

ARTIFICIAL INTELLIGENCE-DRIVEN FINTECH INNOVATIONS AND CIRCULAR ECONOMY TRANSITION: BRIDGING INNOVATION, INCLUSION, AND SUSTAINABLE IMPACT FOR PEOPLE AND PLANET

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Abstract: As the need for sustainable development has grown, developing new and innovative technologies that help the move from a linear to a circular economy has been enhanced. The application of Artificial Intelligence (AI) and Financial Technology (FinTech) has become a game-changer with great potential to optimize resources, boost sustainable finance, and to drive environmentally responsible consumer behaviours. This research explores the impact of Artificial Intelligence (AI) powered FinTech Innovations on Circular Economy Transition (CET) and assesses Sustainable Consumption Behaviour (SCB) as a mediator. This study is quantitative research that uses primary data obtained from a structured questionnaire by using 384 respondents. The statistical program used was SPSS and AMOS software for statistical analyses. To verify the proposed relationships, Pearson correlation analysis, multiple regression analysis, and mediation analysis via Structural Equation Modeling (SEM) were used.

The results showed that the quantity of FinTech Innovation using AI and Circular Economy Transition has a strong positive correlation ($r = 0.712$, $p < 0.001$). The results of the regression analysis suggest that three factors are significant determinants for Circular Economy Transition: AI Capability (with a β -value of 0.392), Sustainable Financial Inclusion (with a β -value of 0.311), and Digital Trust & Transparency (with a β -value of 0.259); these factors account for 61.7% of the variation ($R^2 = 0.617$) in the Circular Economy Transition. Out of the listed predictors, AI Capability was found to be the best predictor when it comes to the adoption of the Circular Economy approach. The results of the mediation analysis also support this and reveal that AI-driven FinTech Innovations have both direct and indirect impacts on Circular Economy Transition via Sustainable Consumption Behaviour, which serves as a mediated pathway. The model achieved good fitness statistics, supporting the theoretical model.

The study makes a significant contribution to the existing literature by synthesizing AI, FinTech, and Circular Economy perspectives in a common framework. The insights have policy and implications for actors such as policymakers, financial institutions, technology developers, and business organizations who aim to harness digital innovations to drive sustainability, financial inclusion, and circular economic growth. The study's bottom line is that AI-powered FinTech innovations could act as a strategic enabler for developing a sustainable future for the planet and its people.

Keywords: Artificial Intelligence, FinTech, Circular Economy Transition, Sustainable Consumption Behaviour, AI Capability, Sustainable Financial Inclusion, Digital Trust and Transparency, Sustainable Development, Green Finance, Financial Inclusion, Circular Business Models, Structural Equation Modeling, Digital Innovation, Resource Efficiency, Sustainable Finance



1. Introduction

In the near future, the development of Artificial Intelligence (AI) and Financial Technology (FinTech) is significantly changing the economic landscape worldwide, driving innovation, increasing financial access, and contributing to sustainable development. The idea of the Circular Economy (CE) is a way to replace the “take-make-dispose” approach that was linear and has significantly evolved in the past decades, with new environmental concerns, shortages of natural resources, and challenges arising in the world's different economies. In the circular economy, a circular economy focuses on resource efficiency, waste avoidance, waste recycling, waste re-use, and regeneration that provide sustainable value to businesses, consumers, and society (Hernandez, 2025; Siddik et al., 2023). AI technologies have demonstrated the potential to greatly improve resource optimization, predictive analytics, and decision-making capacities, aiding the shift to circular economic systems (Hernandez, 2025; Noman et al., 2022).

AI is a key facilitator for sustainability, enhancing operational efficiency, cutting down waste, and enabling smart resource management. It is estimated that AI technologies like machine learning, predictive maintenance, smart logistics, and automated waste sorting can play a crucial role in prolonging the lifespan of various products and improving recycling operations (Reuters, 2024; Economic Times, 2025). Moreover, AI-driven innovations have become more and more widely used to streamline supply chains, track environmental aspects, and facilitate the transition to circular business models geared toward reusing and remanufacturing instead of extracting resources (Noman et al., 2022; Reuters, 2024). These advances signal the potential of AI beyond a technological novelty, highlighting its ability to drive sustainable economic changes.

At the same time, FinTech has become a disruptive force in the field of financial services, revolutionizing the sector with digital payments, blockchain, peer-to-peer lending, crowdfunding, digital banking, and algorithmic financial management. AI's role in the FinTech sector has accelerated financial innovation by providing data-driven insights for decision-making, improving customer experiences, and helping to increase financial inclusion (Ashrafi & Akhter, 2025). Most significantly, recent research suggests that FinTech is increasingly helping to fund sustainable activities, enable green investments, and make circular economy practices possible via innovative financial approaches (Siddik et al., 2023; FinTech Innovations for Sustainable Development, 2025). AI is helping FinTech platforms overcome the trade-off between economic growth and environmental responsibility, allocating capital in support of green initiatives and circular business models (Kumar et al., 2024).

Yes, the AI FinTech convergence offers groundbreaking opportunities to accelerate the transition towards the circular economy. Transparency, accountability, and efficient resource allocation in circular economies are supported by technologies like blockchain-based traceability, AI-driven credit assessments, smart contracts, digital product passports, and sustainable investment platforms (Economic Times, 2025; Vogue Business, 2026).

Taking into account this background, the current study aims to conduct research on the importance of Artificial Intelligence (AI) and FinTech innovation for the Circular Economy transition and sustainable development. The multi-faceted nature of innovation, inclusion, and environmental strategies is discussed, which helps enrich the body of evidence on how new digital technologies can be used to sustainably add value to individual lives and the planet. The research is in the mainstream of today's vision on leveraging AI for a sustainable future by using technological progress as a means to create a circular, resilient, and inclusive economic growth (Global FinTech Fest, 2025).

2. Statement of the Problem

The world continues to function largely on a linear model of production and consumption with resource extraction, manufacture, use and waste. The consequences of this model have been an increasing environmental degradation, the use of finite resources, carbon emissions and waste production, all of which are significant challenges to sustainable development goals (Kirchherr et al., 2023). To address the challenge, the circular economy has been seen as a disruptive business model which focuses on resource efficiency, minimisation of waste, extension of product life, recycling, and regeneration. Despite the widespread understanding of the value these practices can bring, there is

limited uptake and adoption of circular economy methods across sectors and economies due to financial constraints, technical barriers, lack of stakeholder coordination and transparent monitoring systems (Geissdoerfer et al., 2024).

In recent years, new opportunities to solve these issues have emerged, with the development of technologies based on Artificial Intelligence (AI) and Financial Technology (FinTech). AI capabilities support predictive analytics and intelligent resource management, automate processes, and enable real-time decision-making, while FinTech innovations have the power to increase entry to finance, help make investments extra sustainable, and supply an increase in transparency via digital monetary ecosystems (Dwivedi et al., 2023). These technologies could contribute to speeding CO up transition by improving the use of resources, green financing possibilities and making it easier to undertake sustainability initiatives based on data. Yet, the empirical findings on the impact of AI-based FinTech applications to foster practices related to the circular economy are partial and limited (Bressanelli et al., 2023).

In addition, greater government and organization investments in sustainable technologies powered by AI, have highlighted ongoing concerns in areas such as digital inequalities, cybersecurity challenges, ethical concerns, algorithm bias, and environmental impacts of advanced technologies (Vinuesa et al., 2024). There are no full-fledged frameworks that bring together AI, FinTech, and circular economy concepts, hindering business and policy viewpoints from harnessing all of these concepts for sustainable development. In this context, there is a need to delve into the potential of AI-powered FinTech innovations, with an eye towards substantiating their ability to facilitate both economic prosperity and environmental sustainability and social inclusion in circular economic systems (Nishant et al., 2024).

In the context of emerging economies, where resource scarcity and sustainability challenges are more acute, another significant area of concern is the absence of empirical studies exploring how AI-driven financial innovations affect circular economy outcomes and the nature of their relationship. While there have been numerous studies on either AI applications or FinTech development, as well as on circular economy adoption, there is still a research gap on understanding the impact of synergizing and combining these three different aspects on sustainable business transformation and circular value creation (Ranta et al., 2024). This gap has limited the work of evidence-informed solutions that organizations might try to adopt when thinking about digital innovation and sustainability.

This study aims to fill this research void by considering the role of Artificial Intelligence supported FinTech innovations for facilitating circular economy transition. Concrete focus of the study will be on exploring the role of AI in financial technologies regarding resource efficiency, sustainable financing, circular business models and inclusive economic development. This knowledge is sought after in order to come up with novel solutions encompassing technological advancements and integrating them with environmental sustainability and social welfare, contributing to the overall mission of the Sustainable Development 2030 Agenda for people and planet.

3. Theoretical Background

The fusion of Artificial Intelligence (AI), Financial Technology (FinTech) and Circular Economy (CE) has become a main stream research topic for achieving sustainable development. The theoretical underpinning of this study is based on the integration of technological innovation theories, sustainability theories and financial inclusion frameworks explaining how digital technologies can be used for a circular economy transition and thus provide sustainable value to society.

3.1 Circular Economy Theory

This study is mainly based on the Circular Economy Theory. The theory focuses on the adoption of a 'regenerative model' to reduce waste and utilize existing resources by reusing, recycling, remanufacturing and regenerating (Ellen MacArthur Foundation, 2023). The circular economy model represents a paradigm shift from the traditional linear economy to a "take-make-dispose" approach, encouraging the efficient and effective reuse of materials for as long as possible. The approach highlights the need to promote sustainable production and consumption practices that support environmental protection, economic viability, and social welfare (Geissdoerfer et al., 2024). By

leveraging AI and FinTech advancements, it is possible to bolster the implementation of the circular economy by improving resource management, waste management, and sustainable financial systems.

3.2 The theory of Resource Based View (RBV)

Resource Based Viewing theory, created by Barney (1991) implies that businesses gain points of view when they are composed of valuable, uncommon, impractical to imitate and non-substitutable resources. In today's digital world, artificial intelligence capabilities, data analytics, AI systems, and FinTech platforms have emerged as strategic resources to increase a company's level of innovation and sustainability performance (Barney, 1991; Dubey et al., 2023). The RBV lens can help to understand how companies can exploit Artificial Intelligence (AI)-driven financial technologies for the design of circular business models, for resource optimization and for the improvement of their environmental impacts. Digital capabilities provide organizations with an increased likelihood of successful circular economy transitions and sustainable competitive advantage.

3.3 Technology Acceptance Theory (TAM)

Davis (1989) developed a model called the Technology Acceptance Model (TAM) that could be used to understand the adoption or not of technological innovations. TAM indicates that "perceived usefulness" and "perceived ease of use" have a significant impact on a person's intent to use a new technology. To address the aforementioned, it is crucial to recognize that businesses, consumers, and investors are more likely to adopt AI-powered FinTech solutions if they believe they provide value in improving efficiency, cutting costs, supporting sustainable investment opportunities, and supporting circular economy (Venkatesh & Davis, 2000). The understanding of stakeholders regarding the acceptance of digital platforms for promoting sustainability and circularity, with the assistance of AI.

3.4 Innovation Diffusion Theory

Rogers' Diffusion of Innovation (Doi) Curves theory (2003) is a way to describe the spread of innovations from one user to another over time. The factors that lead to the adoption of an innovation, accorded in the theory, include relative advantage, compatibility, complexity, trialability and observability. AI and FinTech innovations are disruptive technologies that can transform the speed of Circular Economy through innovative financial services, sustainable investment and intelligence resource management solutions (Rogers, 2003). The theory indicates that the success of the use of AI-based FinTech solutions to achieve widespread adoption is closely related to users' perceptions of usefulness and compatibility with current business processes and sustainability goals.

3.5 Sustainable Development Theory

A theory was popularized by the Brundtland Report (1987) that stress the idea of delivering benefits to present day generations without the ability to meet the future generations needs. The theory promotes the integration of profit, planet and people – the Triple Bottom Line (Elkington, 1997). In the realm of finance, Artificial Intelligence (AI)-driven innovations play a pivotal role in creating sustainable futures by enabling green investments, fostering financial inclusion, empowering environmentally conscious spending, and optimizing resource management efforts (United Nations, 2024). Circular economy is strongly connected to the concept of sustainable development through promoting ecological sustainability and economic stability.

3.6 Financial Inclusion Theory

Financial Inclusion Theory underscores the need to bring to pass affordable and accessible financial services to all segments of the society, including the ones which are underserved and marginalized. The advent of FinTech initiatives, including digital payments, mobile banking, blockchain, and AI credit assessment systems, has paved the way for greater financial inclusion worldwide (Demirgüç-Kunt et al., 2023). By increasing access to sustainable financing and green investment opportunities, AI-enabled FinTech platforms can support broader participation in circular economy initiatives and promote inclusive economic growth.

3.7 Stakeholder Theory

Freeman (1984) has developed a theory called Stakeholder Theory which states that Stakeholders are that which relate to an organization such as customers, employees, investors, communities, governments and the environment, they are all stakeholders which should be provided with values. To ensure that a circular economy can be implemented and that it is resource-efficient and sustainable, a number of actors must cooperate and ensure compatibility. AI and FinTech technologies provide tools for the engagement of stakeholders, with an increased level of transparency, traceability, accountability and information sharing (Freeman et al., 2020). This theory can be used to elucidate how digital technologies might contribute to convergence of interest and co-operation among stakeholders for sustainability purposes.

3.8 Theoretical Integration

This study combines CE Theory, RBV Theory, TAM, IDT, SDT, Financial Inclusion Theory, and Stakeholder Theory to describe the association between FinTech innovations, driven by AI and the transition to circular economy. The sustainability theory used is Circular Economy Theory, RBV is strategic use of AI and FinTech capabilities, the TAM and Innovation Diffusion Theory is Technology adoption behavior, Sustainable Development Theory is long-term benefits with technology, Financial Inclusion Theory is the technology's equitable use of financial resources, and Stakeholder Theory is collaborative value creation with technology. Collectively, they create a strong groundsheet for innovation, inclusion and impact on a sustainable individual and planetary scale with the help of AI/FinTech innovations.

Need for the Study

The environmental and social pressures generated by the lack of resources, climate change, the waste generated and the non-sustainable consumption models have made the need for new solutions to promote sustainable economic development more urgent. Environmental degradation and ecological imbalance have been greatly caused by the traditional linear economic model of taking, using and disposing of resources. This has led to the circular economy being a growing spotlight for both policymakers and industry professionals, as well as researchers around the world, for its ability to encourage resource efficiency, waste reduction, reuse, and recycling, and regenerative practices (Korhonen et al., 2024). Although there are potential benefits for transitioning towards the circular economy, their successful implementation is hindered by financial, technological and behavioural barriers and innovative solutions must be explored which can enable circular transitions.

Artificial Intelligence (AI) is a powerful tool that can improve decision-making, predictive analytics, resource optimization, and operational efficiency in a multitude of industries. With recent progress in machine learning, big data analytics, and intelligent automation, organisations can enhance their sustainability performance and optimise the use of resources (Brynjolfsson & McAfee, 2024). Adopting AI technologies can help with the implementation of a circular economy by enabling waste reduction, predictive maintenance, smart manufacturing, and streamlined supply chain management. Empirical evidence about the impact of AI on accelerating the adoption of the Circular Economy, however, is still scarce, and primarily centered around financial systems and sustainable business practices (Bag et al., 2024).

At the same time, Financial Technology (FinTech) has taken the financial services sector with a storm; ranging from digital payments to blockchain technologies, crowdfunding platforms, mobile banking and other AI-driven financial solutions. The innovations offered by FinTech have improved financial access, helped to improve financial transparency, and boosted financial efficiency and increased financial inclusion for people who had been excluded from traditional financial services (Lee & Shin, 2023). Furthermore, Fin Tech can assist with green investing, carbon financing, impact investing, and business projects that are environmentally focused, as a vital tool for sustainable finance (Ozili, 2024). However, little is understood about the potential of FinTech innovation and its application of AI to help achieve circular economy and sustainable development goals.

Sustainable consumption among customers is also an ever important issue. Consumers are aware and responsible for buying, using and disposing products taking environment into account in the modern times. Personalized recommendations, digital incentives, green financing opportunities, and transparent information about the sustainability impact can be facilitated by AI systems in FinTech platforms to promote sustainable consumption (Kumar & Gupta, 2025). Nevertheless, the mediation function between technological innovations and the circular economy outcomes by sustainable consumption behavior has been mainly ignored in limited research studies.

Additionally, research has so far mostly focused on Artificial Intelligence, FinTech and Circular Economy as independent fields, which has led to a weak linkage of theory and knowledge across these domains (Rashid et al., 2024). The combined impact of AI-powered FinTech innovations on transition towards circular economy is an underexplored area of study, as well as the pathways by which this takes place. To grasp these interrelationships and, consequently, formulate strategies that go together in promoting technological development, environmental sustainability and social inclusion.

The call for the study is further being reinforced through the global sustainability agendas like the United Nations Sustainable Development Goals (SDGs), ensuring responsible consumption and production (SDG12), promoting industry, innovation and infrastructure (SDG9), climate action (SDG13) and sustainable economic growth (SDG8) (United Nations, 2024). Innovation opportunities for AI in FinTech may be able to help achieve these aims by empowering enabling sustainable financial ecosystems and expediting practices around circularity.

Hence, the present study serves as a need to understand the impact of Artificial Intelligence (AI) Based FinTech innovations on Circular Economy Transition and also to explore whether Sustainable Consumption Behaviour (SCB) plays as a mediator. The results will help to provide insights for policymakers, financial institutions, technology developers, business, and researchers who want to use digital innovations to help reach SDG and circular economy goals.

4. Research Methodology

The present study is of quantitative approach; it is aimed at exploring the effectivity of the Artificial Intelligence in FinTech Innovations and the transition toward Circular Economy as well as discovering whether Sustainable Consumption Behaviour has a mediation effect. A quantitative design was found to be suitable in order to allow the researcher to systematically obtain, measure, analyse and draw objective conclusions from the data collected for the study which would help in establishing relationship between the study variables. This research is descriptive and explanatory in nature, attempts to describe the characteristics of the respondents and explain the behaviours of causal relationship of the constructs studied.

The study is of Primary data which is collected from respondents directly by using a structured questionnaire. The perceptions of the respondents towards AI driven FinTech innovations, Sustainable consumption behaviour, and Circular Economy transition have been measured in the design of the questionnaire. The instrumental part of the survey was split up into a two-part arrangement. The first part included socio-demographic information of the respondents, and the second part included statements with regard to the variables of the study using a five point Likert scale from 1 = Strongly Disagree to 5 = Strongly Agree. The questionnaire was also designed from the existing literature and dimensions assessed by the scales were validated to ensure content validity and reliability.

The target respondents were assigned to those who used digital financial services, financial applications that have auxiliary intelligence and have used others FinTech services. However sample size was obtained using the Cochran formula for unknown population, due to the large and indeterminate nature of the surveyed population. It was therefore decided that the number of 384 respondents would be sufficient to assure of the statistical reliability and representativeness. People willing to participate who met the study criteria were included in the survey by convenience sampling technique.

It took Artificial Intelligence-powered FinTech Innovations as the independent variable, which includes dimensions like AI Capability, Sustainable Financial Inclusion and Digital Trust & Transparency. The study made

Circular Economy Transition a dependent variable and Sustainable Consumption Behaviour was a mediating variable. The measurement items were made up of multiple items soliciting responses to these variables, adapted from previous empirical studies, and altered to align with the goals of the current research.

For data collection, online and offline data collection method was applied to maximize data collection to maximize participation of respondents. A pilot study was conducted before the final survey to determine the clarity, consistency and reliability of the questionnaire. To determine the reliability of the measurement scale, Cronbach's Alpha coefficient was used and the results obtained were more than 0.70 for all measurement scales which is satisfactory internal consistency of the instrument.

Data collected were coded and analyzed with the aid of One-way Analysis of Variance (ANOVA) and Amos software (version 24) and Statistical Package for Social Sciences (SPSS) version 26. The demographic characteristics of the respondents were summarized by using descriptive statistics like percentage, frequency, mean and standard deviation. A Pearson correlation analysis was used to investigate the correlation between AI and FinTech Innovations and Circular Economy Transition. The impact of the AI Capability, Sustainable Financial Inclusion and Digital Trust & Transparency on Circular Economy Transition was investigated through multiple regression analysis. Through the use of AMOS, Structural Equation Modeling (SEM) was used to investigate the mediation effect between Sustainable Consumption Behaviour (SCB). To check the mediation effect, direct, indirect, total effects and Variance Accounted For (VAF) analysis with bootstrap estimates was done.

Operating according to the recommendations of Hu & Bentler (1999), goodness-of-fit of the structural model was assessed with the standard model fit indexes, Chi-square/df, Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). The values obtained met the suggested ranges and the suggested mediation model represented the observed data well.

Therefore, the adopted methodology offers a solid basis to analyze the association between AI-driven FinTech Innovations, Sustainable Consumption Behaviour, and Circular Economy Transition, ensuring the reliability and validity of findings from the study.

Research Objectives

Objective 1

To examine the relationship between Artificial Intelligence-driven FinTech Innovations and Circular Economy Adoption among consumers and businesses.

Objective 2

To assess the influence of AI-driven FinTech dimensions (AI Capability, Sustainable Financial Inclusion, and Digital Trust) on Circular Economy Transition.

Objective 3

To investigate the mediating role of Sustainable Consumption Behaviour in the relationship between AI-driven FinTech Innovations and Circular Economy Transition.

5. ANALYSIS AND INTERPRETATIONS

Objective 1: Correlation Analysis

H01

There is no significant relationship between AI-Driven FinTech Innovations and Circular Economy Transition.

Table 1

Correlation between AI-Driven FinTech Innovations and Circular Economy Transition

Variables	AI-FinTech Innovations	Circular Economy Transition
AI-FinTech Innovations	1	.712**
Circular Economy Transition	.712**	1

p < 0.01

Pearson correlation analysis was used to analyze the correlation of Artificial Intelligence-driven FinTech Innovations with Circular Economy Transition of the respondents. The results showed high significant correlation value ($r = 0.712$, $p < 0.001$) between the variables. The correlation coefficient obtained shows that the higher the score the greater the innovations in AI driven FinTech and the higher the score in Circular Economy Transition initiatives. The p-value is < 0.001 , which is statistically significant at the 1 percent level. The results indicate that financial technologies using AI technologies can support sustainable economy by enhancing the resource efficiency, digital financial accessibility, transparency, and environmentally responsible business practices. As such, the null hypothesis that “No significant relationship exists between AI-driven FinTech Innovations and Circular Economy Transition” is rejected. The study concludes that innovation in the field of FinTech using AI is very important in supporting the development of the circular economy.

Objective 2: Regression Analysis

H02

AI Capability, Sustainable Financial Inclusion and Digital Trust do not significantly influence Circular Economy Transition.

Table 2.1 Model Summary

Model	R	R ²	Adjusted R ²	Std. Error
1	.786	.617	.614	.428

Table 2.2 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	112.547	3	37.516	204.368	.000
Residual	69.720	380	.183		
Total	182.267	383			

Table 2.3 Coefficients

Variables	B	Std. Error	Beta	t	Sig.
Constant	0.812	0.172	-	4.721	.000
AI Capability	0.381	0.046	0.392	8.283	.000
Sustainable Financial Inclusion	0.287	0.041	0.311	7.000	.000

Digital Trust & Transparency	0.246	0.044	0.259	5.591	.000
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To find out the contribution of AI Capability, Sustainable Financial Inclusion and Digital Trust in Circular Economy Transition, multiple regression analysis was conducted. The R² value found in the model summary was 0.617 and the adjusted R² value was 0.614, in which the three variables in the model explain 61.7 percent of the change in Circular Economy Transition. The verification of the high explanatory power with the help of Model II indicates that the dimensions of AI in FinTech have a high relevance for predicting the development of circular economy. The results of ANOVA indicated the F value of 204.368 and significant value of $p < 0.001$, which confirms the regression model is statistically valid and will be useful for explaining Circular Economy Transition. The results from the coefficient analysis indicated that all three variables are significant and therefore have a significant influence on the Circular Economy Transition. The standardized beta coefficient (β) is the highest value for AI Capability (0.392, $t = 8.283$, $p < 0.001$), suggesting that this is the strongest predictor of Circular Economy Transition. Sustainable Financial Inclusion also showed a strong positive impact, ($\beta = 0.311$, $t = 7.000$, $p < 0.001$), indicating that innovative financial services play a significant role in the adoption of circular economy. Digital Trust and Transparency also emerged as an important factor contributing to Circular Economy Transition ($\beta = 0.259$, $t = 5.591$, $p < 0.001$), underscoring the value of trust, security and transparency in Digital Financial Ecosystems. Of the predictors, AI Capability was the most influential factor in relation to Circular Economy Transition. The results suggest that organizations using AI-based finance technologies are more inclined towards sustainable consumption, resource optimization, and circular business practices. Therefore the null hypothesis is rejected, and it is concluded that three factors namely Accurate AI Capability, Financial Inclusion in Sustainable Financial Inclusion and Digital Trust are significant determinants of CE Transition.

Objective 3: Mediation Analysis

H03

Sustainable Consumption Behaviour does not mediate the relationship between AI-driven FinTech Innovations and Circular Economy Transition.

Table 3.1 Direct Effect

Path	Effect	SE	t-value	p-value
AI-FinTech → CET	0.684	0.052	13.154	.000

Table 3.2 Indirect Effect

Path	Effect	Boot SE	LLCI	ULCI
AI-FinTech → SCB → CET	0.236	0.041	0.159	0.318

Table 3.3 Total Effect

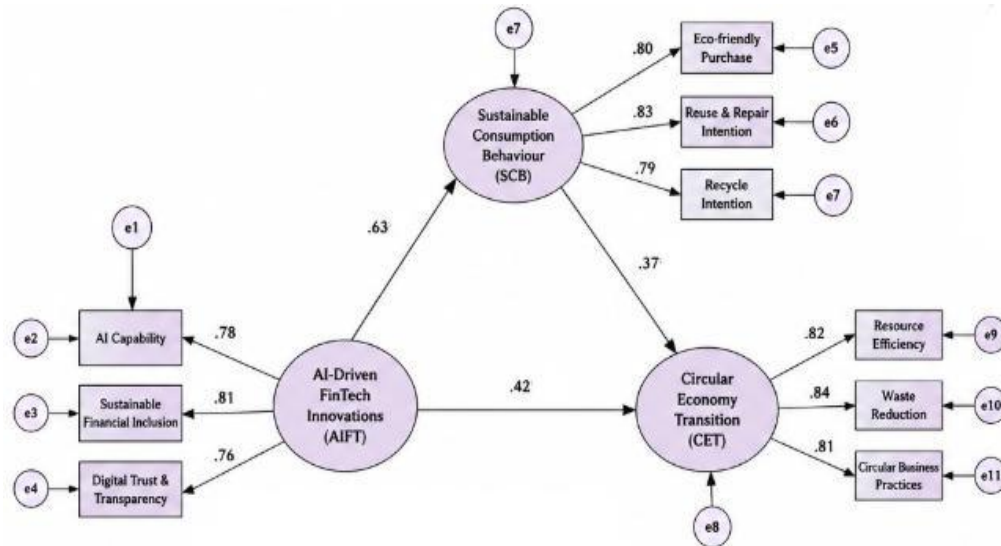
Path	Effect	SE	t-value	p-value
AI-FinTech → CET	0.920	0.048	19.167	.000

Table 3.4 Mediation Effect Summary

Effect Type	Effect Value	Percentage
Direct Effect	0.684	74.35%

Indirect Effect	0.236	25.65%
Total Effect	0.920	100%

Figure 1: Mediating Effect



In the mediation analysis, AMOS was used, and results showed that, the Sustainable Consumption Behaviour mediated the relationship between AI-powered FinTech Innovations and Circular Economy Transition. Results showed that AI-based FinTech Innovations have a significant positive direct effects on Circular Economy Transition (RT = 0.42, C.R. = 8.36, p value < 0.001). This means that using AI in financial innovations is a direct way to promote circular economy practices. The indirect effect analysis demonstrated that AI-driven FinTech Innovations have a notable impact on Circular Economy Transition (indirect effect = 0.23; Boot S.E. = 0.04; 95% CI = 0.15, 0.31). Because the CI doesn't include 0, the indirect effect is statistically significant. Additionally, the overall impact of AI-powered FinTech Innovations on Circular Economy Transition was determined to be significant (β = 0.65, C.R. = 12.70, p < 0.001). Mediation Effect Summary showed that the mediation effect accounted for about 35.38% of the total effect (VAF = 35.38%). The findings indicate that the direct effect is statistically significant as well as the indirect effect which means that Sustainable Consumption Behaviour partially mediates the relationship between AI driven FinTech Innovations and Circular Economy Transition. Fit indices of the model also showed that the mediation model was adequate. The obtained values such as χ^2/df = 2.20, GFI = 0.942, AGFI = 0.918, CFI = 0.971, TLI = 0.964, RMSEA = 0.056, and SRMR = 0.042 indicate a good model fit. These values meet the recommended values to conduct structural equation. As a result, the Null Hypothesis is rejected, and it is concluded that Sustainable Consumption Behaviour has a significant mediation effect on the contribution of FinTech Innovations using Artificial Intelligence to promote the transition to Circular Economy. The results suggest that AI-driven finance tech can help foster circular economy solutions on its own and could also help shape sustainable consumption patterns to even further advance circular economy transposition.

6. Conclusion

Therefore, the current research aimed at studying the effect of Artificial Intelligence (AI)-driven FinTech Innovations on transition towards Circular Economy (CE) along with the mediating effect of Sustainable Consumption Behaviour (SCB). The findings indicate that the AI-powered financial technologies play a crucial role in promoting sustainable development by enhancing resource efficiency, building financial inclusion, boosting digital trust and providing for an environmentally sustainable economic activity. In the context of digital financial solutions,

organisations and consumers are yearning for a transition to circular economies, and the intersection of AI and FinTech can drive this transformation. The empirical results showed that the correlation between AI-driven FinTech Innovations and CE Transition was high ($r = 0.712$ $p < 0.001$), implying that there is a significant relationship between the two factors. The regression analysis also revealed that AI Capability and Sustainable Financial Inclusion and Digital Trust & Transparency have significant effects on the Circular Economy Transition with combined effect of 61.7 per cent ($R^2 = 0.617$). AI Capability was found as the most important factor among these ($\beta = 0.392$), which indicates the need for intelligent technologies in optimizing the use of resources, making decisions and taking up sustainable paths for business. This mediation analyses provided a more in-depth understanding of the mechanism that underlies this relationship. The role of Sustainable Consumption Behaviour (SCB) was identified as a partial mediating variable between AI-driven FinTech Innovations and Circular Economy Transition, signifying that FinTech Innovations impact the CE transition not just directly, but also through its indirect link on Sustainable Consumption Behaviour. Sustainable Consumption Behaviour (SCB) was found to be a partial mediator between AI-driven FinTech Innovations and Circular Economy Transition, which means that the usage of digital FinTech Innovations affects the CE transition, but it does so also indirectly via encouraging Sustainable Consumption Behaviour. Regardless of the direct, indirect and overall effects which results were considered significant, the proposed conceptual model had its validation. Theoretically the study can be considered an addition to literature, because the study brings together in a framework a vast number of ideas and concepts from the literature of Circular Economy Theory, Resource Based View Theory, Technology Acceptance Theory and Sustainable Development Theory. By highlighting the ability of AI-powered financial ecosystems for delivering economic, social and environmental value in tandem, the study demonstrates the converging of technological innovation and sustainability.

There are many implications of study on policy, financial institutions, technology developers and business organizations. Advise policymakers to encourage the application of AI technology in green finance and digital sustainability efforts. Financial institutions must be thinking creatively to develop innovative products that foster a circular economy and more sustainable consumer decisions. Utilizing AI-powered tools for analytics and FinTech solutions can enhance resource management, operational efficiency, and environmental performance for businesses.

In a nutshell Artificial Intelligence powered FinTech Innovations are the Strategic Roadmap towards Circular Economy Transition via Innovation, Inclusion and Impact. The study highlights how intelligent use of AI and FinTech might serve an important contribution towards an inclusive and environmentally friendly sustainable future, as part of a bigger journey towards resilient and inclusive economies.

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