that by 2030, the circular economy will reshape the global labor landscape and create new business models in which women can participate, including e-commerce and the sharing economy (Pansera *et al.*, 2024). Furthermore, empowering women can contribute to promoting gender equality, as women and men can participate in this field with equal opportunities and conditions (Khalifa *et al.*, 2024). Despite a significant increase in the number of Bahraini women with higher education compared to previous decades, this has not been matched by a similar rise in their participation in the labor market (Zaidan & Ehsan, 2025). This underscores the need for women's economic empowerment, which aims to enhance their influence in policymaking and their ability to impact economic decisions, thereby facilitating the transition to a circular economy (Al Khalifa *et al.*, 2024). In this regard, Mordi *et al.* (2022) pointed to several interconnected factors contributing to the underrepresentation of women globally in the digital transformation, including gender bias in STEM education, limited mentorship and leadership opportunities, and a lack of prominent female role models in the technology sector. By increasing the number of women-led businesses, the focus on women's role in the economy and development, and the opportunities for achieving gender equality, can gradually shift Bahraini society's perception of women's participation in these enterprises (Zaidan & Ehsan, 2025; Al Khalifa *et al.*, 2024).

This study will contribute to the literature in several ways. First, it connects three modern terms, including, digital transformation, gender equality, and circular economy, which are of growing importance in developing countries like Bahrain. Second, the importance of this research is evident in the significant role that digital transformation plays in shaping certain economic variables, such as financial inclusion, with the aim of achieving growth and attracting investments. It also highlights the impact of this transformation on the growth of GDP due to digital advancements, information technology, and the provision of services in both the public and private sectors in Bahrain. Third, this study contributes to raising awareness of the importance of Bahraini women's role in the circular economy. Finally, it helps identify the policies and procedures necessary to achieve gender equality in Bahrain, thereby realizing the circular economy goals of Bahrain Vision 2030 and contributing to sustainable development.

## 2 LITERATURE REVIEW

### 2.1 Circular economy

The term "circular economy" emerged in 1989 with the publication of the book "Economics of Natural Resources and the Environment" by David W. Pearce and R. Kerry Turner (Donaghy, 2022). The circular economy is a sustainable economy based on using fewer resources in the manufacturing process. It relies on changing the activities and practices related to how waste is disposed of through reuse, repair, and recycling (Pansera *et al.*, 2024). This means the possibility of converting products and components into raw materials again that can be used in other processes through repair and remanufacturing (Llaftiu, 2022). The circular economy is an approach or method that transforms the function of resources in the economy, where waste generated by factories becomes a valuable input for another process, and products can be repaired, reused, or improved instead of being disposed of (Pastore & Tommaso, 2024). The circular economy can be defined as a development strategy that addresses environmental degradation and resource scarcity (Kukovič & Radević, 2024). Its three principles that are reduce, reuse, and recycle form a circular system where all materials are recycled. From the above, it can be concluded that the circular economy is an economic model that aims to reduce the waste of natural resources and minimize waste through the reuse of materials and resources (Oppong & Mathibe, 2024). It encourages recycling and remanufacturing instead of discarding products after use. It also aims to design reusable products, which helps reduce environmental impact (Palm *et al.*, 2024).

The circular economy relies on production and consumption systems that integrate nature and society (Tanveer *et al.*, 2025). It aims to optimize resource use and minimize negative environmental impact. This type of economy depends on the circular flow of materials and energy (Hysa *et al.*, 2020). It helps improve economic growth in more sustainable ways and employs innovative strategies to optimize resource utilization. The goal is to achieve economic growth while preserving the environment (Lamba *et al.*, 2024). New industrial systems are designed within the circular economy; these systems promote resource sustainability and reduce negative environmental impact (Baca-Neglia

*et al.*, 2025). A circular economy is an industrial system that produces no waste or pollution from its initial design. It incorporates two types of material flow: biological nutrients designed to safely re-enter the biosphere, and technological nutrients designed for high-quality recycling within the production system without re-entering the biosphere, and which are also repairable and renewable from the moment of their design (Baldassarre & Carrara, 2025). The researcher pointed out that the circular economy seeks to rebuild capital, whether financial, industrial, human or consumer, and improve resource returns by recycling products, components and raw materials used at all times, thus ensuring a continuous flow of technological and biological materials.

The circular economy works by keeping raw materials and products in production cycles for as long as possible (Trushkina & Prokopyshyn, 2021). It aims to eliminate waste in our industrial systems, making them less reliant on extracting limited resources (Ilić *et al.*, 2022). This concept enables companies to access new sources of value and fosters flexible markets and supply chains capable of achieving long-term sustainable prosperity (Bakır & Aral, 2025). Moving towards a more circular economy can increase competitiveness, stimulate innovation, boost economic growth, and create jobs. Redesigning materials and products for circular use can enhance innovation across various economic sectors (Chung *et al.*, 2025). The circular economy is now considered a key mechanism for economic growth and sustainable development, as it contributes to creating new economic activities capable of absorbing a significant portion of unemployment and recovering capital invested in production processes by recycling and reusing waste. This, in turn, reduces material costs to the greatest extent possible, unlike the linear economy (Rashid *et al.*, 2025).

## **2.2 Digital transformation**

The concept of digital transformation is widely used across various sectors, as there is no single, universally accepted definition. It is applied to trade, industry, education, healthcare, and more. Therefore, it can be described as changes brought about by digital technology, which plays a role in various aspects of life. It is used to improve performance and development, primarily for institutions (Alam *et al.*, 2022). From another perspective, digital transformation is the process of converting the model of

government institutions or private sector companies into a model that relies on digital technology to facilitate and deliver services and products. This reflects the circular economy resulting from the revolution in communications and technology within a knowledge-based, advanced economy (Krchová & Höesová, 2021). Additionally, Ye & Cai (2024) defined it as investing in intellectual capital, changing behavior, artificial intelligence, and data analysis to transform work methods using technological advancements to serve beneficiaries more quickly. In other words, it leverages the wealth of information and communication technologies to deliver innovative new products (Tanveer *et al.*, 2025). Regarding the concept of digital transformation, it can be defined as investing in thinking and changing behavior to bring about a radical shift in the way we work, by leveraging significant technological advancements to serve beneficiaries faster and better (Chen *et al.*, 2023). Digital transformation also provides enormous potential for building effective, competitive, and sustainable societies by fundamentally changing services for various stakeholders, including consumers, employees, and beneficiaries, while improving their experiences and productivity through a series of proportional processes, accompanied by the restructuring of the necessary activation and implementation procedures (Trushkina & Prokopyshyn, 2021).

It can also be defined as the process of providing and disseminating knowledge rapidly through electronic networks that eliminate time and space, in an enabling administrative system that is subject to evaluation, accountability and community participation (Chung *et al.*, 2025). On the governmental level, Wang *et al.* (2023) defined it as a government project in which various institutions and sectors of the state participate, and which is represented in transforming vital and basic services related to serving individuals, institutions and various investments from their traditional form to the smart electronic form, relying on modern and advanced technologies. Digital transformation aims to achieve this through the use of digital technologies such as the Internet of Things (IoT), augmented reality (AR), and artificial intelligence (AI). For example, the Internet of Things comprises three main elements: smart devices, advanced data analytics technology, and people working on-site (Tran-Dang & Kim, 2021). These elements are interconnected by modern communication technologies, leading to systems that can collect, exchange, and analyze data, providing valuable new insights that enable companies to make decisions faster and more effectively (Ilić *et al.*, 2022).

### 2.3 Gender equality

Numerous international agreements and conventions have called for equality between men and women. Among these is the International Covenant on Economic, Social and Cultural Rights of 1973, which affirmed the necessity of equality between women and men in all economic, social, and cultural rights (Llaftiu, 2022). Equality is defined as any discrimination, exclusion, or restriction based on sex that has the effect of weakening or nullifying the recognition and enjoyment of women's rights and their ability to act of their own free will, on an equal basis with men and women, in fundamental rights and freedoms, whether in the political, economic, social, cultural, civil, or any other sphere (Pansera *et al.*, 2024). This includes civil, political, and social rights; laws, regulations, and procedures; access to public services and resources; and empowering marginalized groups to challenge inequality (Palm *et al.*, 2024). Arab societies are witnessing a clear interest in women's issues and their participation in various aspects of life, given women's important contribution to building and developing society. The issue of equality has begun to impose itself on various aspects of women's education, work, and humanity (Al-Rabadi & Al-Rabadi, 2017). We note that the literature in this field is limited and varied, in that Arab studies discuss the issue of equality between men and women based on limited variables without providing a microscopic view of the social dimensions and backgrounds that contributed to shaping attitudes towards the issue of equality between men and women (Khalifa *et al.*, 2024).

### 2.4 Underpinning theories

This study relied on feminist theory and endogenous growth theory to justify the selection of study variables. Feminist theory can be integrated into understanding the role of women in local community development, highlighting the gendered analysis of power and assessing how gender orientation influences decision-making processes at the local level. It analyses and understands social relations from a gender perspective (Kantola & Lombardo, 2024). This critical approach to feminist theory seeks to explore and understand gender-based injustice and discrimination, and aspires to achieve gender

equality (Larson & Guy, 2024). In the context of local governance, feminist theory can be particularly important in examining how power is distributed and decisions are made within the community. Feminist theory promotes an interest in analysing social dynamics between genders at the local power level, highlighting the challenges women face in their participation in local governance (Johansson Wilén, 2024). This includes opportunities to access leadership positions and exert effective influence. By focusing on the concept of "representation" in local governance, feminist theory seeks to understand the extent to which women are represented in local decision-making structures. The theory also points to the need for changes in the social and political context to achieve more balanced gender representation in local governance (Jumriani *et al.*, 2025).

Endogenous growth theory explains long-term growth as stemming from economic activities that produce new technological knowledge. Endogenous growth is defined as long-term economic growth at a rate determined by internal forces within the economic system, particularly those forces that regulate the opportunities and incentives for producing technological knowledge. In the long run, the rate of economic growth and the rate of per capita output growth depend on the rate of growth of total worker productivity, which is itself determined by the rate of technological progress (Yuan & Zhang, 2024). It is worth noting that neoclassical growth theory, including Solow's model, assumes that the rate of technological progress is determined by a scientific process separate from and independent of economic forces. Thus, from an external perspective, neoclassical theory suggests that economists can consider the long-term growth rate as a given external factor. However, endogenous growth theory challenges this neoclassical perspective by proposing channels through which the rate of technological progress can be influenced (Wu & Zhou, 2025). Therefore, the sustainable circular economy is affected as technological progress occurs through economic activities, such as innovations in the form of new products, processes, and markets. Many firms learn from experience how to produce more efficiently, and increased economic activity can accelerate process innovation by giving firms more production experience (Jianping, 2023).

### 3 RESEARCH PROBLEM AND QUESTIONS

The problem addressed in this study falls within the broader context of the established and widespread interest in gender equality among women's organizations and bodies working in the fields of human rights and development, as well as among Bahraini women and a large number of researchers and stakeholders (Zaidan & Ehsan, 2025; Al Khalifa *et al.*, 2024). These studies and efforts collectively seek to integrate women into the circular economy, eliminate all forms of discrimination against them, and genuinely recognize their capabilities and potential within the context of Bahrain's digital transformation (Khalifa *et al.*, 2024). This stems from the belief held by most of these Bahraini entities that a demeaning view of women remains deeply ingrained in the cultural fabric of society, creating unequal distribution of roles and functions, and an unfair hierarchy of positions, thus hindering the transition to the circular economy. While achieving a circular economy requires the genuine participation of women in Bahraini society, they have yet to attain full and equal citizenship (Al Khalifa *et al.*, 2024). Their status is precarious and lacks a solid foundation. They suffer discrimination in the application of certain laws, hindering their advancement and participation. This is a crucial factor, as stereotypes play a role in shaping the economic fabric. It is a biased society with double standards, and these ideas guide the economy in this direction and determine its behavior toward human leadership (Mordi *et al.*, 2022). Despite the high indicators of Bahraini women's participation in the business sector, there are low indicators of women's empowerment in senior positions due to their limited capabilities and technological skills, which are among the most important requirements of the circular economy (Almannai *et al.*, 2024). Consequently, the following questions were developed:

**RQ1: What is the role of gender equality in promoting circular economy in Bahrain?**

**RQ2: What is the impact of digital transformation on achieving circular economy in Bahrain?**

## 4 RESEARCH METHODOLOGY

In this study, a qualitative methodology was adopted. It allows the examination of a single case or number of cases to provide information with all-inclusiveness and completeness. Additionally, the qualitative approach aids the researcher in gathering accurate and superior data from the individuals who represent the situations (Hendren *et al.*, 2023). Accordingly, information gathered using qualitative techniques offers detailed and descriptive details regarding the suggested issue (Halevi Hochwald *et al.*, 2023). Furthermore, because qualitative data are more detailed and precise, they offer additional information about a problem (Dehalwar & Sharma, 2024). This method enables us to compile, evaluate, and synthesize current theoretical frameworks and research on Bahraini women. Thus, information gathered using qualitative techniques offers detailed and descriptive details regarding the suggested issue (Halevi Hochwald *et al.*, 2023).

In this study, interviews were adopted as a research tool to collect data from the research sample. Interviews were conducted with 15 Bahraini policymakers and officials in government agencies concerned with sustainability, circular economy, digital transformation, and women's empowerment and gender equality. The reason behind using the semi-structured interview in this study is that it focuses on examining the role of gender equality and digital transformation in promoting a sustainable circular economy in Bahrain. The interview questions discussed various components and aspects of gender equality, digital transformation, and circular economy. The interview guide contained open-ended questions that stimulated the participants to present their experiences, views and ideas about gender equality, digital transformation, and circular economy at their organizations. Thematic analysis, which is a popular approach to the analysis of qualitative data, was employed to analyze the qualitative data retrieved through the semi-structured interviews. Thematic analysis is an adaptable, organized methodology that facilitates the determination, investigation and reporting of patterns (or themes) in the information (Naeem *et al.*, 2023). Such an approach is especially fitting to the current study because it can be used to explore the subjective experiences and views of Bahraini policymakers and officials in government agencies regarding gender equality, digital transformation, and circular economy. The NVivo software was used to help in the coding and identification of themes. NVivo is a data analysis program designed to help

qualitative researchers to analyze a bulk of textual information by means of organizing, coding, and retrieving information (Zamawe, 2015). Through NVivo, the researcher is able to code the various sections of the interview transcripts systematically, meaning that a code is given to each of the sections of the interview transcripts that symbolizes a particular idea or concept of the research questions. After coding the data, NVivo enables one to identify themes in a process of constant comparison so that the findings are data-driven. The software also assists in the management and visualization of trends within the data that can be easily translated into complex qualitative information (Allsop *et al.*, 2022).

## 5 PRESENTATION OF FINDINGS

As mentioned previously, this study employed thematic analysis to analyze the data and information extracted from the interview data. In light of the proper and correct application of these stages above, the Table 1 shows a summary of the codes and themes that could be extracted from the interview data.

**Table 1**

*The Proposed Themes and Codes of the Research.*

<b>Themes</b>	<b>Codes</b>
The Role of Gender Equality in Achieving Circular Economy	Inclusive decision-making process Women's economic empowerment Gender-responsive policies Female leadership in sustainability Women's technological skills
The Role of Digital Transformation in Achieving Circular Economy	Financial inclusion Digital platforms for circular practices Technological infrastructure Technological innovation

Source: The Researcher

## 5.1 Theme 1: the role of gender equality in achieving circular economy

### 5.1.1 Inclusive decision-making process

Most respondents indicated that inclusive decision-making process plays an important role in promoting a sustainable circular economy in Bahrain. Giving women the opportunity to develop their abilities and skills will empower them to participate in various aspects of life: economically, by creating job opportunities that meet the demands of the circular economy, and socially, by enabling them to participate in decision-making processes that affect them and their communities (Kukovič & Radević, 2024). As participant 4 illustrated:

“In my view, achieving gender equality is accomplished through women's participation in strategic decision-making. This plays a significant role in promoting a circular economy in Bahrain. Women leaders have brought about significant improvements to the decision-making process, based on their greater inclination towards collaboration and a holistic approach. This results in more inclusive and effective decision-making processes, ultimately leading to improved outcomes for companies and institutions.”

This idea was supported by respondent 13:

“I believe that women’s participation in making crucial decisions is the way to develop a circular economy in Bahrain. A significant gap exists in the decision-making process, favouring men over women. Bridging this gap and achieving gender equality requires a comprehensive review of existing laws and the adoption of gender-sensitive public policies. These policies should include specific measures and serious interventions to change the prevailing patriarchal culture, which confines women to traditional frameworks and leads to discrimination against them in leadership positions, thus preventing their access to decision-making roles. This is essential to ensuring equal opportunities in all state institutions.”

Another respondent 15 said:

“I emphasized the need to address biases and stereotypes that may limit women's career growth through inclusive decision-making process and ongoing efforts to raise awareness and promote equality.”

### 5.1.2 Women's economic empowerment

Some respondents pointed out that women's economic empowerment plays an important role in promoting a sustainable circular economy in Bahrain. Economic empowerment enhances women's leadership capabilities, enabling them to exert a strong and effective influence on economic decisions. Women's economic empowerment compels Bahrain to change and amend their laws, policies, work mechanisms, and procedures, creating an environment that supports women's capabilities and potential (Al Khalifa *et al.*, 2024). Economic reforms and privatization implemented in Bahrain have impacted, and will continue to impact, women's educational attainment and access to employment opportunities due to their precarious position in the labour market. It also changes prevailing concepts and values to achieve the highest levels of women's empowerment and eliminate all forms of gender discrimination against them (Palm *et al.*, 2024). As participant 4 explained:

“In my opinion, women's economic empowerment is the key to achieving a circular economy in Bahrain, in both the public and private sectors. However, achieving women's economic empowerment requires concerted efforts from various stakeholders, including governments, the private sector, local communities, and the international community. Governments play a pivotal role in launching women's economic empowerment by enacting policies and laws that encourage their participation in the labour market. These policies contribute to providing equal employment opportunities, encouraging investment in women-owned businesses, and ensuring gender non-discrimination. In addition, the private sector complements government efforts by providing equal employment opportunities and equal opportunities for women. Private companies and institutions can play a significant role in supporting economic empowerment by providing a diverse work environment and offering opportunities for advancement and skills development for women.”

Another respondent 14 clarified:

“I think that women's economic participation is a fundamental pillar for achieving sustainable development. Women's economic participation drives economic growth, rather than simply being a means of survival and a burden on society. Furthermore, women's projects contribute positively and effectively to strengthening national economies. Women's entry into the economic sphere and their contribution to the production process contribute to their economic liberation, which in turn fosters self-confidence and a sense of self-worth. Women engaged in economic activity are more capable of participating in decision-making.

### 5.1.3 Gender-responsive policies

Most respondents indicated that gender-responsive policies plays an important role in promoting a sustainable circular economy in Bahrain. Implementing these policies has enabled the adoption of a comprehensive vision focused on achieving gender equality, access to decent work opportunities, and encouraging women's entrepreneurship. This includes a particular focus on addressing the gap in women's economic participation in specific sectors. This will be achieved through integrated policies that focus on developing the professional skills required in the future labor market, strengthening the legislative environment that supports women's employment, and promoting a culture of self-employment and entrepreneurship among women (Llaftiu, 2022). In the area of quality of life, this includes implementing awareness initiatives and programs to promote healthy lifestyles and environmentally sound practices for Bahraini women and their families, and developing safety services for women in the workplace (Almannai *et al.*, 2024). As participant 1 stated:

“There is no doubt that improving gender-responsive policies in Bahrain is the best way to achieve a circular economy. This, within the area of economic participation, includes initiatives to develop technical and vocational education programs for girls by incorporating gender-responsive budgeting to enhance regulatory frameworks for these programs. It also encompasses initiatives related to women's financial portfolios and accessible financing programs, including monitoring and evaluating the utilization of these portfolios and leveraging initiatives for women's participation.

This idea was supported by respondent 8:

“To achieve a circular economy in Bahrain, gender-responsive policies must be promoted. This means continuing efforts to review and develop policies, systems, and regulations to support and enhance women's role in the economic sectors. This includes ensuring their continued and effective participation in the labour market and entrepreneurship in a way that achieves equal opportunities and gender balance.”

Respondent 2 also demonstrated:

“I am inclined to address the gender-responsive policies, especially by highlighting outstanding role models and their pioneering roles in various sectors, with a focus on emerging and promising fields and technology sectors such as artificial intelligence, digital content creation, digital transformation, space science, information technology, financial technology, communications, renewable energy, and modern sciences, while providing legal protection to help them balance their family responsibilities with their work in society.”

#### 5.1.4 Female leadership in sustainability

On contrast, some respondents pointed out that women's access to leadership positions plays an important role in promoting a sustainable circular economy in Bahrain. Women's leadership and the promotion of gender equality are crucial for achieving a circular economy and building a more prosperous and inclusive future for all (Pansera *et al.*, 2024; Oppong & Mathibe, 2024). Women leaders in a circular, interconnected economy can work efficiently and adapt to changing business demands. However, Bahraini women face fewer opportunities for advancement due to the ideology and practice of gender-based division of labor within a patriarchal system (Zaidan & Ehsan, 2025; Al Khalifa *et al.*, 2024). As participant 5 illustrated:

“From my practical experience, I firmly believe that appointing women to leadership positions is one of the most effective ways to strengthen the circular economy in Bahrain. Leadership qualities are not determined by gender, but rather by individual experience and capabilities. Bahraini women are capable of being great leaders, possessing many essential qualities, including strong character, excellent communication skills, the ability to inspire and motivate others, and a clear vision for the future.”

Another respondent 6 mentioned:

“A circular economy requires providing equal opportunities for promotions and leadership development programs for both Bahraini men and women, as well as fostering a supportive and inclusive work environment that values diversity and gender equality. Women possess a keen insight into understanding diverse perspectives and the needs of more than half of society, enhancing the value of their vision. They are also characterized by strength, resilience, a thirst for learning, and intellectual curiosity, along with the ability to empathize with others—all essential qualities for leaders.”

### 5.1.5 Women's technological skills

Most respondents indicated that enhancing women's technological skills plays an important role in promoting a sustainable circular economy in Bahrain. Bahraini society has recognized the importance of enhancing women's technological skills in the circular economy and their contribution to economic growth. Numerous technological initiatives and programs have emerged to support women's participation in the workforce (Alam *et al.*, 2022). As participant 10 explained:

“Empowering women with technology is crucial for achieving a circular economy in Bahrain. Information and communication technology (ICT) offers women many key advantages, most notably providing them with training and digital skills related to ICT, including how to start small and medium-sized enterprises, learn about e-commerce business models, understand online marketing strategies and internet ethics, learn time management, and explore green ICT opportunities and challenges.”

Another respondent 7 mentioned:

“I think that we must focus on improving women's technological skills if we are to achieve a circular economy in Bahrain. This includes specialized training initiatives, such as raising awareness about available local and international professional certification programs to develop technological skills that align with promising job opportunities in the labor market. These programs contribute to the sustainability of women's career development or open new horizons for them. Furthermore, this includes technical training programs aimed at raising awareness about specialized and technical training options and the importance of women's economic participation.

Respondent 12 also demonstrated:

“Empowering women in technology is key to helping men achieve a circular economy. Bahrain is a shining example of how women can make a tangible difference and open up broader horizons for themselves. I am confident that with access to technical tools and technology, Bahraini women will become successful leaders, entrepreneurs, and ambassadors for positive change. This represents a bright future for business growth and the comprehensive development that Bahrain is witnessing.”

## 5.2 Theme 2: the role of digital transformation in achieving circular economy

### 5.2.1 Financial inclusion

Most respondents pointed out the the impact of financial inclusion on the efficiency and sustainability of circular economy in Bahrain. Financial inclusion has become a role in promoting circular economy, which is currently under discussion by many researchers and policymakers in this regard to achieve circular economy. Furthermore, digital transformation works to solidify financial inclusion to achieve growth, attract investments, and improve government performance through automation, creating job opportunities, and activating the link between the public and private sectors (Zahid *et al.*, 2024). This is achieved by adopting digital technologies to provide services to individuals and employees, leveraging the benefits of the communications and information revolution within innovative products, and facilitating the buying and selling of goods and services electronically (Taera & Lakner, 2025). As participant 2 explained:

“I think financial inclusion has a positive impact on circular economy, increasing benefits and reducing economic costs. Therefore, institutions and companies in Bahrain must strive to analyze and discuss the digital transformation of the economy and its effectiveness in promoting financial inclusion.

This idea was supported by respondent 14:

“The role of digital transformation in the circular economy lies in promoting financial inclusion in Bahraini institutions and companies across all sectors. This requires integrating multiple and diverse levels, highlighting the importance of these technologies in changing institutions and economic relationships,

understanding and appreciating digital openness and its potential through communication and linking financial and economic processes at various levels, and integrating ideas that enhance the role of financial inclusion in the circular economy.”

### 5.2.2 Digital platforms for circular practices

Many respondents indicated the the impact of digital platforms on the efficiency and sustainability of circular economy in Bahrain. Digital transformation plays a significant role across various digital and economic sectors and key aspects by providing digital payment services and platforms aimed at promoting circular economy. This is a result of technological advancements, modern technologies, and the information brought about by this transformation. Generally, there is significant interest in providing high-speed telecommunications infrastructure and electronic payment platforms, as well as enacting appropriate legislation (Ilić *et al.*, 2022). There is also a need to implement comprehensive economic reforms based on fundamental principles, namely sustainability and scientific competitiveness, which will help advance the economy and transition it to the digital age (Chung *et al.*, 2025). The development of digital platforms is essential for circular economy in Bahrain, as well as serving as an incentive for companies, for example, where digital technologies: reduce pollution and emissions, improve energy efficiency, and mitigate environmental degradation, leading to better resource allocation and efficiency. As participant 3 stated:

“From my point of view, achieving a circular economy requires high-quality digital platforms, especially in the era of digital transformation. Thus, digital transformation requires the development of comprehensive platforms aimed at improving services within the framework of integrated information management and enhancing investments in infrastructure in Bahrain, thus accelerating the transition to a circular economy.”

This idea was supported by respondent 6:

“With the emergence of new digital platforms, such as social networks, E-commerce marketplaces, and big data, companies across all sectors are undertaking numerous initiatives to explore and leverage their advantages. This will facilitate a smooth transition to the circular economy. This often involves

significant shifts in core business processes and impacts products, operations, and organizational structures, requiring companies to establish agile management practices to manage these complex transformations.”

Another respondent 11 stated:

“Based on my experience in the Bahraini public sector, digital transformation encompasses the latest technological advancements in e-government, in addition to specialized initiatives such as the use of artificial intelligence, block chain technology, smart digital services, and innovative applications that improve various aspects of the lives of individuals and businesses. This facilitates the transition to a circular economy. This is achieved through a government that relies on big data, analytics, and business intelligence, transforming the user experience from digital to smart services to meet public demands, and re-evaluating the user experience to enhance user satisfaction and reduce visits to service centers by citizens and residents.”

However, some participants pointed to some challenges in using digital platforms that may hinder the transition to a circular economy in Bahrain. As participant 8 stated:

“The number of partnerships with the private sector to implement digital transformation projects and initiatives remains lower than targeted, and there is a delay in keeping pace with emerging technologies due to limited resources and slow legislation.”

In addition, participant 1 mentioned:

“Data availability remains a significant challenge, as data gaps hinder the measurement of sustainable development performance in Bahrain and other Gulf Arab states.”

Participant 15 also illustrated:

“There are many obstacles to the circular economy in Bahrain, including legislative, financial, and infrastructure aspects, localization of national competencies and migration of national talent, community culture, and aspects of process engineering.”

Another participant 9 explained:

“Some institutions and companies in the public and private sectors in Bahrain have not yet reached the required level for the current stage of digital transformation, and many services have not yet been fully digitized online. Therefore, converting some services to a digital environment remains a challenge, with reservations related to funding, regulation, and research and development within the innovation environment. Furthermore, a delay in keeping pace with emerging technologies can be observed due to limited resources and slow legislative processes.”

### 5.2.3 Technological infrastructure

Some respondents indicated the impact of technological infrastructure on the efficiency and sustainability of circular economy in Bahrain. The requirements for digital transformation are used to achieve a circular economy, and among the most important are infrastructure indicators, which are key contributors to economic growth and increased productivity across various sectors (Trushkina & Prokopyshyn, 2021). Therefore, Bahrain needs a robust infrastructure to enable it to implement its digital strategies and ensure the more effective digitization of its economy. As participant 4 clarified:

“I believe that technological infrastructure has a major role to play in promoting the circular economy in Bahrain. The availability of this infrastructure positively affects the overall productivity growth of establishments. These factors result from supporting capabilities through increased efficiency, the use of innovative new business management methods, product design, and encouraging the adoption and development of designs, engaging in foreign trade, and improving their position in international markets. This is due to the comprehensive use of technology, increasing their use of skilled labor. Many sectors in Bahrain also benefit as a result of most of them making larger complementary investments to improve their business productivity models and management quality.”

In addition, participant 12 mentioned:

“In general, technological infrastructure plays a key role in achieving a circular economy in Bahrain. This enhances the productivity of sectors and their ability to adapt and adjust their business practices. This is usually greater in large establishments that have sufficient resources to access information about consumers, attract skilled labor, and understand consumer preferences and tastes. The technological infrastructure also contributes to increased integration of the global economy, facilitating greater access to international trade and foreign markets and sectors that were previously difficult to reach.”

#### 5.2.4 Technological innovation

Many respondents pointed out the impact of technological innovation on the efficiency and sustainability of circular economy in Bahrain. There is no doubt that the circular economy has a promising future. The increasing trend towards using digital tools indicates the potential for achieving high growth rates in the medium term, through an increase in patent applications in the field of information and communication technology, and the development of infrastructure to improve the supply of technological products and enhance innovation. It can be said that the emergence of these advanced digital technologies, platforms, and infrastructures has been of paramount importance in fostering innovation, creating new job opportunities, generating value, increasing production, and improving its quality (Tanveer *et al.*, 2025). As participant 7 explained:

“Certainly, Bahrain's circular economy requires technological innovation across various sectors. Digital economic innovation is driving changes in the industrial structure, contributing to improved productivity and reduced costs in the production sector.”

Participant 13 also illustrated:

“In the Bahraini context, I think that technological innovation can pave the way for a circular economy by providing highly skilled human capital. This allows for the adoption of a technology-based economic model that embraces innovation, encourages risk-taking, and values creativity. Within this framework, Bahrain has begun implementing significant digital transformation initiatives and has even risen to advance rankings in several digital transformation indicators.”

In addition, participant 10 mentioned:

“Technological innovation is urgently needed for a smooth transition to a circular economy in Bahrain. Bahrain aims to build a digital society and provide smart, innovative, and high-quality services across all sectors and disciplines. This coincides with establishing a solid foundation for a growing and innovative IT sector that attracts more local and foreign investment. Efforts are also underway to support the supply chain and adopt digital media to meet the needs of beneficiaries. However, its efforts to encourage innovation and increase the adoption of digital technologies in Bahrain's public and private sectors still face significant challenges.”

## 6 DISCUSSION

This study concluded that the role of gender equality in achieving circular economy is represented by inclusive decision-making process women's economic empowerment gender-responsive policies female leadership in sustainability, and women's technological skills. This result is in consistent with Pansera *et al.* (2024); Oppong & Mathibe (2024); Pastore & Tommaso (2024); Kukovič & Radević, I. (2024); Llaftiu (2022). This result reflects the Bahraini's well-considered and purposeful policies, from enshrining gender equality in national strategies to launching impactful initiatives that encourage Bahraini's women to explore technology careers at an early age. The increasing participation of women strengthens Bahrain's position as a global hub for a smooth transition to a sustainable circular economy, where diversity fuels innovation and sustainable growth. To achieve this, leveraging policy advantages, such as mandatory female representation on boards of directors, to develop more Bahraini women leaders for these roles is not only sound policy but also a competitive imperative to bridge the talent gap and empower them to lead the transformation towards a sustainable circular economy. Achieving a successful transition to a circular economy model that promotes greater gender balance and harmony is crucial, as the circular economy can contribute to achieving many of the Sustainable Development Goals. Gender equality can also enhance circular economy practices, and progress in the workplace directly related to the circular economy facilitates its integration.

In addition, the role of digital transformation in achieving circular economy is realized through financial inclusion digital platforms for circular practices, technological infrastructure, and technological innovation. This result is in line with Tanveer *et al.* (2025); Chung *et al.* (2025); Ilić *et al.* (2022); Trushkina & Prokopyshyn (2021). Digital technologies and innovative solutions have the potential to improve resource efficiency, enhance production processes, improve access to education, health, and other services, and strengthen risk management and environmental monitoring. Access to digital transformation technologies and the development of digital skills encourage more women and girls to pursue careers in the technology sector. In addition, this study concluded that digital transformation technologies have contributed to Bahrain by increasing employment opportunities and the possibility of integration into global value chains. They

have also transformed women's participation in the workforce. For example, digital transformation technologies have facilitated many aspects of work today through voice calls, text messages, various applications, and video recordings. The new economy, the "circular economy," has enabled many women to find work that allows them to utilize their skills. Some have been able to launch entrepreneurial projects through e-commerce, while others have found employment opportunities in electronic services.

Digital transformation technologies play a vital role in establishing the concept of sustainable development. They enhance research and development activities to improve the performance of governmental and private institutions and lead to the creation of new administrative and institutional models, such as digital cities and technology incubators. They also stimulate economic growth, generate new job opportunities that contribute to poverty reduction, and facilitate the development of plans and programs aimed at transitioning to an information society and achieving the goals of digital transformation. Digital transformation is closely linked to achieving the Sustainable Development Goals. As is well known, sustainable development seeks to achieve social, economic, and environmental dimensions to improve the lives of individuals within society and enable everyone to access comprehensive social, economic, and environmental development. This can only be achieved by providing a suitable infrastructure that helps everyone reach a decent life and achieve comprehensive development through the use of technological advancements in all social, economic, and environmental fields within society, by employing digital transformation to serve the community.

### **6.1 Practical implications**

The practical implications of this research are evident in helping Bahrain transition to a circular economy through gender equality and the use of digital transformation technologies. The circular economy represents an innovative and promising economic model that can overcome the limitations and shortcomings associated with the traditional linear economic model. This model is distinguished by its ability to transform waste from an environmental and economic burden into a resource with added economic value, thus contributing to economic growth and sustainability in Bahrain. Furthermore, the circular economy helps mitigate environmental, social, and

economic risks, thereby promoting public health and ensuring the sustainability of natural resources for future generations. Digital transformation contributes to economic growth and increases its competitiveness within the international economy, thus opening up broad horizons for global trade and new global markets. This, in turn, significantly increases national revenues and the national economy, ultimately contributing to raising the standard of living for individuals in Bahrain. Digital transformation can also contribute to efforts to combat administrative and financial corruption by providing greater transparency to oversight mechanisms for public funds, officials, and public employees. The digitalization of public finances plays a prominent role in this regard, alongside the establishment of information systems at the departmental level responsible for contracting in public projects and administration, given the substantial public spending involved in both processes and the overlapping jurisdictions of numerous entities.

## 7 CONCLUSION

In conclusion, gender equality presents a unique opportunity to bolster Bahrain's circular economy. By overcoming current challenges and capitalizing on available opportunities, Bahraini women can achieve pioneering accomplishments that will make them a regional role model in the circular economy. Innovation and investment play a pivotal role in accelerating the transition to a circular economy, particularly through developing Bahraini women's capabilities and skills in technological innovation and fostering a conducive technological environment. Moreover, the most important finding of this study, which focused on the importance of digital transformation in achieving sustainable circular economy in Bahrain, is that digital transformation plays a significant role in achieving these goals in their social, economic, and environmental dimensions. This is because digital transformation provides a modern technological infrastructure that facilitates comprehensive development for all within society and contributes to the advancement and progress of communities. Digital transformation plays a fundamental role in achieving sustainable development goals on social, economic, and environmental levels, contributing to serving society, achieving community development for all individuals, developing infrastructure, achieving economic development, raising the

standard of living for individuals, and protecting the environment, in accordance with the economic, social, environmental, and technological changes the world is witnessing. This will only be achieved through a comprehensive legal framework capable of creating a legislative environment conducive to a digital and sustainable future.

## **7.1 Recommendations**

Given the aforementioned conclusions, this paper recommends the need to leverage digital transformation to access technology-based services is paramount, contributing to meeting the needs of Bahraini institutions and companies and facilitating access to information. This requires providing the necessary requirements for digital transformation and a conducive environment at the sectoral level or in key areas to contribute to developing the e-commerce infrastructure, thus facilitating the transition to a circular economy. Furthermore, the role of digital transformation in Bahrain must be activated, albeit in a limited capacity, to enhance financial inclusion and enable the use of financial services in financial institutions and companies. On the other hand, the Bahraini government must allocate sufficient and appropriate budgets to finance digital transformation projects and initiatives, and seek external funding sources such as partnerships, grants, and loans. This is in addition to providing opportunities, programs, and platforms to qualify, train, and update the skills of Bahraini women in the fields of digital transformation. This means providing, updating, standardizing, and ensuring the compatibility of the devices, software, networks, platforms, and digital services that support and implement gender quality projects and initiatives.

## **7.2 Limitations and directions for future studies**

Like other studies, this one has some limitations that open up opportunities for further research. Because the study focuses primarily on Bahrain, its findings may not be applicable to other countries. Therefore, future research could examine other Gulf countries and compare the results with this study. Despite the significant advantages of the qualitative approach, it also has some drawbacks. The most important of these are the difficulty in generalizing the results, the subjectivity of the researcher in interpreting the

data, and the time and effort required. Therefore, future studies could adopt a mixed-methods approach or a case study, as these may offer new insights and contributions. Another limitation is the small sample size, as it is limited to 15 Bahraini policymakers and officials in government agencies concerned with sustainability, circular economy, digital transformation, and women's empowerment and gender equality. This may significantly reduce the quality and reliability of the results, increase the margin of error, and result in inaccurate representation of the target population. A final limitation is that this study focused on only two main variables that are gender equality and digital transformation. However, other factors may influence the realization of a circular economy, such as organizational culture, leadership, the legislative framework, or the level of innovation. Therefore, future research suggests studying the relationship between the circular economy and financial performance, environmental performance, and the competitive advantage of enterprises.

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### **Authors' Contribution**

All authors contributed equally to the development of this article.

### **Data availability**

All datasets relevant to this study's findings are fully available within the article.

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