International Journal of Distributed and Cloud Computing
11 (1) 2023, 01-09
http://www.publishingindia.com/ijdcc

The Role of Innovation and Digitalization: Influence SMEs to Adopt Circularity in the Business Model

Sayandeep Chandra
Sales & Solution Analyst, Tata Consultancy Services; MBA, Marketing & Finance, Rajiv Gandhi Institute of Petroleum Technology, Amethi, Uttar Pradesh, India.
Email: sayandeep.chandra@gmail.com

Abstract: The circular economy can balance the environmental aspect and industrial production objectives. It defines the methodology to employ fewer resources and gain production efficiency with the help of reduce-reuse-recycle. Compared to larger organization, small, and medium enterprises (SMEs) faces technical & resource challenges to adopting circular economic practices. This lack of technical know-how and managerial myopic point-of-view towards sustainability hold back SMEs to shift to the sustainable business model from the liner structure. Here transition towards digitalization plays a pivotal role and ignites the innovative mindset. The implication of data analytics and machine-learning algorithm help to optimize the day-to-day operation. Application Artificial Intelligence empowers SMEs to understand consumer insight, risk assessment and predict the outcome. The incorporation of Internet-of-Things and Cloud Computing assist to access product usage data and user behavioural r data easily and entitle the exchange of data across multiple stakeholders.

Keywords: Circular economy, Digitalization, Innovation, R-framework, SMEs.

I. Introduction

The reorganization towards a circular economy (CE) has become a strategic focal point for global political leaders, business leaders and leading organizations. CE is the alternative model to the linear economic model that appreciates the take-make-waste principle [1]. CE discard the *"end-of-life"* approach and encourages to adoption recycle, reuse and reduction principle [2]. Transformation to the CE ensures waste generation is minimized, resource utilization is optimized and instead of scrapping, the resource is fed for reproduction. Thus the development & production processes are designed sustainably [3].

Compared to multination organizations, SMEs face challenges to transform to a circular economic model from a linear model due unavailability of data and knowledge. Here, digitalization plays a crucial role [2]. Cutting-edge technologies like Artificial Intelligence, Machine Learning, the Internet of Things, and Cloud Computing empower SMEs to harmonize with the paradigm shift [4]. Accessing the users' data, industry data and product usage data enables SMEs to gain insights into the product life-cycle pattern and it will impacts the manufacturing & decision-making process [5]. The adoption of digital technologies fuelled the importance of innovation to create a viable market that attracts non-consumers [6] and curves the avenue for revenue for SMEs.

In this article, we will try to understand the concept of innovation and CE. The first section of the literature review will explain the evaluation of the concept of innovation. Initial innovation was defined as the birth of new ideas & products, later development of new services is considered a part of innovation and in recent times market creation ability of innovation is prioritized. In the second part of the literature review, we will review the CE concept. Later we will discuss the barriers that prevent SMEs to adopt CE and how

digitalization & innovation boost the willingness to develop the CE business model.

II. Literature Review

A. Innovation and Market Creation

There are different perspectives when defining the term "Innovation". If we analyse various definitions of innovation through a period, we can witness the change in the fundamental areas of agreement. Some researchers prioritised the term "new idea", and some researchers focused on the internal & external environmental effects on the organization that cherished the innovation. On the other hand, recent definitions gave importance to value creation as a crucial factor. Victor A. Thompson defined innovation as the generation, acceptance and implementation of new ideas. From an organization's point of view, the production and utilization of new ideas should be considered innovation [7]. Becker and Whisler suggested *first and early use of an idea* that harmonizes with the organization's goal should be defined as innovation. Here they emphasized *stimulus (external or internal)* as the igniter for innovative action [8]. L. B. Mohr distinguished the concept of "*invention"* from "*Innovation"* and explained innovation as "*bringing something new into use"*. Also, L. B. Mohr highlighted once the change idea is adopted by organization stakeholders or the public, it will not be considered as innovative, no longer [9]. Innovation leads to economic growth and nourishes the job market. In the chapter *"The Institutional Analysis of Entrepreneurship: Historic Aspects of Schumpeter's Development Theory"* Alexander Ebner defined innovation as the introduction of a new good or new quality of good or new methodology of production that creates a new market which curves a different supply chain [10]. Clayton M. Christensen in his book *The Prosperity Paradox* defines innovation as a change in process that leads to the transformation of *labour, capital, material and information* into goods and services with significant value [6]. Though there is diversity in the definition of the term "innovation", the key aspects are- innovation is associated with organisational change and the objective of the innovation is to create a new market. More specifically, as stated by Clayton M. Christensen, innovation is essential to attract the "*non-consumer"* section of the market [6]. Innovation has a significant impact on the market because it leverages technology or business model to make products and services affordable and accessible to people. Abernathy and Clark [11] explained innovation can obsolete existing knowledge of a particular application with the introduction of a new product or process. Thus it develops a new market that addresses customer needs.

B. Circular Economy

Easily available resources and inexpensive and zero-impact on the environment, in that case, the linear economic model is suitable for meeting the consumers' demands. Companies extract the raw material and convert it into a product or use the core material to produce energy that directly or indirectly serves the requirement of the customers. In return, consumers pay for the product and discard the waste after usage. This is the "take, make, waste" principle of the linear economy. But the growing population and consumers demand to create pressure on the production system and most of the core resources that we use for production, are non-renewable. In simple words, a linear economy barely prioritizes the environmental aspect and zero-waste policy [12]. The business concept-three bottom line framework talks about *profit, people & planet* [13]. The said perspective links business goal with the concept of sustainable development, defined as the need of the present generation should be met without jeopardising future generations [14]. The weak version of sustainability considers *natural capital* and *manufactured capital* are substitutable and there is no difference. The primary aspect is that the aggregated *stock of capital* should be the same or increased. On the other hand, strong sustainability denies the former concept, rather it states that most natural resources are not interchangeable with manufactured capital [15]. The knowledge about sustainable development evolved the concept of CE that proposes an alternative to the "take-make-waste" model. CE model emphasizes the cyclical material flow, use of renewable energy and judicial use of waste energy. The economic aspects

of the CE are the reduction of raw mater & energy costs, waste management, emission control, risk & goodwill management and creating the market for a new product or business model innovation. From a social point of view, CE encourages towards shared economy [16]. So, CE is related to three strategies- optimized resource use for production, increase utilization period of the product and connect a post-usage product with the initial production stage [17].

III. Relevance of CE in Small, Medium Size Enterprise Ecosystems

CE approaches the win-win condition that enables an economically feasible way to reuse the product and increase the life of the goods through recycling [18]. The fundamental objective of the CE is described with various models; the *"R"* framework is the most appreciated and commonly accepted framework. The frameworks are *3R* (Reuse, Repair, Recycle), the *4R* considers Refurbish along with the formers, the *6R* includes Rethink and Remanufacture, *9R* adds Repurpose, Recover, Reuse. The said *"R"* frameworks explain the circular relationship between production and consumption [19]. The CE improves resource utilization and waste management methodology across the valuechain. In the upstream, management of resources employed for production and reduction of wastage are guided by CE, thus productivity & efficiency are boosted. It is necessary to monitor the reintroduction of the discarded product (after the end of life) back into the production process. These two features institute the closed loop for the production valuechain and ensure sustainability [20].

The transition towards the CE needs proactive engagement from various stakeholders- *policy-makers, industries, companies, and individuals* who can drive the fundamental changes associated with an industrial structure [19] [21]. Large corporations are capable to adopt the practices related to the CE, due to the stability. Proactively working on sustainable development multinational corporations strengthens the relationship with the stakeholders and embrace global ESG policies [19]. But some potential barriers hold back SMEs to adopt the circular business model. Internal stakeholders like managers, employees and owners focus on the direct market returns and benefits linked with the core business. Also, SME stakeholders have a basic level of knowledge about sustainability and CE. This is an organisational cultural barrier, creating a huddle for opportunities for CE [22] [23]. Lack of capital [24] is another aspect that obstructs the adoption of CE for the SME sector. Transform from a linear business model to a circular one requires upfront investments like supply-chain optimization, distribution, repurchase from the customers, logistics and inventory management etc. Along with the said ones the institution needs to monitor the product life-cycle and has to employ committed resources for close tracking and observation [25] [26]. On the other hand, potential investors perceive that green investment is associated with risk due to the uncertainty related to performance [27]. Technical knowledge and information related to CE are not easily accessible by the SME sectors. Whereas multinational institutions with the help of in-house research, develop technological knowledge and design ESG policies that harmonize with sustainability goals. But, SMEs do not have the desired research team, resources, and knowledge to customize the technologies that deliver environmental benefits along with economic benefits and thus they have to depend on the technologies that are available in the market [28] [29]. External support and inter-industry collaboration are essential to nourish the willingness to adopt green business practices for SMEs. But in reality, SMEs face challenges communicating with external partners regarding green business models and there are limited forums or platforms for SMEs that cultivate green innovation ideas and practices [30]. Poor organization structure leads to a knowledge gap related to green buying and supply chain and stakeholders ignore the environmental aspect for cost saving. Absence of structured training programme and technology support from the Government make SMEs myopic about the CE [31]. Customers or end-users are the primary drivers of the demand centre and their buying patterns impact the market. Cost-sensitive consumers often disagree to pay a premium for green products and thus SMEs find the adoption of green practices less potential [31] [30]. Also, the knowledge gap among consum-

ers about green products fails to develop demand pressure on the production side. Lack of demand portrays no realistic benefits of the CE to the SMEs and does not bring out the necessity of transition to CE [26] [32] [33].

Entrepreneurs act as a driver who can monetize innovation and transfer knowledge into economic growth [34]. Entrepreneurs are flexible to adopt changes and can synchronize with the market needs [35] [29]. According to The World Bank data, the SME sector accounts for 90% of business and is responsible for 50% of employment, globally. The said sector contributes ~40% of the national income in emerging countries [36]. The SMEs sector contributes a significant amount to the national income of India (~ 30% of GDP) and creates employment opportunities. Unlike a large corporation, SMEs sustains rural industrialization and socio-economic growth in India [37]. In European Union Countries (EU; 27 countries; EU-27), SMEs are the key contributor to economic growth and employment generation. In 2021, 22.8 million SMEs were active in the EU-27 and accounts for 99.8% of all enterprises in non-financial business sectors [38]. The environmental impact caused by SMEs, facts are surprising. According to the British Business Bank report, SMEs at a group level are responsible for 43-53% of business greenhouse emissions in the UK [39]. SMEs certified sustainable standard is very minor across the globe- only 5% of micro and 13% of small enterprises comply with the standard [40]. The said sector contributes to job creation and adds value to economic development Notably, SMEs are *pollution-intensive* compared to large organisations [41]. In recent years, SMEs are adopting necessary steps toward the sustainability standard and this shift is crucial for the future of mother earth. This transition is supported by eco-innovation and a change in consumers' orientation towards green products [41] [29]. The adoption of circular economic practices will support the SME sector to reduce environmental impacts.

IV. Digitalization and Innovation Boost the Adoption of the CE

Advancement in Information and Communication (ICT) technology segment, organizations adopted ICT as the key driver for business growth and a tool for market expansion. Businesses across different verticals have enabled data processing techniques and digital communication channels (like social media) to gain an advantage over the competition and bring agility into day-to-day operations (UNCTAD, 2021). Moreover, the COVID-19 pandemic has fuelled the digitalization process and connected all the stakeholders with a common thread; the thread is called data. Data is an intangible asset with a certain economic value. The most important characteristic of data is "non-rival" by nature and it allows multiple companies to utilize the same users' group data at the same time. This data is used to make a decision that impacts the economy and environment (Coyle, Diepeveen, Wdowin, Kay and Tennison, 2020). The fourth industrial revolution is nourished by the integrated information and knowledge-driven networking system. Data accumulated in every stage of production helps enhance the decision-making process and evaluate efficiency. Adoption of digital technologies helps in developing the CE and curve the path for reduction of carbon footprint. Cutting-edge digital technologies like the Internet of Things (IoT), and Big Data Analytics, are essential resources to design remanufacturing, recycling and repurposing production systems [42]. The application of these emerging technologies brings in several benefits tracking business operations, product lifecycle management, and real-time data analysis for better decision-making [43]. Moreover digitalized CE can nullify the barriers by enabling improved communication channels between stakeholders throughout the value chain and monitoring the information flow, essential for the transition to the CE [44].

The article limits its focus to a few digitalization tools- Artificial Intelligence (AI), IoT, Cloud Computing (CC) and Big Data (BD), application of these tools will be beneficial for SMEs to develop circular business models.

A. Role of Big Data (BD)

Workforce skill is an implicit resource that is invisible in the lens of the traditional measurement methods. Skills are learnt and develop with the time

[45]. Digitalization and data analytics has become the implicit skill that is the driver for modernization. This resource is complex and brings in competitive advantage by improving cost performance and operational efficiency of the organization [46]. So, BD is designed with the comprehensive dataset coming from various sources facilitating enormous amount of data and information. Then desired analytical method is applied on the dataset and data mining and machine learning algorithm is applied to discover the pattern [5]. In simple terms, Big Data Analytics (BDA) generates insight by analysing data and assists in decision-making like knowledge management, cost management, distribution etc. BDA is useful for product quality management and understanding the product lifecycle [2].

B. Role of AI and IoT

Organizations adopt AI and Machine-Learning (ML) as the latest control system that optimizes cost, manages resources and reduces response time. The autonomous decision-making ability incorporates flexibility & agility in the organization's ecosystem [46]. Implementation of AI and ML enables real-time data analytics by optimizing resource flow, predicting risk and designing a suitable system. This AI-based platform leads to improve circularity [47] [2]. AI can identify hidden patterns in the dataset and efficiently derive insights. Researchers developed an AI-based system that identifies suitable suppliers based on circularity standards, an AI-enabled decision support system that is useful in minimizing resource consumption [48] [49]. Natural Language Processing (NLP) is another efficient application of AI and it can transform methodical work into an autonomous system [50].

IoT-enabled devices or products are effective to track the lifecycle and help in maintaining, reusing, recycling and remanufacturing. Current usage of the product and future performance can be measured in IoT devices. This creates a digital profile of the product and the manufacturer can decide the circularity of the product by analysing the profile. This data-driven decision-making process is fuelled by data collection and exchange characteristics of IoT systems [51] [52].

C. Role of Cloud Computing

CC refers to the delivery of computing services over the internet. Data are stored, analysed and distributed online with the help of cloud service. The primary benefit of the cloud service it can be accessed by multiple users from various locations. CC helps the organization to save infrastructure costs by reducing the dependency on physical servers and improving operational efficiency [44]. Cloud platform helps to store IoT product data, real-time user data, organizational data etc. and make them available on a need basis. The said feature provides flexibility to run the operation smoothly and design the system with agility [53].

From the above discussion, we understood the impact of digitalization on CE. Now we need to articulate how digitalization and innovation encourage SMEs to adopt CE. CE is an example of a new way of business management that considers the environment as a key operational lever like cost-centre, profit-centre, supplier-buyer, resource management etc. To adopt the new business model SMEs need to understand Business Canvas Model (BMC) related to the industry they are serving. It is essential for SMEs to define what value is created, what value is proposed and what value will deliver to the consumers. SMEs have to structure the revenue stream and cost model for business sustainability [54]. Three types of innovation models can acknowledge SMEs to adopt CE practices. First, sustaining innovation model, second, the efficiency innovation model and lastly market-creating innovation model [6]. Sustaining innovation model focuses on improving existing products and targets consumers with purchasing power. Consumers have a positive inclination towards green products purchase and personal traits, external influencers, and knowledge work as the motivator in this case [55]. The efficiency innovation model prioritizes the process of manufacturing. The said innovation model emphasizes resource utilization and waste minimization. Reuse, Recycle, Remanufacturing, Refurbish, Repair etc. elements of CE, are linked with the efficiency innovation model and it will empower SMEs to be predominantly part of the green economy. Last innovation model-Market-creating innovation model is essential for

new SMEs or start-ups. As mentioned in the name, the said innovation model comes with new ideas and a new business model that attracts the *non-consumer* section of the market [6]. Considering some of the nine elements of the CE, entrepreneurs can develop new technology with new business models that will cater to niche sections of the market.

Innovation and digitalization are two tools for SMEs to synchronize with the circular economic model. Innovation derives new ideas, and new business models and digitalization work as a catalyst that makes the operation smooth, agile, cost-effective and data-driven.

V. Discussion and Conclusion

The fundamental concept of the CE is to produce more with minimum use of resources. CE links business operations with resource efficiency. Resource efficiency depends upon optimized production methodology-reuse, recycle, energy resource, waste reduction etc. Successful adoption of an efficient production strategy encourages cutting down production cost, minimising resource procurement cost, and energy management and finally lead to revenue generation [56] [57]. Digitalization helps in driving the CE business model and works as the key enabler. AI, ML, and BDA are essential to derive insight from the large volume of data and utilize that data to automate operations. IoT and Cloud technology are two pillars of digitalization, helping to get real-time data and manage the data easily. SMEs, especially in developing countries, need to adopt technologies to innovate business models that fit with the CE. Support from Government, policy maker and financial institutions, is desired to motivate owner-managers of SMEs to accept the transition and restructure to the eco-friendly business model.

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