



INTERNATIONAL CONFERENCE ON Dynamics of Sustainability Management through Digitization

Conference Proceedings

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CHIEF MINISTER
RAJASTHAN

Message

I am delighted to learn that the Department of Business Administration, Jaipur School of Business at JECRC University, Jaipur, is organizing the International Conference on "Dynamics of Sustainability Management through Digitization (DSMD25)."

In today's rapidly evolving world, the intersection of sustainability, business management and digitization is crucial for a prosperous and sustainable future. This conference provides a valuable platform for researchers, academics, industry professionals and policymakers to connect, exchange ideas and explore cutting-edge innovations shaping sustainable business practices through digital transformation.

Initiatives like DSMD25 are essential as we navigate global challenges. They inspire collaboration, spark innovative solutions and pave the way for strategies contributing to a greener, more sustainable and digitally empowered world.

I extend my best wishes to the organizers and participants of DSMD25. I am confident the insights and discussions from this conference will significantly advance sustainability and digital innovation.

(Bhajan Lal Sharma)



Dr. Prem Chand Bairwa
Deputy Chief Minister
Government of Rajasthan



Technical Education, Higher Education,
Ayurveda, Yoga & Naturopathy, Unani,
Siddha & Homeopathy (Ayush),
Transport & Road Safety Department

No : Dy.CM/P/2025/ R-4602
Jaipur, Date : 29-01-2025

Message

It gives me great pleasure to acknowledge the initiative taken by the Department of Business Administration, Jaipur School of business, at JECRC University, Jaipur to organizing the International conference on Dynamics of Sustainability Management through Digitization (DSMD25) 4th-5th April'25. This conference promises to cultivate an interdisciplinary platform for researchers, academicians, industry professionals, and policymakers to deliberate on the evolving paradigms of sustainability management, with a focus on leveraging digital technologies.

This forum serves as a platform for scholarly discussion on the current scenario of sustainable environment. It holds significant relevance in exploring various aspects of sustainability through digitization with appropriate measures.

I congratulate the organizing committee for their dedicated efforts in organizing this international conference and for their invaluable contribution of new ideas and research findings. I extend my warm greetings and felicitation to the university and delegates.

With warm regards and best wishes,


[Dr. Premchand Bairwa]



Message from Shri Arpit Agrawal

Vice Chairperson,

JECRC University

Jaipur, Rajasthan

It is my great pleasure to welcome all delegates to the International Conference on “**Dynamics of Sustainability Management through Digitization (DSMD-2025)**”, organized by the Jaipur School of Business & Jaipur School of Economics at JECRC University, Jaipur, on **April 4th–5th, 2025**.

DSMD-2025 aims to provide a dynamic platform for students, researchers, and distinguished experts from around the globe to present their latest research and insights focused on a sustainable future. I am confident that this conference will not only serve as an intellectual forum for valuable discussions but also contribute meaningfully to society.

At JECRC University, we are dedicated to delivering world-class education enriched with innovation and research, empowering young minds to take on global challenges. Hosting such academic initiatives at regular intervals has been a cornerstone of our academic ethos.

I wholeheartedly appreciate the efforts of the Jaipur School of Business & Jaipur School of Economics in organizing this esteemed conference and extend my best wishes for its grand success.

A handwritten signature in black ink, appearing to be 'Arpit Agrawal'.

(Arpit Agrawal)

Vice- Chairperson, JECRC University
Jaipur, Rajasthan



Message from Prof. Victor Gambhir

President

JECRC University, Jaipur

I am indeed delighted to note that the International Conference on “**Dynamics of Sustainability Management through Digitization (DSMD-2025)**” is being organized by the **Jaipur School of Business & Jaipur School of Economics**, JECRC University, Jaipur, on **April 4th–5th, 2025**.

This conference addresses critical aspects of sustainability across diverse domains, including the economy, digital empowerment in public health and social inclusion, global trade and employment trends in the digital era, digital financial inclusion for global cooperation and sustainable development, energy, cognitive computing, and fostering innovative workplace cultures.

I am confident that the insights and discussions at **DSMD-2025** will make a valuable contribution to academic research and practical solutions for contemporary scientific and societal challenges.

It is a matter of great pride for **JECRC University** to host such a significant gathering, and I extend my best wishes to the organizers for a successful and impactful event.

A handwritten signature in black ink, reading 'vgambhir'. The signature is stylized with a long horizontal line extending from the end of the name.

(Prof. Victor Gambhir)
President, JECRC University



Message from Shri S.L. Agrawal

Registrar

JECRC University, Jaipur

It is a privilege to be associated with the International Conference on **“Dynamics of Sustainability Management through Digitization (DSMD-2025),”** to be held at JECRC University, Jaipur, on **April 4th–5th, 2025.**

I take great pleasure in extending a warm welcome to all the delegates and keynote speakers of DSMD-2025. This conference serves as a vital platform at the intersection of sustainability, business management, and digitization—key drivers of a prosperous and sustainable future. It will delve into critical themes such as sustainable business practices, digital transformation in economic growth, financial inclusion, global trade dynamics, innovative workplace strategies, and the role of technology in fostering long-term sustainability.

By bringing together researchers, academics, industry professionals, and policymakers, DSMD-2025 facilitates meaningful connections and the exchange of ideas that will shape the future of business and the economy.

I am confident that the discussions at this conference will provide valuable insights for both young scholars and distinguished experts in the field.

"I extend my best wishes to the organizers and participants for a successful conference, fostering advanced sustainability and driving digital innovation for a sustainable future

A handwritten signature in blue ink, appearing to read 'S.L. Agrawal', with a horizontal line underneath.

(S.L. Agrawal)
Registrar, JECRC University



Message from Prof. (Dr.) Renu Pareek

Dean, JSB

JECRC University, Jaipur

We are honored to host the **International Conference on Dynamics of Sustainability Management through Digitization (DSMD25)**, a platform dedicated to exploring the intricate relationship between sustainability and digital innovation.

This conference will serve as a vital platform for thought leaders, researchers, and practitioners to engage in meaningful discussions on digital transformation's role in achieving **Sustainable Development Goals (SDGs)**. By integrating cutting-edge research with global sustainability imperatives, DSMD25 embodies our institution's vision of responsible progress. We look forward to insightful deliberations that will drive impactful change.

I extend my sincere gratitude to the esteemed authorities of **JECRC University**, Jaipur, for their invaluable support in making this conference a reality. My heartfelt appreciation also goes to the dedicated organizers whose efforts will undoubtedly ensure the grand success of this event.

Wishing all participants an enriching and inspiring experience at DSMD25.

A handwritten signature in black ink, appearing to read 'R. Pareek', with a long horizontal line extending from the end.

Prof.(Dr.) Renu Pareek

Dean, JSB

JECRC University, Jaipur

From the desk of editors

It gives us immense pleasure to present the proceedings of the *International Conference on Dynamics of Sustainability Management through Digitization (DSMD25)*. This volume brings together a diverse collection of research contributions, case studies, and conceptual insights shared during the conference, reflecting the dynamic intersection of digitization and sustainability.

The conference served as a vibrant platform for academicians, industry leaders, researchers, and practitioners to engage in meaningful discussions on how digital technologies can be leveraged to address pressing global challenges. The selected chapters in this book not only highlight technological advancements but also underscore the importance of ethical business practices, social responsibility, and sustainable resource management.

We firmly believe that interdisciplinary collaboration is the key to fostering innovation and driving impactful change. This compilation stands as a testament to the collective wisdom, curiosity, and commitment of the contributors who are striving to shape a more sustainable and inclusive future.

We extend our heartfelt gratitude to all authors for their scholarly contributions, the reviewers for their critical insights, and the organizing team whose dedication ensured the success of DSMD25. A special note of thanks goes to our sponsors and volunteers whose support made this endeavor possible. We are thankful to Dr Akanksha Joshi and Ms Taniya Soni for their valuable contribution in the proceedings.

It is our sincere hope that this volume will serve as a valuable reference for researchers, practitioners, and policymakers alike. May the ideas, findings, and discussions contained within these pages inspire continued exploration and collaboration in the journey toward sustainable development through digitization.



Prof (Dr.) Ruchi Goyal
Head, Department of Business Administration
Jaipur School of Business,
JECRC University



Dr Manish Sharma
Assistant Professor, Department of
Business Administration
Jaipur School of Business
JECRC University

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Perception of MOOCs among Higher Education Students

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Department of Management, Birla Institute of Technology Mesra, Jaipur Off-Campus

Introduction

Rapid technological advancements have transformed the education sector in the last three decades, making learning more readily available. One of the most notable innovations in this area is Massive Open Online Courses (MOOCs), which have allowed millions of students worldwide to gain quality education from esteemed institutions and experts. Platforms like Coursera, edX, and Future Learn have become prominent leaders in this field, providing free or affordable courses across diverse themes. That eventually led to MOOCs emerging as a powerful force in higher education, offering an alternative to conventional classroom learning previously constrained by geographical, financial, and social obstacles. The variety of courses offered on the MOOC platforms is highly appealing and attracts a diverse range of individuals. During the COVID period, the lockdowns and restrictions compelled educational institutions to close on-site operations and directed students to further their understanding through online platforms (Raja & Kallarakal, 2020a). As a result of the lockdowns, both students and faculty members started utilizing the online platforms, which provided a wide selection of MOOCs across various fields of study (Raja & Kallarakal, 2020b).

Except for NPTEL, these new platforms have only been around for 4 to 5 years, whereas SWAYAM, launched in 2017, is the newest initiative focused on the creation and delivery of MOOCs across a wide range of disciplines, from senior high school to postgraduate studies, aimed at producing world-class content. SWAYAM has listed over 1550 MOOCs, with more than 800 courses already delivered. Approximately 3.4 million students have signed up for these courses. Although MOOCs have been lauded for their potential to make education more accessible, students' views on these courses vary and are often influenced by their individual experiences and expectations. Some learners regard MOOCs as a beneficial resource for independent study, valuing their flexibility and availability (Kundu & Bej, 2020). Over the last two decades, education has undergone a substantial transformation, driven by progress in information and communication technologies. One of the most notable innovations has been the advent of Massive Open Online Courses (MOOCs), which promote accessibility to education by offering online courses to students worldwide. Online platforms offering diverse MOOCs have partnered with leading global institutions, bolstering the courses' perceived value.

Furthermore, the affordability of MOOC fees encourages students to enrol. The concept of

MOOCs was first proposed in 2008. However, it began to catch on in 2012 with the advent of course providers such as Coursera, Udacity, and edX collaborating with prestigious universities (Deimann, 2015). In the past, distance education primarily relied on courses delivered through correspondence by postal mail. MOOCs are increasingly many mixed courses at the tertiary level (Wu & Luo, 2022). Additionally, research shows that over 90% of people enrolled in MOOCs do not finish the courses (Pham, 2025).

A reason for the low completion rates in MOOCs is the ongoing reliance on a unified teaching model that prioritizes the instructor (Al Murshidi et al., 2025). MOOCs have transformed conventional higher education frameworks by providing an easily accessible, free platform for gaining knowledge and promoting continuous learning.

Their inclusive and interactive characteristics present a fresh view on education, highlighting collaborative learning and the construction of knowledge through networks (Haniya & Paquette, 2020). Learners might feel uneasy when engaging in group activities or show imbalanced involvement, which could lead to conflict (Dinh, 2025).

Literature Review

MOOCs have fundamentally changed the education landscape by providing accessible, flexible, and scalable learning options to a diverse global audience (Dinh, 2025). With their inception in the early 2000s, MOOCs have advanced significantly, offering a broad range of courses across different fields of study. Their main contribution is democratizing education, allowing learners from various backgrounds to access high-quality educational resources from prestigious institutions worldwide without financial barriers (Kent & Bennett, 2017).

Research has indicated that MOOCs enhance learning efficiency by allowing students to utilize high-quality resources and benefit from self-paced learning environments. For example, a study demonstrates that MOOCs can be effectively incorporated into blended learning models to improve collaborative learning and skill acquisition (Abhishek N. et al., 2023).

From the students' perspective, MOOCs are appreciated for their open access, flexibility, and the opportunity to connect with peers worldwide. However, issues such as conventional teaching approaches, insufficient personalized feedback, and low completion rates have been recognized (Meneses et al., 2019). An investigation into SWAYAM MOOCs indicated that many learners discontinue their studies due to a lack of motivation to obtain certification, highlighting the necessity for improved engagement strategies (Mondal & Majumder, 2019). Sustainability of MOOCs: The sustainability of MOOCs relies on overcoming their existing challenges. Suggested improvements include integrating advanced technologies like learning analytics, peer review systems, and adaptive learning to enrich the user experience, enhance awareness, and increase the perceived value of MOOCs, which could promote higher levels of participation and completion (Meneses et al., 2019).

This review emphasizes the dual nature of MOOCs as both an opportunity for and a challenge to higher education. While they possess significant potential to revolutionize learning, it is essential to address their limitations to optimize their effectiveness.

In numerous instances, MOOCs have been provided entirely free of charge. This research aims to illuminate the role of MOOCs, which could represent a significant advancement in the evolution of university teaching and learning. Although this form of education is still relatively new, the preliminary outcomes have demonstrated its effectiveness. This educational model is in its infancy and encounters specific challenges, but these may not necessarily hinder its adoption as a key contributor to the advancement of university education (Alhazzani, 2020).

There are two factors contributing to this remarkable rise in registration numbers. Firstly, the heightened interest in online education, which surged due to its widespread adoption during the COVID-19 pandemic; secondly, the growing demand for workforce development and retraining in light of the challenging economic conditions and the resulting labor market crisis brought about by COVID-19. (Sharma & Nathani, 2023) (Alario-Hoyos et al., 2017) examined how student motivation and engagement forecast academic outcomes in various MOOCs. This research aimed to explore the connection between student motivation, engagement, and overall performance in two MOOCs with different underlying motives yet similar educational design. The findings suggested that the specified aim of the MOOC resonates with students and their motivations to participate in online learning, influencing their academic results. MOOCs also drew in students from diverse backgrounds, highlighting significant implications for practical and strategic issues regarding accreditation and monetization, which MOOC providers need to consider about the life circumstances of their target audiences that affect their enrolment decisions (Seeman & McEwen, 1996; Ståhla et al., 2001). Furthermore, this has implications for MOOC participants, aligning with a well-informed message for students aspiring to achieve high grades: motivations to excel from the start of the course and involvement in various offered activities. Other findings are related to reaching mastery goals, personal or social ambitions, or fulfilling objectives beyond the MOOC.

This study examines how learning technologies are a crucial learning resource, enabling and empowering a MOOC's WBIS. They are defined as the range of software-enabled technical features and functions integrated into e-learning programs that facilitate learning.

The concept of MOOCs was first proposed in 2008. However, it began to catch on in 2012 with the advent of course providers such as Coursera, Udacity, and edX collaborating with prestigious universities (Stephen, n.d.). In the past, distance education primarily relied on courses delivered through correspondence by postal mail (Stephen, n.d.)

Table 1.1 MOOC Platforms

Platforms	Description	Link
Coursera	Coursera is a digital education platform that offers various topics in multiple learning formats, including courses, Specializations, Professional Certificates, degrees, and tutorials.	(Coursera, n.d.)
Udacity	Udacity courses are highly interactive with activities such as quizzes and exercises interspersed between short videos and interviews with instructors and industry experts.	(Learn the Latest Tech Skills; Advance Your Career Udacity, n.d.)
Udemy	Established in 2010, Udemy is an online education platform designed to bridge the knowledge gap between learners and qualified instructors worldwide. It provides more than 200,000 online courses.	(Online Courses - Learn Anything, On Your Schedule, n.d.)
Khan Academy	Khan Academy is a non-profit educational organization based in the United States, founded in 2006 by Sal Khan. Its goal is to offer a free, high-quality education to individuals everywhere.	(Khan Academy Free Online Courses, Lessons & Practice , n.d.)

NPTEL	The National Programme on Technology Enhanced Learning (NPTEL), which utilizes information and communication technology (ICT), is the most extensive technical dissemination initiative in India, involving seven IITs (Indian Institutes of Technology), including Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras, and Roorkee, along with IISc, Bengaluru.	(Swayam - NPTEL, n.d.)
SWAYAM	SWAYAM is a program launched by the Government of India to fulfill three fundamental principles of the Education Policy: access, equity, and quality. This initiative aims to provide the finest teaching and learning resources to everyone.	(Swayam Central, n.d.)
edx	edX is a platform for online education and a provider of Massive Open Online Courses (MOOCs), delivering top-notch courses from premier universities and institutions to students worldwide. We support online education both in classrooms and globally.	(Build New Skills. Advance Your Career. n.d.)

Source: Authors' Composition

Many students consider MOOCs to be a valuable enhancement to conventional education, valuing the excellent material and knowledge offered by prestigious institutions

At the research level, MOOCs have allowed universities to understand better how students learn and how to enhance technology-based education beyond traditional classroom settings. For instance, MOOCs align with the principles of social constructivism. They facilitate group interactions, collaborative efforts, discussions, and the co-creation of knowledge. Therefore, it is not surprising that many researchers are exploring how to promote collaboration in MOOCs through tools like user forums. Collaboration can manifest through various learner activities, including commenting on assignments, sharing resources, or engaging in joint projects. Consequently, learning can take place through spontaneous student interactions rather than solely through content engagement (Papadakis, 2023).

Nevertheless, numerous studies have pointed out the challenges and issues related to using MOOCs and the expectations surrounding their role in enhancing the educational process. One significant issue is the high dropout rate among learners: only a small fraction of the participants who enrol in MOOCs complete the course, especially compared to traditional courses (De Notaries et al., 2021). It has been noted (Borella et al., 2022) that the completion rates for MOOCs fall below 10% and may even be as low as 5%. Here are some models that

are related to our study:

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is an extensively utilized framework in the social sciences that examines how new electronic technologies or services are accepted and used. It operates on the premise that users' views on a technology's utility and user-friendliness shape their attitudes and intentions regarding its use. (*ScienceDirect.com | Science, Health and Medical Journals, Full Text Articles and Books*, n.d.) Elements involved in the TAM Model are:

External variables: This refers to the factors outside the technological framework such as learner's demographic, prior knowledge and social influence etc., that can influence perceived usefulness, perceived ease of use, Perceived usefulness: This refers to the perception of the individual about how technology can enhance their performance and achieve their goals. If someone believes technology can help them be more productive and effective, we are more likely to use it. Perceived Ease of Use: This refers to the extent to which an individual believes using a specific technology can be effortless and straightforward. If a technology is perceived as easy to learn and use, users are more likely to adopt it. Attitude towards using MOOCs: This refers to the willingness and desirability of using a particular technology. The attitude is affected by usefulness, ease of use, and Behavioural intention to use: This refers to the conceivability of a person using the technology. A positive attitude towards technology use leads to a stronger intention to use it.

Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a framework that describes and anticipates how technology is accepted and utilized, incorporating various established theories and highlighting four main components: performance expectancy, effort expectancy, social influence, and facilitating conditions. (*Sage Journals: Discover World-Class Research*, n.d.) Elements involved in the UTAUT Model are:

Performance expectancy: It is defined as "*the degree to which an individual believes that using the system will help him or her to attain gains in job performance*" (Venkatesh et al., 2003), Effort expectancy: It is defined as "*the degree of ease associated with the use of the system*" (Venkatesh et al., 2003), Social Influence: It is defined as "*the degree to which an individual perceives that important others believe he or she should use the new system*" (Venkatesh et al., 2003), Facilitating conditions: It is defined as "*the degree to which an individual believes that an organisation's and technical infrastructure exists to support the use of the system*" (Venkatesh et al., 2003).

Theoretical foundations provide a chance to link with existing knowledge and to clarify the assumptions derived from comprehensive theoretical evaluations, which can aid in uncovering

new connections. Various fields influence learning, including cognitivism, behaviourism, constructivism, humanism, and connectivism. Therefore, it is essential to investigate the relevant theories to enhance understanding and offer a logical and justifiable reasoning for the study's purpose. The primary objective of any educational institution is to deliver the best service to society, which enhances employment prospects and contributes to the economic development of a nation. In this context, human capital plays a significant role in a nation's wealth, and thus organizations must cultivate individuals' learning capabilities and contribute positively to society (Anand Shankar Raja & Kallarakal, 2021).

The viewpoint of higher education students towards MOOCs (Massive Open Online Courses) has been thoroughly explored, with research emphasizing various important facets. Students typically recognize the benefits of MOOCs due to their accessibility and adaptability, enabling them to study at their own pace without limitations related to location or financial situations. Numerous students appreciate the chance to interact with high-quality content and teaching offered by renowned institutions, enhancing their overall learning journey.

Objectives of the study

- The study aims to understand the motivators for using MOOCs among higher education students.
- The study aims to understand perceived benefits associated with the use of MOOCs.
- The study aims to understand the problems perceived by higher education students when using MOOCs.

Hypothesis:

H_A: The awareness among students towards MOOCs has a positive correlation with perceived ease of use.

Research Methodology

The study: The method of questionnaire was used for conducting the survey.

Sample design: Population: The population included respondents from the Rajasthan region.

Sample size: The sample size was 159 respondents.

Sampling element: individual respondents were the sample element.

Sampling technique: a non-probability purposive sampling technique was used to collect the data.

Tools used for data collection: a modified and standardized questionnaire was used for data collection in the current study on a Likert-type scale. Value 1 indicates the minimum agreement of respondents, and 5 indicates the maximum agreement of the respondents. On the other hand, the choice of "strongly disagree" indicates minimum agreement, and the choice of "strongly agree" means maximum agreement.

-Research design

The research utilizes a quantitative descriptive approach to examine the reach and perception of Massive Open Online Courses (MOOCs) among college students in Rajasthan. We employed a cross-sectional questionnaire method to understand students' opinions, attitudes, and perceptions regarding the MOOCs platform. The research aims to draw insights into the context of the students' reach, acceptance, and challenges while using MOOCs.

-Sampling Strategy: Non-probability purposive sampling includes expertise and creates an in-depth understanding.

-Data Analysis Techniques: - The statistical tools include Descriptive statistics, including percentages and frequencies, analysis of variance, correlation matrix, and regression analysis, which are utilized to identify trends and patterns within the data. Microsoft Power BI uses visualization tools to express the results in pie charts and bar charts.

-Research context

MOOCs have played an essential role in making high-quality education offered by universities worldwide accessible to everyone. MOOCs serve as a crucial instrument for learners worldwide. Over the years, various theories have been developed regarding the perception of MOOCs. The study is conducted in the state of Rajasthan, India, which is known for its lively student population and contributes to efficient analysis of high school students' perception. A country like India with a complex societal structure may experience gaps in learning opportunities, especially in regions where traditional education may struggle due to financial or infrastructural barriers. The study data was collected during the academic year 2024-2025. By taking into consideration the various insights derived from the survey, we can know how MOOCs can be effectively adapted to address the needs of the learners, inform policy suggestions, improve curriculum, develop improved strategies, and integrate MOOCs into the traditional higher educational system.

This research context highlights the significance of examining both the achievements and shortcomings of MOOCs to ensure they function as a pathway to equitable and accessible education for everyone. The results seek to guide educational policy, improve curriculum design, and create strategies to boost student engagement and amplify the effectiveness of MOOCs in higher education.

-Research Instrument:

The survey implemented in this study was crafted to gather quantitative data suitable for

analysis involving a large sample size, enabling extensive data collection without requiring physical presence.

This study gathered primary data to obtain first-hand information from the respondents (n = 159) through a sampling approach. The period for data collection lasted around one month, from February 15th to March 10th, 2025, and due to this brief timeframe, comprehensive data could not be obtained. The study focuses solely on higher education institutions (HEIs) in Rajasthan, India, concentrating on the student community utilizing MOOCs for data collection. The survey design incorporates the Task-Technology Fit (TTF) and the Technology Acceptance Model (TAM) frameworks. The TTF aspect addresses the requirements of tasks and perceived benefits, such as improved academic performance, alongside barriers identified, like problems in understanding language and navigation through the course. The TAM aspect evaluates familiarity and awareness by asking, "Are you aware of the benefits of MOOCs?" Respondents choose from predetermined options that align with the TAM components of Perceived Ease of Use and Perceived Usefulness.

Data collection and analysis are done through Google Forms, in which we have included closed-ended and open-ended questions to align with research goals, which are to test awareness, ease of use, and perception of MOOCs.

Closed-ended questions: These were structured as multiple-choice and Likert-scale questions to obtain precise information about participants' experiences, completion rates, and levels of awareness regarding MOOCs.

Open-ended questions allowed respondents to express their thoughts in detail, offering valuable insights into their motivations and obstacles related to online learning.

The Google Form was disseminated digitally, promoting accessibility and convenience for many participants. The online format also made data collection, organization, and analysis more efficient.

Ethical Consideration

Ethical considerations in research are essential for ensuring the safety of participants and maintaining the credibility of findings. This involves integrity and fairness in the management of data, respect for participants through informed consent, minimizing potential harm, and assessing social consequences. Participants were informed of their anonymity and their right to withdraw from the study at any point without having to explain their decision.

Analysis and Findings

The sample's population consists of students engaged in higher education, primarily from BIT, Mesra College. Of the total student enrolment, 51% were female and 49% were male. We utilized a comprehensive approach to encourage greater participation. The survey was

distributed to all universities in Rajasthan. Consequently, the sample showcases the diversity of students from various courses, academic programs, and year levels. The demographic details are presented in the table

Table: 1.2 Respondents' Demographics

Attribute	Category	Frequency	Percentage
Gender	Male	78	49%
	Female	81	51%
Age	17-21	56	35.22%
	22-24	38	23.89%
	24-26	29	18.23%
	26-28	36	22.66%
Academic level	Diploma	40	25.15%
	Undergraduate	43	27.06%
	Masters	76	47.79%
Total		159	100%

Source: Authors' Composition

The results of this demographic information offer important contextual insights for understanding the research findings. Most of the students are aged 17 or older and are enrolled in undergraduate programs. Although the number of students is relatively small, the variety of courses and colleges contributes to the generalizability of our results.

Bivariate Correlation

Table.1.3 Bivariate Correlation among awareness regarding MOOC'S and ease to use

Correlation		
VARIABLES		<i>easy to navigate</i>
Awareness Regarding MOOCs	<i>Pearson correlation</i>	0.538
	Sig. (2 tailed)	1
	N	159
Correlation is significant at the 0.01 level (2 tailed)		

Source: Author's composition

The bivariate correlation analysis is used to assess the strength and direction of the association between two variables. The correlation coefficient has a range of values from +1

to -1. The correlation coefficient, which ranges from +1 to -1, is positive and is at 0.538. Therefore, as seen above in the table, there was a positive link between the Awareness Regarding MOOCs and easy navigation.

Analysis of Variance

Analysis of variance based on demographics among the variables affecting the perception of MOOCs among higher education students.

Table 1.4 ANOVA

variables		Sum of squares	df	Mean Square	F
Gender (Male/Female)	Between Groups	4.5	1	4.5	65535
	Within Groups	0	0	65535	
	Total	4.5	1		
Age	Between Groups	396.75	3	132.25	65535
	Within Groups	0	0	65535	
	Total	396.75	3		
academic level	Between Groups	798	2	399	65535
	Within Groups	0	0	65535	
	Total	798	2		

Source: Author's composition

This table outlines the results from an Analysis of Variance (ANOVA), which examines how demographic aspects such as Gender, Age, and Academic Level impact factors influencing students' perceptions of MOOCs (Massive Open Online Courses). Below is a summary:

- Gender (Male/Female):

- The difference observed between male and female groups indicates a Sum of Squares of 4.5, accompanied by a degree of freedom (df) of 1. The Mean Square remains at 4.5; however, the notably high F-value (65535) suggests possible errors in computations or results that may be exaggerated due to data limitations.

- Age:

- The age categories show a more substantial Sum of Squares (396.75) with df=3. The Mean Square (132.25) indicates the average variance across age groups, yet, once more, the F-value (65535) is unusually elevated, pointing to unexpected outcomes.

Academic Level:

- The Sum of Squares (798) with $df=2$ and Mean Square (399) suggests considerable differences among the groups. However, like the other factors, the elevated F-value raises concerns about possible data anomalies or extreme values. In all instances, the Within Groups variance is noted as zero, indicating a lack of variation within specific demographic groups or that this part of the analysis may be incomplete or flawed. Overall, the table suggests noteworthy patterns but also implies a need for thorough verification of the calculations and data entries to ensure their accuracy.

Regression Analysis

The Regression Analysis has been evaluated between the two variables, which are awareness regarding MOOCs and ease of use.

Table.1.5 Regression Results

<i>Regression Statistics</i>	
Multiple R	0.537899083
R Square	0.289335423
Adjusted R Square	0.052447231
Standard Error	8.990342106
Observations	5

Source: Author's composition

Table 1.5 regression analysis, multiple R, depicts moderate regression statistics between awareness and ease of use.

R-squared denotes that approximately 29% of the variation in ease of use can be explained by awareness levels.

Adjusted R square depicts small sample size with explanatory power of about 5.2%.

Standard Error calculates the accuracy of forecast (8.99, relatively high) Observations consider 5 data points.

Table.1.6 F-statistic

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	98.72124646	98.72125	1.221401	0.349758567
Residual	3	242.4787535	80.82625		
Total	4	341.2			

Source: Author's composition

Table 1.6 - ANOVA:

- Divides the variance into elements:

- Regression (df=1): The variability explained by awareness.
- Residual (df=3): The unexplained variability.
- Includes F-statistic (1.22) and its significance (0.35), which specify that the regression model isn't statistically significant at conventional thresholds.

Table.1.7 Coefficients

	<i>Coefficient</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
ease of use	3.885269122	8.055667983	0.4823	0.662593	-21.751462	29.5219999	-21.7514617	29.5219999
awareness	0.341359773	0.308875346	1.10517	0.349759	-0.6416194	1.32433898	-0.64161943	1.32433898

Source: Author's composition

Table 1.7 - Coefficients:

- Lists the regression coefficients for ease of use (constant: 3.88) and awareness (slope: 0.34).
- P-values for both are above 0.05, showing no significant relationship.
- Confidence intervals (e.g., Lower 95% and Upper 95%) display wide ranges, reflecting uncertainty due to limited data.

Discussion of Results

Awareness about the MOOCs platforms

The table.1.3 summarizes the awareness levels of various MOOC (Massive Open Online Course) platforms among participants, as part of the research findings related to the perception of MOOCs. It investigates the research question: "Are you aware of MOOC platforms?" The table enumerates seven platforms—Coursera, Udacity, Udemy, Khan Academy, NPTEL, SWAYAM, and edX—alongside the number of participants familiar with each platform and their corresponding percentages.

Notable insights reveal that Udemy is the most recognized platform, with 23.27% of participants aware of it, followed by NPTEL at 21.38% and SWAYAM at 20.13%.

Table 1.3 offers insights into the awareness rates regarding various MOOC (Massive Open Online Courses) platforms among participants.

Table: 1.7 Awareness about the MOOCs platforms

Which MOOCs platform are you aware about?		
Platforms	Count	Percentage (%)

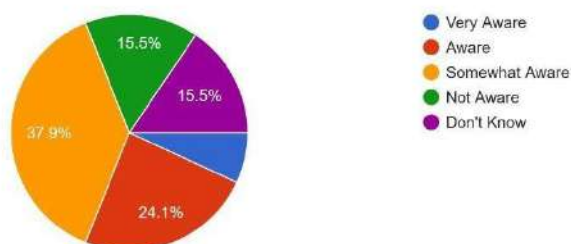
Coursera	26	16.35220126
Udacity	2	1.257861635
Udemy	37	23.27044025
Khan Academy	14	8.805031447
NPTEL	34	21.3836478
SWAYAM	32	20.12578616
edx	14	8.805031447
TOTAL	159	100

Source: Author's composition

Awareness About the Benefits of MOOCS

Fig:1.1 Awareness About the Benefits of MOOCS

Are You Aware About the benefits of MOOC's?
58 responses



Source: Author composition

The pie chart depicts the awareness and benefits of MOOCs (Massive Open Online Courses) among the students. Important takeaways include: -

Very Aware (15.5%): A relatively small number of respondents exhibit a high level of awareness about the benefits, suggesting that MOOCs have effectively communicated their value to a specific audience.

Aware (37.9%): A considerable portion indicated that they are aware, positing that initiatives to promote MOOCs effectively engage the intended audience.

Somewhat Aware (24.1%): A significant segment falls into the category of partial awareness, indicating that there is potential to improve how the advantages of MOOCs are communicated to prospective learners.

Not Aware (15.5%): This figure underscores a lack of awareness among some respondents, emphasizing the need for focused campaigns to enhance visibility.

Don't Know (7%): A minor group showed total uncertainty about the benefits, reflecting a lack of exposure or interaction with MOOCs.

These insights stress the need for improved promotional approaches and communication

strategies to achieve a broader and more profound understanding of the advantages associated with MOOCs. Customized outreach initiatives could contribute to closing the awareness gap and motivating more learners to investigate the possibilities of Problem faced while using MOOCs

Table: 1.8 Problem faced while using MOOCs

Yes	No
15.5 %	84.5%

Source: Author composition

Table 1.4 displays the answers to the inquiry, "Have you encountered any problems while using MOOCs?" The results are as follows: -

Yes (15.5%): A few respondents indicated they experienced challenges while utilizing MOOCs. Such issues may include technical problems, accessibility issues, or struggles comprehending the material.

No (84.5%): Most participants reported a seamless and trouble-free experience with MOOCs, implying that most learners found the platforms easy to use and effective. The data underscores that although MOOCs typically offer a favourable experience for most learners, it is crucial to address the particular difficulties a small group encounters to promote inclusivity and enhance accessibility. This information is essential for understanding and enhancing MOOC platforms to ensure a seamless experience for all learners.

Type of problems faced while using MOOCS

Table 1.5 illustrates students' main challenges when participating in MOOCs (Massive Open Online Courses). It presents respondents' levels of agreement with different statements, categorized into five groups: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. The findings highlight significant concerns regarding the limitations of MOOCs.

The first challenge, *difficulty in tracking assignments and engagement in MOOCs, *reveals a varied response, with most students remaining neutral (50 respondents). At the same time, a substantial number agree (39) or strongly agree (12). Likewise, the issue of **language as a barrier* received a neutral perspective from 50 respondents, but 50 responses (22 strongly agree and 28 agree) recognized it as a difficulty.

The perception of *insufficient personalized attention from tutors* is another notable concern, with 67 respondents (27 strongly agree, 40 agree) endorsing this viewpoint, highlighting a disadvantage of MOOCs compared to conventional learning methods.

Lastly, the statement about *high dropout rates in MOOCs* receives considerable agreement, with 78 responses (28 strongly agree, 50 agree), indicating it as a common challenge affecting

course completion rates.

Table:1.9 Types of problems faced while using MOOCs

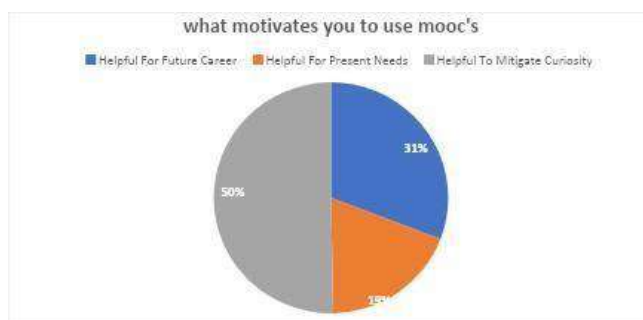
What are the problems faced while using MOOCs					
	Agree	Disagree	Neutral	Strongly agree	Strongly disagree
It Is difficult to keep track of assignments and involvement in MOOCs	39	26	50	12	33
Language can be a barrier while using MOOCs	28	27	50	22	31
MOOCs can't provide personalized attention from the tutor	40	26	38	27	27
A large number of students drop out before completing the course	50	14	64	28	2

Source: Author composition

MOTIVATION TO USE MOOCS

(Kundu & Bej, 2020; Papadakis, 2023) Recognized four general categories of student motivation for enrolling in MOOCs: addressing current needs, preparing for future opportunities, satisfying curiosity, and engaging with others. Additionally, we examined our data through this framework; however, our research found three categories of student motivations for joining MOOCs: useful for present needs, beneficial for future careers, and practical in satisfying curiosity.

Fig: 1.4 MOTIVATION TO USE MOOCS

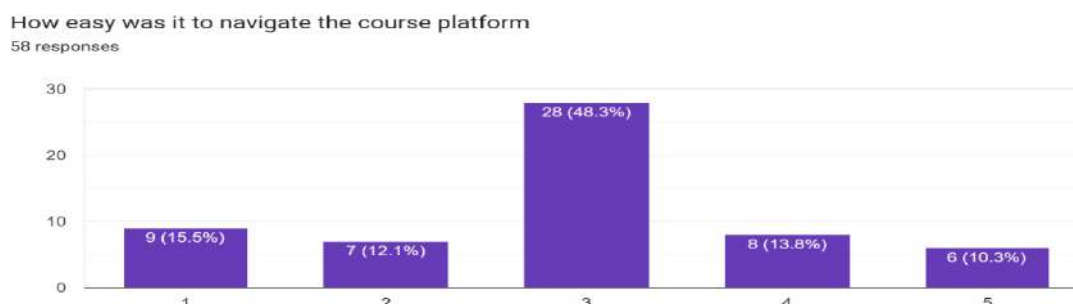


Source: Author composition

The pie chart in Figure 1.4 depicts that 50% of students acknowledged that they utilised MOOCs to mitigate their curiosity, 31% acknowledged that they utilised MOOCs to cater to

future career needs, while 19% acknowledged MOOCs being helpful for present needs.

Fig: 1.5 Ease to Navigate



Source: Authors composition

The bar chart in Fig.1.5 depicts the ease with which the students could navigate through the various MOOCs platforms. We provided the students/participants with ranks from '1' to '5', where '5' represents the highest degree of ease and satisfaction while the '1' depicts the lowest degree of ease and satisfaction. It was identified that rating '3' had the highest response with 28 votes (48.3%), which depicts the moderate level of satisfaction towards the navigation through the various platforms. Therefore, it highlights the evident need to improve platform usability.

MOOC Courses Completed Recently

Table: 1.10 MOOC Courses Completed Recently

Yes	No	Maybe
25.9%	62.1%	12.1%

Source: Author composition

The survey findings shown in Table 1.6 provide insight into how many students have completed any course recently. We extended multiple choices that included the options "Yes", "No", and "Maybe". The percentage obtained for each option is mentioned in the table.

Certificate Earned

Table: 1.11 Certificate Earned

Yes	No
31 %	69 %

Source: Authors composition

Table 1.7 displays the findings related to the question, "Have you earned any certificates?" within the context of engagement in MOOCs (Massive Open Online Courses). The multiple-choice question offered "Yes" and "No," and the percentage received for each choice is mentioned in the table above.

Satisfaction with MOOCs

Table 1.12 Satisfaction with MOOCs

Yes	No	Maybe	Not applicable
22.4 %	12.1 %	13.8%	51.7%

Source: Authors Composition

The table.1.8 represents the results to the question,” Are you satisfied with the MOOCs you have completed?”

Yes (22.4%): This figure indicates that a few participants are pleased with the MOOC courses they've completed. It's important to analyse the course design, content quality, and learner engagement to enhance this satisfaction. Are the courses delivering real value, or do educational gaps need to be filled?

No (12.1%): This implies some learners had an unsatisfactory experience. Common factors for their dissatisfaction may include insufficient interactivity, vague explanations, or technical issues. Pinpointing specific challenges is crucial here.

Maybe (13.8%): Those in this group are uncertain. This could suggest that the course provided some benefits but fell short of fully meeting expectations. Providing clearer information on course outcomes, offering better instructions, and demonstrating real-world applications might encourage this group to lean toward a "yes."

Not Applicable (51.7%): This represents the largest segment. This may reflect individuals who either did not enroll in a MOOC or did not complete the course. If they didn't finish, potential reasons could include time limitations, lack of motivation, or course difficulty. If they did not participate in a MOOC, they may simply be unaware of the options available or the benefits they offer.

Do you think you have gained valuable knowledge and skills from the course?

Table: 1.13

Yes	No	Maybe
39.7 %	17.2 %	43.1%

Source: Authors Composition

The table.1.9 offers an overview of how participants perceive the value gained from MOOCs (Massive Open Online Courses), addressing the question: "Do you think you have gained valuable knowledge and skills from the course?" The data is divided into three response categories—Yes, No, and Maybe—with their percentages indicated. The results show that *39.7% of respondents* believe they acquired valuable knowledge and skills from the courses, indicating a notable level of satisfaction and perceived effectiveness among this demographic. The data indicates:

Yes (39.7%): A notable percentage of respondents feel they have gained significant knowledge

and skills from MOOCs. This highlights the capacity of these courses to provide meaningful learning experiences.

No (17.2%): A smaller proportion of respondents indicated they did not acquire valuable knowledge or skills. This suggests possible deficiencies in course design, content delivery, or the relevance of the material.

Conclusion

It has been witnessed that awareness of MOOCs among higher education students in Rajasthan has been high. However, they are not confident in enhancing knowledge through MOOCs, and clarity about satisfaction is also low. A significant percentage of the students are aware of MOOCs and the benefits they offer. There is a positive correlation between awareness of MOOCs and ease of navigation. Hence, the alternative hypothesis has support.

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Tracing Trends in ESG Disclosures and Firm Performance: A Bibliometric Review

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INTRODUCTION

The urgent issues posed by global warming, climate change, and ecological conservation have elevated environmental sustainability as a core focus for businesses and policymakers worldwide. To tackle greenhouse gas emissions, the United Nations has implemented pre-emptive strategies, including creating the Intergovernmental Panel on Climate Change (IPCC) and adopting the Kyoto Protocol. Through their commitment to the Paris Agreement, nations strive to curtail global temperature increase to less than 2°C, emphasizing the significance of reducing environmental impact. These international efforts have spurred the implementation of carbon trading systems and emission reduction initiatives, effectively embedding environmental considerations within economic endeavours.

In this setting, Environmental, Social, and Governance (ESG) disclosures serve as a crucial mechanism for companies to showcase their dedication to sustainable practices. ESG reporting provides a transparent view of a company's environmental footprint, social endeavours, and governance measures. This allows stakeholders to evaluate their progress in mitigating climate-related risks and promoting sustainable development. Standardized ESG disclosures are instrumental in guiding investors, regulators, and other stakeholders, aiding them in making well-informed decisions regarding a company's sustainability initiatives.



Figure 1: Pillars of ESG, Source: Anevis

However, challenges persist in ensuring uniformity and consistency in ESG reporting frameworks. The voluntary nature of many ESG disclosure systems often results in variations in reporting practices, making it difficult to compare firms' performances effectively. Researchers have highlighted the need for robust guidelines and frameworks to standardize

ESG reporting

Literature Review

Development of ESG Definition, Concept, and Disclosure

ESG, an acronym for Environmental, Social, and Governance, denotes the key criteria employed to assess the sustainability and ethical implications of investing in a company. Initially grounded in corporate social responsibility (CSR) principles, ESG has advanced to adopt a more comprehensive and systematic strategy for corporate sustainability. The environmental dimension pertains to a company's initiatives to control its ecological footprint, while the social facet is centered on its interactions with employees and suppliers.

The governance aspect pertains to the company's leadership, executive compensation, audits, shareholder rights, and impact on customers and local communities. This expanded framework mirrors the increasing expectations of stakeholders and regulatory requirements for transparency and responsible conduct in corporate operations.

ESG reporting has experienced notable development, transitioning from its initial roots in voluntary CSR reporting to more formalized and obligatory frameworks. Initial reports were frequently disorganized and exhibited significant diversity; however, establishing frameworks such as the Global Reporting Initiative (GRI) in 1997 furnished essential standards. The Sustainability Accounting Standards Board (SASB), founded in 2011, went on to incorporate ESG factors to a greater extent.

Investigating financial reporting by emphasizing significant factors influencing financial results. Implementing the European Union's Non-Financial Reporting Directive (NFRD) in 2014 required large public-interest entities to adhere to comprehensive disclosure obligations. Recently, the Task Force on Climate-related Financial Disclosures (TCFD) has sought to establish standardized reporting of climate-related risks, aligning with the increasing international focus on thorough and comparable ESG disclosures.

The Impact of ESG Disclosure on Firm Performance

Studies indicate a multifaceted relationship between ESG disclosure and financial performance. Research findings suggest that comprehensive ESG reporting has the potential to enhance economic performance by boosting investor trust and minimizing risk. For example, organizations that adopt transparent ESG practices frequently benefit from reduced capital costs and improved stock performance. Nevertheless, the available data presents a varied picture, as specific research indicates that the economic advantages of ESG reporting might be contingent on the particular industry context and company size. Current developments in the literature emphasize incorporating ESG factors into conventional financial reporting and the changing demands of investors and stakeholders concerning ESG performance.

Research consistently shows a positive relationship between ESG disclosure and firm

performance. A study conducted by Pulino et al. (2022) suggests that firm performance can be positively impacted by enhancing transparency and building stakeholder trust via ESG disclosure. Similarly, Khandelwal et al. (2023) employed an asset-pricing framework to illustrate that companies disclosing higher ESG information tend to achieve superior financial performance, indicating a growing investor inclination towards sustainable business practices. Atan et al. (2017) conducted a comparative study in emerging markets, showing a noteworthy impact of ESG disclosure.

Drives improvement in firm performance through enhancements to corporate reputation and operational efficiency. Mohammad & Wasiuzzaman (2021) concentrated on Malaysian enterprises, emphasizing that ESG reporting enhances performance and offers a competitive advantage. Governance mechanisms are vital in regulating the correlation between ESG disclosure and corporate performance. Albitar et al. (2020) conducted a study on this phenomenon both pre- and post the adoption of Integrated Reporting (IR), determining that robust governance mechanisms enhance the beneficial influence of ESG disclosure on corporate performance. Likewise, the study by Triyani et al. (2020) demonstrated that the tenure of a CEO amplifies the impact of ESG disclosure on company performance.

Bibliometric analyses comprehensively examine the research landscape surrounding ESG disclosure and firm performance. Khan (2022) carried out a bibliometric analysis and meta-analysis, delineating key trends, influential writers, and significant deficiencies in the existing research. This study highlights the significance of maintaining methodological thoroughness and the requirement for further investigation in emerging markets. Nyantakyi et al. (2023) conducted a bibliometric analysis focused on sustainability reporting and its impact on business performance, revealing a trend where sustainability reporting, encompassing ESG disclosure, is becoming more recognized as enhancing firm performance.

Research on the disclosure of ESG factors and their impact on company performance suggests a positive relationship, influenced by governance practices, industry-specific conditions, and regional characteristics. Future research should focus on filling the current gaps, particularly examining the intricate impacts of ESG disclosure within emerging markets and the changing expectations surrounding environmental, social, and governance (ESG) practices. This thorough comprehension will assist scholars, professionals, and decision-makers in navigating the complexities of ESG disclosure and financial reporting.

RESEARCH GAP

Despite extensive research on ESG disclosures, gaps persist in understanding their direct and sector-specific impacts on firm performance. Limited bibliometric studies focus on mapping the academic landscape and identifying key contributors to this growing domain.

OBJECTIVES OF THE STUDY

1. To identify the most significant author contributing to ESG disclosures and firm performance, based on citation metrics.
2. To determine the organization with the most publications related to ESG disclosures and firm performance.
3. To recognize the most productive nation in the domain, assessed based on citation impact.
4. To pinpoint the journal with the most publications on ESG disclosures and firm performance.

RESEARCH METHODOLOGY

Research Questions

The following research questions have been formulated to guide the bibliometric analysis of ESG disclosures and firm performance:

RQ1: Based on the total number of citations, which researcher is the most significant in ESG disclosures and firm performance?

RQ2: Which organization has produced the highest number of publications related to ESG disclosures and firm performance?

RQ3: Based on the total number of citations, which nation is the most productive in ESG-related research?

RQ4: According to the volume of publications, which journals are the most productive in publishing research on ESG disclosures and firm performance?

RQ5: How has the research landscape on ESG Disclosures and Firm Performance evolved, as demonstrated by the increase in publications from year to year?

DATA COLLECTION

Data was gathered from the Dimensions database, a comprehensive resource for academic research. VOSviewer, a specialized software tool, was used to perform bibliometric analysis, offering additional features such as data mining and graphical presentation of results. The information was searched using the terms "ESG Disclosure" and "Firm Performance." After removing duplicate papers, 2499 articles were included in the bibliometric analysis, forming the foundation for this study's exploration of trends, patterns, and significant contributions in the field.

ANALYSIS AND FINDINGS:

Research Question 1: According to the total number of citations, which researcher is the most significant?

TABLE 1: MOST CITED AUTHORS

S.NO.	AUTHOR	CITATION	TOTAL PUBLICATION
1	Amina Bullay	1372	17
2	Abdullah S Karaman	695	7
3	Ali Uyar	695	7
4	Mohammad Jizi	612	6
5	Allam Hamdan	531	7
6	Khaldoon Albitar	502	9
7	Muhammad Azeem Qureshi	479	8
8	Kai Wang	405	5

The top researchers are listed in Table 1, along with the number of citations they received. The most cited researcher is Amina Bullay, who has 1372 citations. 2019 saw the publication of a paper by Amina Bullay, titled "[Is sustainability reporting \(ESG\) associated with performance? Evidence from the European banking sector.](#)" The maximum number of citations for this publication was 518. Amina Bullay holds the Chief of Scientific Research Development position at the Higher Education Council, Bahrain. She has been Head of Administration and Financial Services at the Ministry of Education.

Buallay is classified as one of the worldwide top 2% best researchers by Stanford University. Abdullah S Karaman holds the second spot. He presently holds the position of Accounting Professor at Winthrop University. [His research interests include supply chain management, business analytics, sustainability, and multi-criteria decision making.](#) He has 3186 citations overall, and his H-Index is 27. Two of his works that have received the most citations in this area are " [Is corporate social responsibility reporting a tool of signalling or greenwashing? Evidence from the worldwide logistics sector](#) " and " [Board attributes, CSR engagement, and corporate performance: what is the nexus in the energy sector?](#) The third most influential author is Ali Uyar.

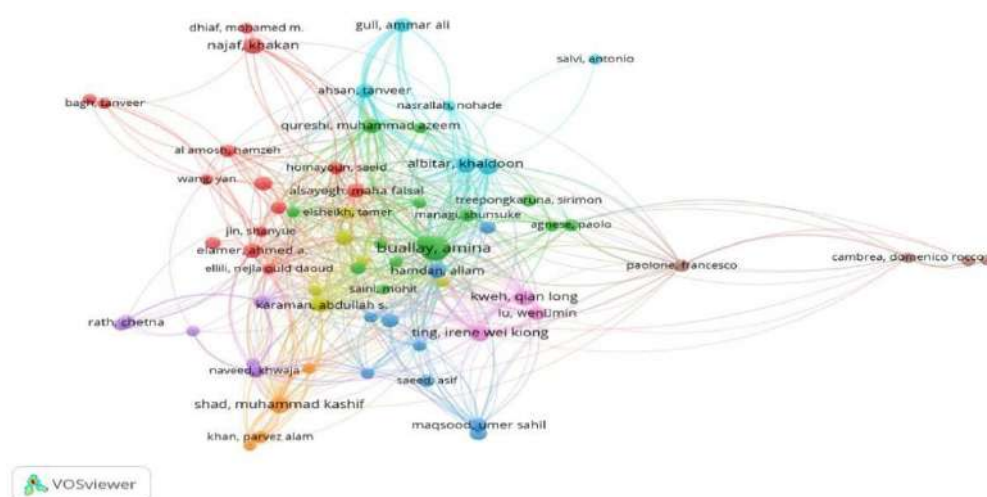


Figure 2 Bibliometric Analysis of Authors based on citations

Research Question 2. Which organisation has produced the most publications overall?

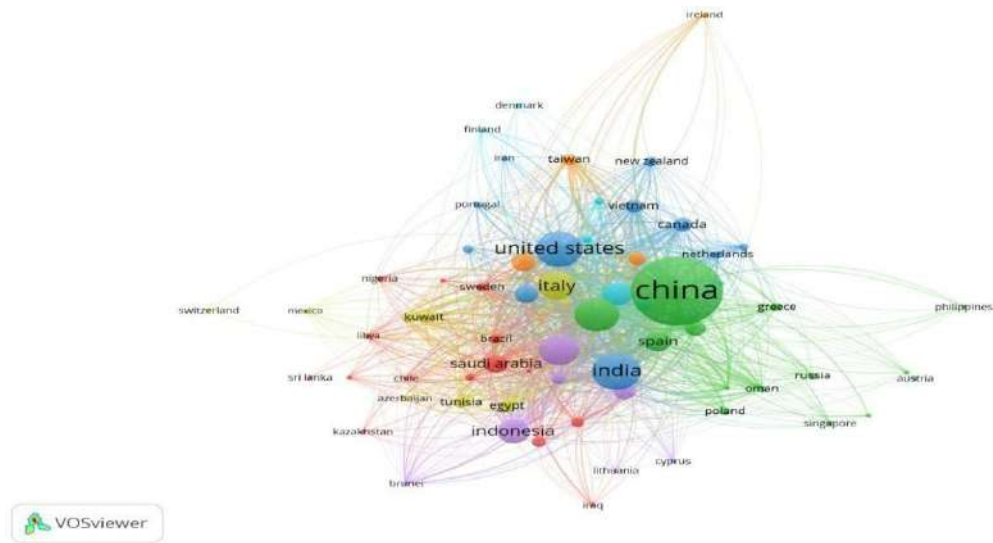
Table 2: Most Productive Organisations

S.No.	Organisation	Documents	Citations	Country
1	Brunel University, London	30	1850	United Kingdom.
2	Ahlia University	24	1461	Bahrain
3	Taylor's University	13	1075	Malaysia.
4	University of Cambridge	7	991	United Kingdom.
5	Chinese University of Hong Kong	6	871	China
6	University of Hong Kong	4	867	China

Table 2 lists the institutions with the highest productivity. The most prolific institution is Brunel University, London, which has 30 publications and 1850 citations. Table 2 ranks Ahlia University second with 24 publications and 1461 citations. With 13 publications and 1075 citations, Taylor's University takes third place. Most studies are conducted in the United Kingdom, followed by Bahrain and China. Therefore, Australian institutions have made the most significant contributions to ESG Disclosures.

Figure 3 Bibliometric Analysis of the Country based on Citations

Research Question 3: Based on the total number of citations, which nation is the most productive in



ESG-related research?

The United States leads in influence with 10687 citations, followed closely by China with 10251 citations. The United Kingdom ranks third with 9780 citations. Other countries, including Italy, Malaysia, and India, have notable roles in advancing this field. The USA, China, and the UK are the most significant contributors to the ESG Disclosures Domain.

Table 3: Most Cited Countries

S.No.	Country	Citation
5	United States	10687
1	China	10251
2	United Kingdom	9780
3	Italy	4362
4	Malaysia	4169
6	India	4041

Research Question 4: According to the volume of publications, which journals are the most productive in publishing research on ESG disclosures and firm performance?

Table 4: Most Cited Journals

S.No.	Journal	Publication	Citation
1	Sustainability	197	5185
2	Environmental Science and	115	2011

of research activities over time, highlighting patterns, changes in academic emphasis, and phases of development or decline, diminished interest in a subject. Examining this data yields valuable insights on the progression of a field and can be beneficial in reaching a greater understanding, analysing current trends, areas for further research and investigation, and the progression of scholarly interest.

Table 5: Publications by Year.

Year	Publications
2024	7385
2023	7056
2022	3339
2021	1924
2020	1599
2019	827
2018	675
2017	505
2016	291

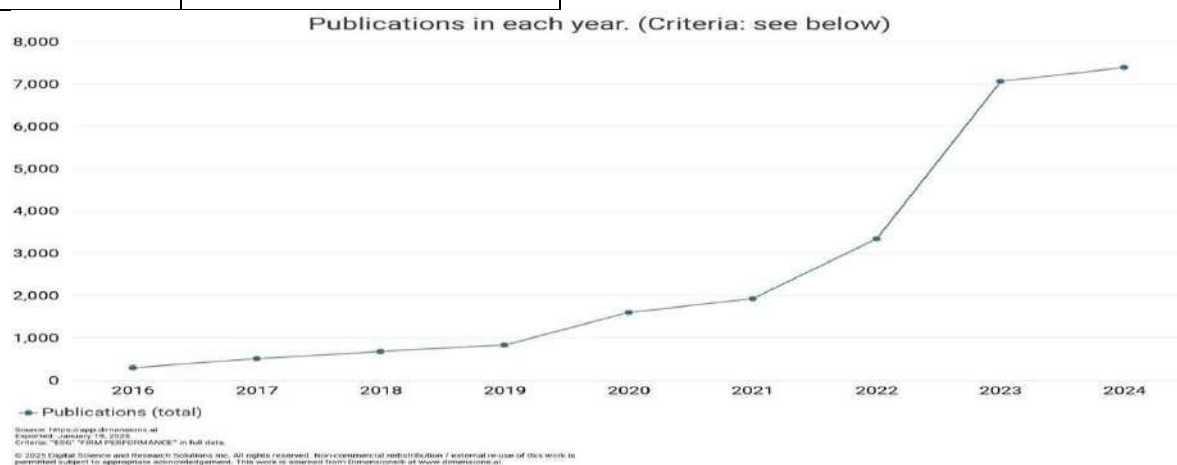


Figure 5: Publications by year

Conclusion

This study aims to conduct a bibliometric analysis of prior research on ESG reporting and firm performance. This field is expanding rapidly with a growing number of publications each year. The study provides a comprehensive summary of the literature produced by various scholars in this area.

Four research questions were developed to identify the most influential researcher, the most productive nation, the most active organization, and the most productive journal over the years. The Dimensions database and VOSviewer software were utilized to analyze these questions. The findings reveal that **Amina Bullay** is the Head of Administration and Financial Services

at the Ministry of Education. Abdullah S Karaman holds the second spot. Brunel University, London, emerged as the most productive organisation with 30 publications, followed by Ahlia University with 24 publications. Based on citations, the **United States** ranks highest in influence with 10658 citations, followed by **China** with 10215 citations. The Sustainability **Journal** leads in publication volume with 197 articles, while Environment Science and Pollution Research ranks second with 115 publications. Accounting researchers are actively investigating current disclosure practices and their associated challenges.

This analysis will be valuable for future researchers, highlighting the most productive authors, nations, organizations, and journals, enabling them to focus on high-quality work. Researchers can identify impactful papers by directly searching for the top journals and authors identified in this study. However, the study has limitations, as it relied solely on the Dimensions database. Incorporating data from additional sources, such as **Scopus** and **Web of Science**, could yield more precise and comprehensive results, as these are among the most extensive databases globally. Future research using multiple databases could offer more robust insights into ESG reporting and firm performance.

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Unlocking Business Sustainability in SMEs through Digital Marketing Adoption

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INTRODUCTION

Small and Medium Businesses (SMEs) are essential to innovation, job creation, and economic growth in several industries. However, these companies face sustainability issues such as fluctuating markets, limited resources, and changing customer needs. In an increasingly digitalized business world, SMEs must employ innovative strategies to increase their competitiveness and long-term survival. Adopting digital marketing has become a game-changing instrument that helps SMEs reach new markets, enhance customer interaction, and improve operations. In the current digital world, SMEs are becoming increasingly aware of the importance of digital marketing to their success (Knežević & Has, 2024).

SMEs use digital marketing techniques to connect with their target audience, encourage engagement, and achieve long-term growth due to consumers spending more time online and traditional marketing channels being less successful (Tochukwu Ignatius Ijomah et al., 2024). For SMEs hoping to compete in today's fast-paced business world, digital marketing has become crucial. Since most customers use the Internet to investigate goods and services, SMEs must have a strong online presence to attract and interact with their intended customers. However, their long-term sustainability is still a significant concern because of market competition, resource constraints, and changing consumer tastes. To overcome these obstacles, SMEs must use strategic techniques that improve their competitiveness and adaptability.

One of the main factors contributing to corporate success is market orientation, which emphasizes customer focus, competitive awareness, and interfunctional coordination. Still, how well SMEs use digital marketing in their strategy framework will increasingly determine how effective it is at ensuring business survival. Adopting digital marketing helps SMEs improve customer relations, increase market responsiveness, and accelerate business operations. Despite its potential, digital marketing adoption still varies among SMEs, frequently because of obstacles like financial limitations, a lack of digital literacy, and opposition to change. For SMEs to adopt sustainable business practices, it is essential to comprehend how market orientation and digital marketing adoption interplay. Applying digital marketing entails a variety of tactics for the business's goal of reaching customers through digital marketing channels (Emini & Merovci, 2021).

In today's fast-paced and interconnected world, small businesses are turning to advanced technologies to enhance efficiency, foster innovation, and strengthen customer relationships.

Small businesses today face the challenge of striking a balance between achieving profitability, practising environmental responsibility, upholding social accountability, and ensuring sustainable growth over the long term.

This conceptual study explores how SMEs could use digital marketing for business sustainability. By examining significant digital marketing strategies, adoption enablers, and the impacts on SME growth and resilience, the study contributes to the broader discussion on sustainable business practices. The results can teach academics, entrepreneurs, and policymakers how to employ digital marketing to increase SME sustainability in the quickly evolving digital economy.

LITERATURE REVIEW

Influencing Business Sustainability through Digital Marketing: In the 1990s, the idea of digital marketing was first proposed and developed in parallel with the Internet. As companies started using online platforms, especially with the emergence of the World Wide Web, the phrase itself began to acquire use in the mid-1990s. (Deku et al., 2024) Search engines, email, and social media marketing are examples of modern marketing tools known as digital marketing technologies that small and medium-sized businesses (SMEs) in emerging markets can anticipate using to grab exceptional business opportunities and gain a competitive edge.

One of the significant turning points in the business world that has raised standards and importance across a range of industries is digitalization. Digital marketing refers to marketing efforts promoting goods and services via digital channels. The use of digital technologies by businesses to engage and keep customers, market goods and services, and boost sales is referred to as digital marketing (Emini & Merovci, 2021). Digital marketing is the process of managing customer connections and public engagement via the use of diverse digital platforms. Over the past three decades, its evolution has been remarkable, enabling companies to use digital media to draw in, hold on to, and grow their client base.

This strengthens their brand's stance relative to competitors. (Lima et al., 2024) Adopting digital marketing is critical to any business's survival in this cutthroat market. Most of the literature on digital marketing concentrates on large firms and organizations; thus, small businesses are not well-informed about digital marketing despite the well-established advantages of digital promotions (Ritz et al., 2019). Small and medium-sized businesses can use digital marketing strategies to compete with multinational corporations. Digital marketing in emerging markets efficiently uses electronic information and communication technologies, especially the Internet, to accomplish marketing objectives. It entails establishing and serving as a communication channel between SMEs and their established clientele via the Internet and other multimedia platforms.

Reduced expenses, improved client access, and increased business efficiency are the primary advantages of digital marketing in emerging markets. As a result, companies that employ

innovative methods to do business via the Internet and information and communication technology (ICT) have greater success than SMEs that do not employ digital marketing (Deku et al., 2024; Herhausen et al., 2020; Liu et al., 2020; F. Wang, 2020). Therefore, businesses that use new techniques to do business through information and communication technology (ICT) and the Internet are more successful than SMEs that fail to use digital marketing.

Expanding market reach beyond regional boundaries is one of the main ways digital marketing affects businesses' sustainability. Digital platforms, as opposed to conventional marketing techniques, provide firms with affordable ways to connect with audiences worldwide, draw in new buyers, and hold onto current ones. Digital marketing also encourages flexibility and adaptability, which enables companies to react immediately to shifting consumer demands, market trends, and competition challenges. Adopting digital marketing can be difficult for many companies, particularly SMEs, despite its benefits, due to a lack of experience, economic limitations, and change resistance. However, in an increasingly digitalized business world, companies that successfully incorporate digital marketing into their strategic operations acquire a competitive edge and guarantee sustainable growth.

Role of Market Orientation in achieving Business Sustainability: According to (Martín-Consuegra & Esteban, 2007), Market orientation means putting the marketing concept into practice. To compete with each other in the global marketplace, businesses must have a market-oriented strategy. (Narver et al., 1990) Mentioned that Market Orientation is the organizational culture that every person in the organization adapts to know the customers' needs and competitors' strengths and weaknesses, disseminating information among the concerned people in the organization, which helps the organization to set superior values for their customers.

Market Orientation makes it easier for a business to forecast, respond to, and take advantage of changes in its surroundings, which produces better results. To compete with each other in the global marketplace, businesses must have a market-oriented strategy. Adopting effective market-oriented strategies can enhance effectiveness, such as service quality, which is increasingly important for service businesses to meet customer needs and improve organizational performance (Ramayah et al., 2011). A strong customer orientation enables businesses to anticipate and respond to evolving consumer preferences, ensuring the continuous delivery of relevant products and services. Businesses build brand loyalty and long-term relationships by consistently meeting customer needs, which is essential for sustained growth. Similarly, competitor orientation allows firms to stay aware of industry shifts, identify opportunities, and develop strategies that enhance their market positioning. Businesses that actively monitor their competitive landscape can make informed decisions, reducing risks and increasing their chances of survival in dynamic markets. Moreover, interfunctional

coordination ensures that all departments within an organization work collaboratively towards common goals. By aligning marketing, operations, finance, and customer service efforts, businesses can optimize resource utilization, improve efficiency, and enhance overall performance.

The degree to which a business adopts a market orientation significantly influences the success of its marketing performance (Dahmiri et al., 2024). This integrated approach fosters resilience and adaptability, which are key to long-term sustainability. Market orientation is particularly valuable in SMEs as it helps overcome resource limitations by focusing on strategic decision-making and customer-driven innovation.

The Role of Digital Marketing Adoption in Linking Market Orientation and Business Sustainability: Business sustainability involves a holistic strategy incorporating economic, social, and environmental factors into daily operations. It demands forward-thinking strategies and implementing sustainable business models, ensuring that companies maintain financial stability while positively impacting society and the environment. Sustainability requires businesses to make decisions considering long-term impacts, ensuring that resources are available for future generations.

Businesses prioritizing sustainability focus on responsible practices, optimizing resources, and fostering innovation to fulfil present needs without compromising future generations' needs (Bansal & DesJardine, 2014). Market orientation is crucial for companies seeking sustainability in today's extraordinarily competitive and digitalized business environment. Companies are better equipped to adjust to changes in the market and guarantee long-term success when they put the requirements of their customers first, keep an eye on their rivals, and efficiently manage internal operations. However, the effectiveness of market orientation in driving sustainability is increasingly dependent on digital marketing adoption, which serves as a crucial link between understanding market dynamics and implementing actionable strategies.

Digital marketing adoption enables businesses, particularly SMEs, to translate market-oriented insights into effective engagement strategies. Through tools such as social media marketing, search engine optimization (SEO), content marketing, and data analytics, businesses can enhance customer interactions, improve brand positioning, and gain real-time insights into consumer behaviour (Tochukwu Ignatius Ijomah et al., 2024).

These digital tools allow firms to respond quickly to shifting customer preferences and competitive pressures, reinforcing the adaptability that market-oriented businesses require for sustainability. Moreover, digital marketing provides cost-effective avenues for reaching broader audiences, overcoming geographical barriers, and improving customer retention. This particularly benefits SMEs with limited resources, as they can leverage digital platforms to

maximize visibility and optimize marketing expenditures.

Although significant research has examined the influence of market orientation on business performance, there remains a scarcity of studies investigating its impact on business sustainability, particularly within the SME sector. Moreover, while digital marketing adoption is widely acknowledged as a key driver of SME competitiveness, limited research explores its mediating role in the relationship between market orientation and business sustainability.

Much of the existing literature treats digital marketing as an independent strategy rather than integrating it within a market-oriented framework. This paper attempts to close these gaps by conceptualizing digital marketing adoption as a crucial link between market orientation and business sustainability in SMEs, offering insightful information for researchers, policymakers, and business professionals. Previous studies have also primarily focused on large enterprises, leaving a gap in understanding how SMEs—often constrained by limited resources and digital adoption challenges—can effectively utilize digital marketing for long-term survival and growth.

THEORETICAL BACKGROUND

Technology Acceptance Model – A sound theoretical framework for comprehending the implementation of digital marketing in SMEs and its function in promoting business sustainability is offered by the Technology Acceptance Model (TAM). One of the most popular models for analysing the adoption and use of new technologies is the (TAM), which was first developed by Davis et al. (1989), based on the theoretical framework of the Theory of Reasoned Action (TRA) (Sheppard, Jon, Hartwick, Paul R, Warshaw, et al., n.d.).

TAM and digital marketing are very interrelated because each aim to realise how individuals use technology and how the perceptions interact with behaviour. TAM is a good approach to check how well users adopt platforms, technologies, and digital marketing tactics. It focuses on mental processes that affect how individuals behave while using technology. According to TAM, a person's decision to adopt and use technology is greatly influenced by two primary constructs: perceived usefulness (PU) and perceived ease of use (PEOU)(J. (Sunny) Kim, 2016). TAM defines user intention to continue using technology as behavioral intention to use, and it directly influences the actual adoption.

The idea behind the TAM is that a technology is more advantageous to the user if it is simpler to use (Venkatesh et al., n.d.). Favourable impressions in digital marketing are created through valuable experiences that are very easy to use and increase the possibility of user interaction on the platform or marketing content. Incorporation of TAM into an organisation's digital marketing strategy will offer deeper insights into how people implement and make use of digital tools and platforms.

Technology usefulness and simplicity of use are also linked to things like attitudes, post-use

evaluations (J. Kim & Forsythe, 2008), and intention to revisit (Reynolds and Ruiz de Maya, 2013), and attitudes (Kulviwat et al., 2014; Ritz et al., 2019). This would allow SMEs to take advantage of these insights for meaningful, user-friendly experiences that drive enduring loyalty beyond just engagement. Equipping SMEs with better strategies reflecting customer perceptions through the principles of TAM will allow digital marketers to advance technology adoption and customer satisfaction while enhancing marketing performance.

Theory of Planned Behaviour – The Theory of Planned Behaviour (TPB) is a standard psychological framework for evaluating and understanding human behaviour, introduced by Icek Ajzen in 1985. It further develops the previous Theory of Reasoned action (TRA), a theory first proposed in 1980 by Martin Fishbein and Ajzen by adding the concept of "perceived behavioural control" (a person's belief about their ability to perform a behaviour) by incorporating this, the actual behaviour of a person can be better predictable (Ajzen & Fishbein, 1969).

TPB assumes that an individual's behaviour is influenced by specific motivational and perceptual factors (Bosnjak et al., 2020). By applying TPB, this study explains how SMEs' attitudes, perceived pressures, and confidence in digital marketing influence their adoption, linking market orientation to business sustainability. Understanding these behavioral drivers can help policymakers and business leaders design targeted interventions that promote digital marketing adoption, ultimately supporting SMEs' long-term resilience and sustainability in an increasingly digital economy.

Resource-Based View: The Resource-Based View (RBV) is a strategic management theory that explains how firms achieve a competitive advantage by leveraging their unique resources and capabilities. The Resource-based view (also known as the resource-advantage theory) was first introduced by Barney (2001). The resource-based view is a strategic management framework highlighting an organization's assets and competencies as the primary sources of competitive advantage. In today's highly competitive business world, it is essential for entrepreneurs to comprehend how companies can gain and maintain a competitive edge.

RBV has since succeeded with a perspective that emphasizes dynamic capabilities (DC), highlighting how an organization may adapt its processes to use resources effectively in a changing business environment. The DC approach holds that innovative resource combinations based on dynamic capabilities rather than just resources provide competitive advantage (Ates et al., 2013; Joensuu-Salo, 2021). Two well-known frameworks- the resource-based view (RBV) and market orientation- have been developed to explain how businesses attain better results. SMEs limited financial, human, and technological resources are a key challenge. However, RBV suggests that firms can leverage digital marketing as a cost-effective and scalable resource to maximize their market orientation efforts. Digital marketing allows SMEs

to reach broader markets with lower costs, making it an invaluable resource for achieving sustainability despite resource limitations.

METHODOLOGY

In order to investigate how digital marketing adoption links market orientation and business sustainability in SMEs, this study uses a conceptual research approach. This research is based on a thorough review of the body of literature, theoretical frameworks, and earlier studies relevant to digital marketing, market orientation, and business sustainability.

The goal is to establish a theoretical understanding rather than test ideas empirically. By synthesizing existing knowledge, this study develops a conceptual framework that explains how SMEs can achieve sustainability through digital marketing adoption within a market-oriented strategy. Given the rapid evolution of digital marketing and the dynamic nature of SME sustainability, an empirical study may face limitations in capturing real-time shifts in business practices. A conceptual research approach allows for a broader understanding of the theoretical underpinnings, laying the groundwork for future empirical validation.

Conceptual Analysis and Discussion

In an increasingly digitalized business environment, the interplay between market orientation, digital marketing adoption, and business sustainability plays an important role in shaping the long-term success of SMEs. Market orientation is a strategic foundation, enabling businesses to understand customer needs, monitor competitors, and align internal processes to deliver superior value. However, in today's fast-evolving digital economy, traditional market orientation alone is insufficient for ensuring business sustainability.

To remain competitive and resilient, SMEs must complement their market-oriented strategies with digital capabilities. Digital marketing adoption is a mediating factor that transforms market-oriented insights into actionable business strategies. SMEs may improve consumer interactions, engage a wider audience, and make data-driven decisions by utilizing tools, including social media marketing, search engine optimization (SEO), marketing through range, and data analytics.

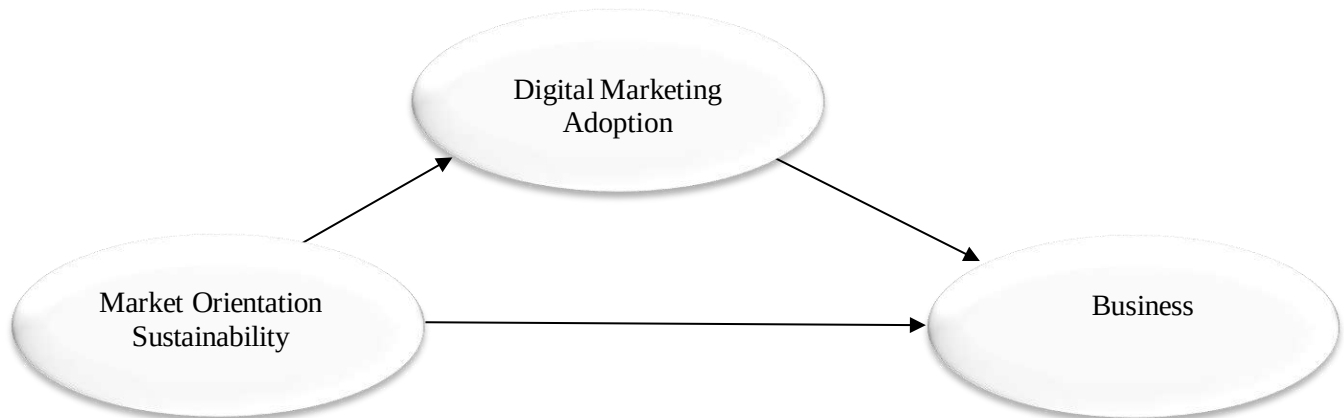
The Technology Acceptance Model (TAM) offers a theoretical framework for comprehending how SMEs see the practicality and usability of digital marketing technologies. When SMEs recognize digital marketing as a cost-effective and efficient way to engage with customers, they are more likely to integrate it into their business operations, ultimately contributing to their sustainability. Beyond technological adoption, behavioral factors significantly influence SMEs' digitalization.

The Theory of Planned Behaviour (TPB) highlights that SMEs' attitudes toward digital marketing, perceived social pressures from competitors and customers, and confidence in implementing digital tools influence adoption decisions. SMEs are more likely to adopt digital

strategies that promote long-term business sustainability if they perceive the advantages of digital marketing favourably and think they have the tools and know-how to execute it successfully. From a strategic standpoint, the Resource-Based View (RBV) highlights that SMEs can use valuable, rare, unique, and non-substitutable (VRIN) resources to gain a durable competitive advantage. Digital marketing allows SMEs to enhance customer retention, scale their market reach, improve data-driven decision-making, and build resilient brand identities. Unlike traditional marketing approaches, digital marketing allows SMEs to maximize their limited resources, improve efficiency, and strengthen their competitive positioning in an increasingly dynamic marketplace.

This discussion demonstrates that digital marketing adoption is not merely a technological shift but a critical enabler of business sustainability for SMEs. By aligning market orientation with digital capabilities, SMEs can create innovative and adaptive business models that ensure long-term growth and survival. Future research should empirically examine these conceptual linkages to provide deeper insights into how SMEs can optimize digital marketing strategies for enhanced sustainability in the digital economy.

Conceptual Framework:



Conclusion

This paper has explored the critical role of digital marketing adoption in linking market orientation and business sustainability in SMEs. In an era where digital transformation reshapes business landscapes, SMEs must move beyond traditional market orientation strategies and integrate digital marketing into their operations. A market-oriented approach gives SMEs valuable insights into customer needs, competitor actions, and industry trends.

However, its full potential is realized only with effective digital marketing adoption. By leveraging digital tools such as social media, search engine optimization, content marketing, and data analytics, SMEs can enhance customer engagement, optimize marketing efforts, and expand their market reach, ultimately ensuring long-term survival and growth. The paper also highlights the theoretical underpinnings of this relationship through the Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), and Resource-Based View (RBV). TAM explains how SMEs' perceived ease of use and usefulness of digital marketing influence their adoption decisions.

TPB emphasizes that SMEs' attitudes, external pressures, and confidence in digital tools shape their willingness to adopt digital marketing. RBV further reinforces that when combined with market orientation, digital marketing creates valuable and inimitable strategic resources that contribute to sustained competitive advantage. These theoretical insights demonstrate that digital marketing adoption is not merely a supplementary tool but a key driver of SME resilience and sustainability.

The study's findings highlight the necessity for SMEs to use digital marketing to promote long-term business sustainability. By aligning market orientation with digital capabilities, SMEs can improve adaptability, strengthen customer relationships, and navigate the challenges of an increasingly competitive digital economy. Future empirical research is recommended to validate the conceptual framework proposed in this study, providing practical insights into how SMEs can optimize their digital marketing strategies for long-term business success. As digitalization continues to shape business environments, SMEs will be more prepared to achieve competitiveness and sustained growth in the changing marketplace if they combine digital marketing with market-oriented tactics.

Research Contribution

Theoretical Implications

This study contributes to the existing body of knowledge by integrating market orientation, digital marketing adoption, and business sustainability within the SME context, offering a novel conceptual perspective. By applying the Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), and the Resource-Based View (RBV), the study extends the theoretical understanding of how SMEs can leverage digital marketing as a strategic tool for

long-term sustainability. The application of TAM highlights how perceived ease of use and usefulness influence SMEs' decisions to adopt digital marketing, providing a framework for understanding technology-driven marketing transformation.

TPB enriches this perspective by incorporating behavioral and psychological factors, such as attitudes, subjective norms, and perceived behavioral control, which shape SMEs' willingness to engage with digital marketing tools. Additionally, the RBV framework positions digital marketing adoption as a valuable and inimitable resource that strengthens SMEs' competitive advantage, reinforcing the argument that digital capabilities should be considered strategic assets rather than mere operational tools.

By synthesizing these theoretical perspectives, this study provides a comprehensive conceptual foundation for future empirical research on digital marketing adoption and SME sustainability. It suggests that digital marketing is not merely a marketing function but a strategic enabler that enhances the effectiveness of market orientation in driving long-term business success. Furthermore, this research encourages scholars to explore sector-specific and contextual variations in digital marketing adoption, highlighting the need for more empirical validation to refine existing theories and frameworks in the digital business landscape.

Practical Implications

This study offers several practical implications for SME owners, managers, policymakers, and digital marketing practitioners. By highlighting the role of digital marketing adoption as a bridge between market orientation and business sustainability, the study emphasizes the need for SMEs to integrate digital strategies into their business models actively. SME owners and managers should recognize digital marketing not merely as a promotional tool but as a strategic enabler that enhances customer engagement, market reach, and long-term competitiveness.

Investing in social media marketing, search engine optimization (SEO), content marketing, and data analytics can help SMEs strengthen their market position and improve customer retention, even with limited financial and human resources. For policymakers, the study underscores the importance of creating supportive digital infrastructure, financial incentives, and capacity-building programs that encourage SMEs to adopt digital marketing. Governments and industry associations should focus on providing SMEs with affordable access to digital tools, digital literacy training, and mentorship programs to bridge the digital divide. Additionally, business consultants and marketing professionals can use the insights from this study to design tailored digital marketing strategies that align with SMEs' market orientation and sustainability goals.

This study highlights that SMEs that successfully integrate digital marketing with a market-oriented approach are more likely to achieve long-term sustainability. By adopting digital marketing as a core business function, SMEs can enhance adaptability, improve customer relationships, and ensure resilience in an increasingly digitalized and competitive business

environment.

Limitations and talking about the future

This study has several limitations, even though it offers insightful conceptual information about the connection between market orientation, digital marketing adoption, and business sustainability in SMEs. First, as a conceptual research paper, it relies on existing literature rather than empirical data, which may limit the generalizability of its findings to real-world SME contexts. The study does not incorporate primary data from SME practitioners, which could provide deeper insights into the practical challenges and enablers of digital marketing adoption.

Additionally, the theoretical frameworks used, including the Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), and Resource-Based View (RBV), offer a structured lens to understand the phenomenon but do not account for all external factors such as government policies, industry-specific dynamics, or socio-economic conditions that may influence SMEs' adoption of digital marketing. Furthermore, this study does not differentiate between SMEs across various sectors, which may have distinct digital marketing needs and capabilities. Future research should empirically test the proposed relationships through qualitative or quantitative methods, considering industry-specific variations and real-world business challenges SMEs face in their digital transformation journey.

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Global Trade and Employment Trends in the Age of Digitalization:A Sustainability Perspective

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Introduction



(Figure 1: Digital Global Trade)

Background

Technology has improved rapidly during the past few decades, and thus global trade and employment have also. The development of digitization has transformed the shape of the trade mode and the structure of labour markets and business models.

Artificial intelligence (AI), automation, and digital platforms are proliferating, and the need for such nervous system policies is obvious, but for trade and employment as well. Where AI might be currently integrated in manufacturing, logistics, and e-commerce, especially in areas requiring more in-depth and abstractive problem-solving, it adds value while causing controversy over job displacement. Technology has contributed to economic growth, but at the same time, it has propelled the widening of the skills gap, and therefore, reskilling, and upskilling initiatives have been targeted. Having never been more essential, the need to balance the advancement of technology with sustainable employment practices is more essential than ever.

Research Problem and Rationale

Research focuses on this topic because of the necessary understanding regarding how

digitalization transforms global commerce and employment patterns, as well as promotes sustainable developments. The global economy bases its operations on digital platforms for conducting trade business and workforce management activities thus requiring transparent ethical employment standards and equal growth opportunities.

The main research issue focuses on determining digitalization sustainability barriers and finding solutions that combine job preservation and economic inclusivity. Detailed research involving digital trade examination and analysis of automation systems, blockchain technology, and gig economy strategies is required to find policies that enhance lasting workforce stability.

Research Aim

This research sought to examine how digitalization affects the global trade and employment, specifically on workforce transformation, the economic and societal stability, and the integrity of global trade.

Research Objectives

To examine the impact of digitalization on global trade and how new economic activities have been developed by it.

To assess the implications of automation and artificial intelligence on employment patterns and workforce sustainability.

Explore how blockchain technology can enhance trade transparency, security, and ethical business practices.

Evaluate the role of digital platforms in the gig economy and their impact on job creation, flexibility, and labor rights.

Identify sustainable strategies for addressing employment challenges arising due to digitalization while ensuring equitable economic growth.

Research Questions

How has digitization influenced global trade and employment structures? How does blockchain contribute to sustainable global trade and transparency?

What role does the gig economy play in the digital era, and how does it impact workforce sustainability?

What policies and strategies can be implemented to ensure sustainable employment in the digital economy?

Literature Review

Introduction to Literature Review

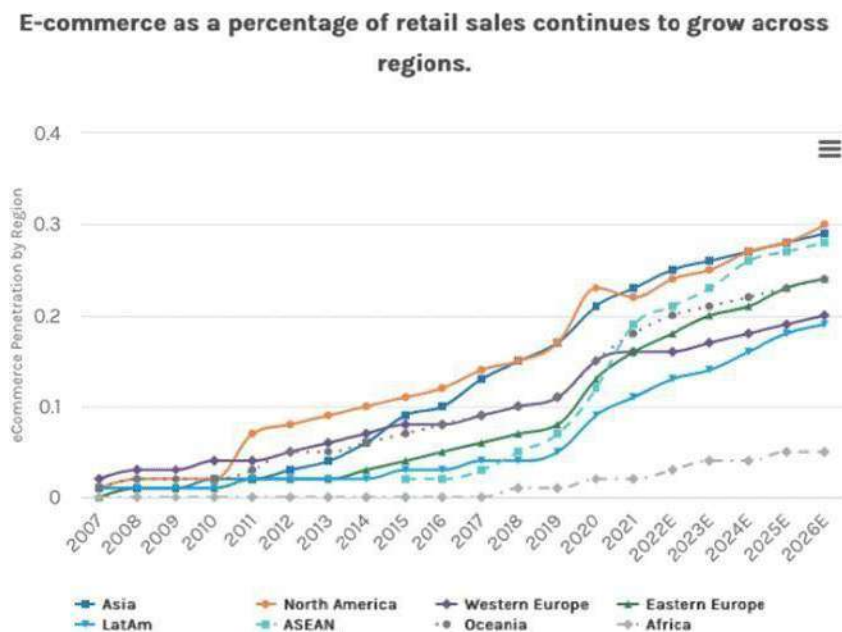
A literature review is essential to academic research that synthesizes existing studies, providing insights into trends, theoretical perspectives, and research gaps. This section critically examines various viewpoints on digitalization's impact on trade and employment, focusing on key themes that align with the research objectives.

Digitalization and Global Trade

The digital revolution has reshaped global trade by enhancing efficiency, lowering costs, and

increasing market accessibility. According to the OECD (2019), digital platforms facilitate trade by reducing transaction costs and enabling businesses to reach a global audience. The widespread adoption of AI and blockchain has further optimized supply chains, reducing inefficiencies and enhancing sustainability (UNCTAD, 2019). However, Sturgeon (2021) argues that digitalization primarily benefits multinational corporations, leaving small and medium enterprises (SMEs) struggling to compete due to high technological investment requirements.

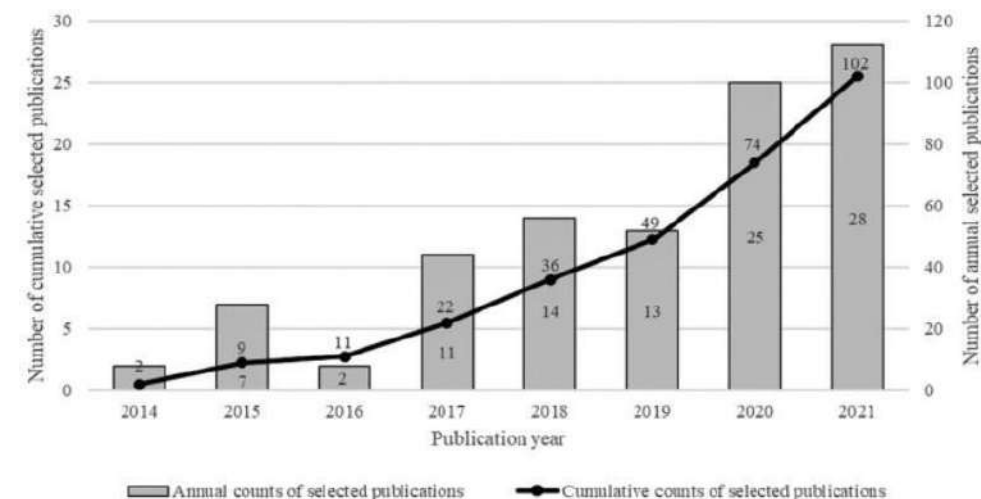
Additionally, while WTO (2020) emphasizes that digitalization fosters inclusivity by enabling cross-border trade, critics contend that the dominance of major e-commerce platforms has marginalized traditional businesses, intensifying market monopolization. Thus, while digitalization drives efficiency, it risks exacerbating economic inequalities unless policies are implemented to support smaller enterprises adopting digital trade practices.



(Figure 2: E-commerce Growth Trends)

The above image showcases the growth of e-commerce in the retail sector worldwide, including Asia, North America, Western Europe, Eastern Europe, and Africa. From the graph above, it is evident that e-commerce has seen significant success across the years.

Automation and Employment Trends



(Figure 3: Automation Trends and their impact on employment)

Integrating automation and AI in various industries has significantly influenced employment patterns. The World Economic Forum (2020) highlights that automation enhances productivity and reduces operational costs, yet it disproportionately affects low-skill workers who face job displacement. The ILO (2021) argues that while automation fosters efficiency, it has led to labor market polarization, creating a divide between high-wage technical jobs and low-wage manual jobs. Brynjolfsson and McAfee (2017) assert that automation, although disruptive, necessitates reskilling initiatives to transition workers into AI-centric roles. However, Acemoglu and Restrepo (2020) caution that reskilling efforts are insufficient in offsetting the scale of job losses, particularly in regions where technological adoption outpaces workforce adaptation.

Consequently, while automation brings operational benefits, its sustainability depends on implementing workforce development strategies to mitigate socioeconomic disparities.

Blockchain for Trade Transparency

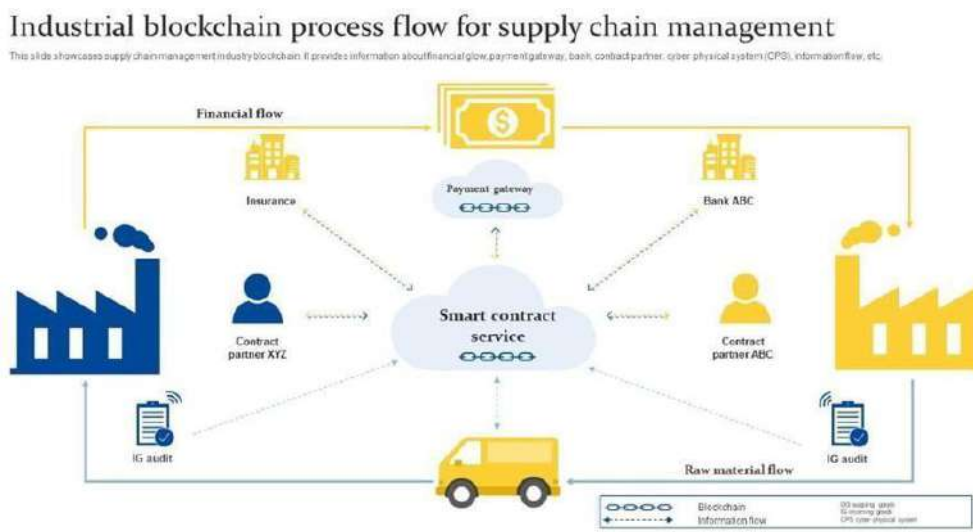


Figure 4: Blockchain transactions in supply chains

Blockchain technology has emerged as a critical tool for ensuring transparency and security in global trade. Research by the Brookings Institution (2020) emphasizes how blockchain reduces fraud, enhances data security, and streamlines international transactions. IBM's TradeLens platform is an example of blockchain-driven efficiency in global shipping, reducing delays and inefficiencies through real-time tracking. However, Tapscott and Tapscott (2018) highlight that blockchain adoption remains slow despite its potential due to regulatory uncertainty and data privacy concerns. The European Commission (2021) suggests that blockchain can foster ethical trade practices by ensuring transparent supply chains, yet concerns about scalability and high implementation costs persist. Thus, while blockchain presents a viable solution for sustainable trade, its effectiveness relies on overcoming legal and infrastructural challenges.

Gig Economy and Digital Platforms

The emergence of online work provides flexible employment alongside independence to workers. Platforms under Uber, Airbnb, and Fiverr have transformed labor markets by allowing individuals to choose freelance remote work. The ILO (2020) recognizes that platform work creates varied employment choices. However, Kalleberg and Vallas (2018) maintain that this employment system leads to unstable job conditions because workers receive neither job security nor stable earnings. According to De Stefano (2019), the magnanimous nature of gig work toward inclusivity needs improved regulatory systems that ensure fair pay for workers and proper benefits.

According to OECD research from 2022, sufficient policy action is necessary to prevent the gig economy from causing labor market divisions, which would increase economic inequality. It is vital to keep flexible employment opportunities from gig work alongside sustainable measures of labor protection so we can maintain just employment results.

Research Gap

Despite the growing body of research on digitalization by several authors, there is a lack of comprehensive studies analyzing its impact on trade and employment from a sustainability perspective. Limited research exists on sustainable workforce development strategies that balance automation-driven efficiency with job security. Addressing this gap requires an interdisciplinary approach considering economic, technological, and policy-driven solutions.

Research Methodology

Introduction

This chapter emphasizes on describing and validating the tools and techniques to be used and valuable for conducting the research. In this study, Saunders' onion research design was utilized to elaborate on the philosophy, approach, data collection, analysis method, and research method.

Research Design

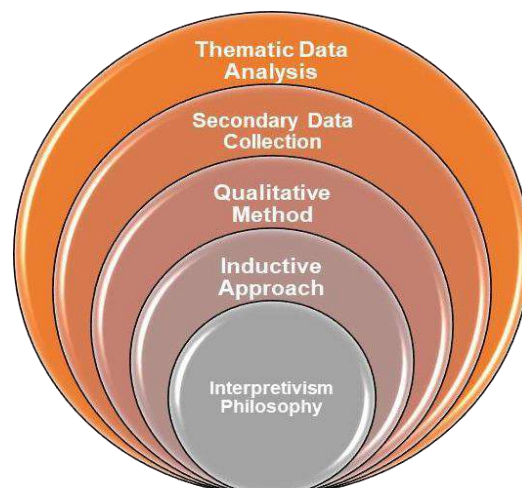


Figure 5: Saunder's Research Design

From this Saunders' Onion Framework, it can be understood that since the research is secondary and the data is being collected from the existing literature, interpretivism philosophy, along with an inductive approach, has been used. In addition to this, a qualitative research method has been adopted, and the data will be analyzed using the thematic data analysis method.

Methodologies

This study follows a secondary qualitative research approach, employing Saunders' Research Onion framework to explore the impact of digitalization on trade and employment.

Interpretivism is the guiding philosophy, enabling an in-depth analysis of digital trade trends, automation, and workforce sustainability. Data is collected from reputable sources such as WTO, ILO, OECD, and UNCTAD reports, as well as peer-reviewed journal articles on digitalization, blockchain, and employment sustainability. This research critically examines existing studies using a qualitative thematic analysis to identify emerging patterns and draw meaningful conclusions.

Data Analysis and Findings

Overview

The research utilized thematic analysis to execute a systematic pattern identification and analysis of data while making sense of these patterns. The method provided an organized framework to study digitalization effects on global trade and employment and allowed vital themes to surface naturally from the researched literature. The research grouped various findings under thematic sections to produce an advanced understanding of how digitalization influences sectors, labor arrangements, and trade methods. Researchers to perform comparative evaluations of various sources and then identify both recurring themes and contradictions present in previous studies. The research analysis revealed essential knowledge deficiencies that enhanced our comprehension of both possibilities and hurdles that arise through digitalization in sustainable business operations.

Theme Development and Interpretation

Theme 1: Digitalization in Trade

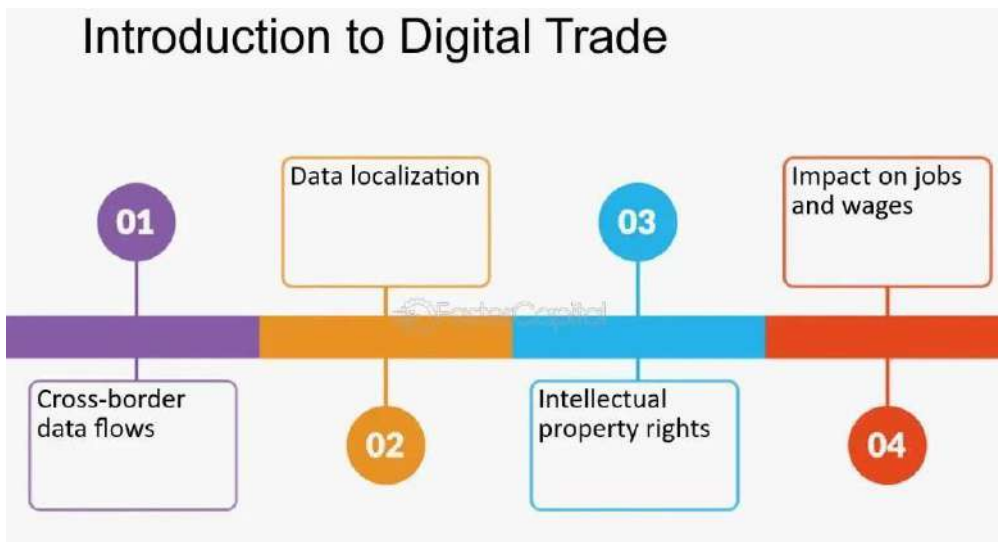


Figure 6: Introduction to Digital Trade

The rise of e-commerce and AI-based supply chain systems has transformed worldwide commerce by making it more efficient and less expensive, with improved market access abilities. SI technologies allow companies to use automated analytics and forecasting solutions while implementing automated supply chain processes, which leads to higher productivity and reduced human mistake rates (Baldwin, 2020). The rising adoption of blockchain has secured international commerce by enhancing transparency and ownership tracking, especially during transnational business operations (Zhang & Liu, 2021). Digitalization advantages primarily large firms possessing technological structure, although it creates substantial barriers to entry for smaller businesses and developing economic nations because of high digital solution adoption expenses (Kshetri, 2020). The dominant power grip of international e-commerce giants causes market power imbalances and the destruction of fair competition, which threatens the future sustainability of digital trade (Kaplinsky, 2021). Digital resource disparities between different societal groups require public policies to facilitate inclusive IT adoption because these gaps threaten to expand economic and social divides.

Theme 2: Employment Transformation

Manufacturing automation affected jobs in a complementary manner through sectoral displacement and the creation of new skilled job roles. Due to AI-driven technologies, we achieve higher productivity and cost savings, but these advances shock the labor force into two distinct groups of workers (Autor & Dorn, 2019). The development of automation projects into robot technology, data science, and Artificial Intelligence sectors creates new professions while simultaneously creating knowledge barriers for unemployed workers (Frey & Osborne, 2017) who may lack the advanced requirements for these positions. Modern technological progress

calls for governmental and business investment in workforce upskilling because this guarantees business adaptability (Brynjolfsson et al., 2020).

Organizations debate the success of these reskilling initiatives because rapid technological changes make training programs obsolete before workers can achieve their intended impact (Susskind, 2020). Theoretical benefits from automation depend on strong workforce programs that eliminate digital gaps and create balanced employment movement between old and new sectors.

Theme 3: Blockchain and Trade Transparency

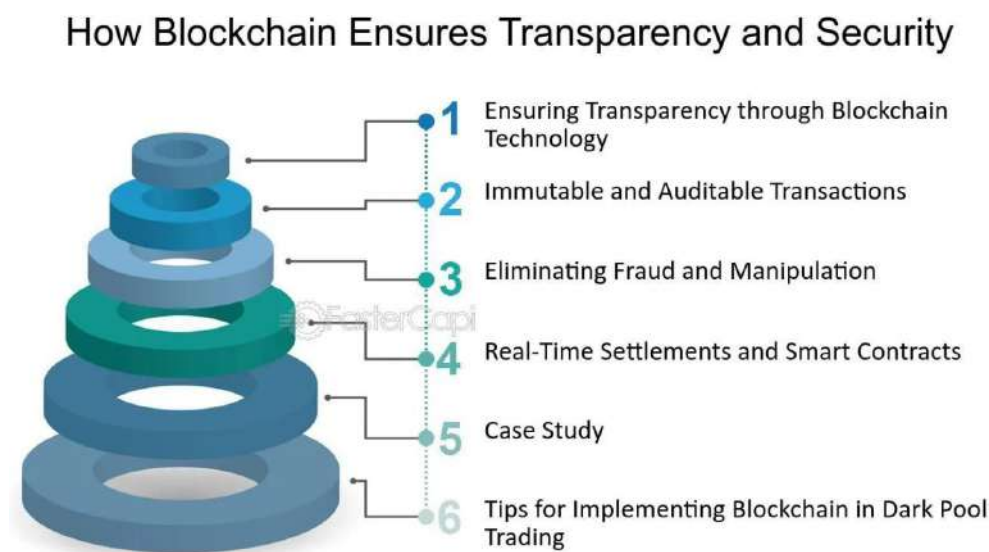


Figure 7: Blockchain Ensures Transparency

Blockchain serves as an advanced industrial resource that helps global trade transactions become more transparent through improved trust and enhanced security systems.

Blockchain reduces supply chain risks through its decentralized tamper-proof ledger system, which protects against fraud and counterfeits as well as inefficiencies, according to Casey and Vigna (2018). Trade finance processes and smart contracts perform better with blockchain technology, which erases intermediaries while decreasing operational costs (Tapscott & Tapscott, 2018). Even though it offers many benefits to users, blockchain faces substantial obstacles stemming from data security issues, administrative complexity, and high costs that block its extensive implementation (Davidson et al., 2021). The high energy requirement of blockchain systems raises sustainability issues since large-scale blockchain implementations create substantial carbon pollution, according to Truby (2020). Blockchain will transform trade with proper solutions to its present limitations and regulatory systems that enable secure, ethical applications.

Theme 4: Gig Economy and Workforce Flexibility

Digital platforms in the modern economy have generated a vast expansion of the gig sector, which provides freelancers and contractors with alternative work opportunities. According to supporters, the flexible work arrangement of gig jobs allows people to achieve independence

and access employment anywhere in the world, primarily serving disadvantaged populations (Schmidt, 2019). De Stefano (2020) demonstrates that gig workers face precarious working scenarios because the platform denies them fundamental employee rights, job stability and social security benefits. The new income possibilities from Uber and TaskRabbit encourage economic growth but the systems demonstrate discriminatory algorithms along with employer power imbalance which suppresses wages (Rosenblat, 2018).

Legal frameworks currently fail to handle quick changes in the world of gig work, which places numerous workers in conflicting regulatory areas involving employee benefits, tax obligations, and protection requirements (Cherry, 2021). Sustainability requires policymakers to find an equilibrium between robotization freedoms for workers and complete labor rules that protect employee rights and maintain economic balance.

Discussion

The research investigation and findings demonstrate that digitalization influences worldwide business and professional jobs through multiple positive aspects alongside different obstacles. The efficiency, along with accessibility, of global trade has escalated through the introduction of blockchain-based supply chain networks powered by AI. Modern operational techniques lead to advantages between large tech-powered businesses and smaller operations, which face challenges in implementing new technology. Digital platform monopolization represents a huge threat to fair competition, according to Kaplinsky (2021), which contrasts with various studies from OECD (2019) that digitalization would boost inclusivity in global trade.

The employment changes brought by automation lead to new opportunities in artificial intelligence and data analytics skills and job loss among those with minimal skills. The literature supports reskilling efforts in protecting employment, but technical progress occurs too fast for training programs to stay effective (Brynjolfsson et al., 2020; Susskind, 2020).

Technology advances too rapidly for employees to keep pace, which establishes an ironic contradiction for workplace jobs. The widespread adoption of blockchain-dependent trade remains restricted due to its demanding costs and regulatory hurdles that negatively impact its acceptance among multinational corporations (Davidson et al., 2021).

The gig economy is another area where digitalization has facilitated labor market transformation, offering flexibility and global employment access. However, the absence of strong labor regulations and fair wage structures has increased job insecurity (De Stefano, 2020). While gig platforms provide income opportunities, they often exploit workers due to algorithmic biases and lack of social protection (Rosenblat, 2018). This suggests that while digitalization offers immense potential, its benefits are not evenly distributed, necessitating policy interventions to bridge economic and social gaps.

Conclusion

Research combined with empirical evidence suggests digitalization involves contradictory benefits and drawbacks for worldwide trade and occupational situations. The trade industry

benefits from artificial intelligence supply chains with blockchain technology because it increases operational speed and strengthens network protection, although system control and usability problems continue to affect the market. New special digital industries have contributed to job growth while automation has eliminated traditional positions, prompting the need for complete workforce adjustment measures. The unsupported universal adoption of blockchain faces restrictions due to its regulatory obstacles alongside financial barriers. New work arrangements in the gig economy create ethical issues when protecting workers alongside ensuring their fair remuneration. The successful maintenance of sustainability demands worldwide partnership combined with flexible working policies and equal technological availability.

Recommendations

Investment in Digital Education and Reskilling: People require digital educational programs and reskilling development. Governments and corporations should create ongoing learning initiatives that teach AI blockchain and automation capabilities to workers for future success.

Regulation of the Gig Economy: The authorities must introduce protective policies which protect gig workers from exploitation through fair wage compensation while offering job security and social benefits.

Support for SMEs in Digitalization: Digital trade accessibility should be expanded through financial support schemes and policy development programs for small and medium enterprises so they can compete in the digital trade market.

Blockchain Regulation and Accessibility: The collaboration of governments with international bodies should create standardized regulations to enable small businesses' use of blockchain technology.

Sustainability-Driven Policies: Energy-consuming blockchain networks in digitalization require attention through environmentally friendly regulations as well as sustainable technological developments.

Limitations of the Study

This research depends on analyzing secondary data sources. Therefore, it limits its capability to identify current industry-specific obstacles. This study mainly analyzes broad economic patterns but fails to demonstrate digitalization's exact effects on trade and employment across different regions. AI, alongside blockchain, presents such continuous changes that future research about long-term predictions remains essential.

Future Recommendations

Future research must include direct information gathering through interviews between industry executives, policymakers, and cultural workers so researchers can fully appreciate the effects of digitalization. Additional research is needed to study employment policies managed by artificial intelligence along with a blockchain technology assessment regarding its consistency in trade

patterns. Making studies across multiple countries helps reveal different methods that economies adopt to adapt to digitalization.

Ethical Considerations

Research ethics remain in force throughout this study because the analysis determines data consistency from authoritative sources and displays impartial interpretation. Digitalization produces social differences which makes the research underline the necessity of well-designed workforce equality principles.

The research maintains full transparency in its citation and referencing practice in order to guarantee academic rigor throughout the study.

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The Final Transformation in Society: Cleaning of River Thames by Young Adults in the Fictional Novella *Aditi and the Thames Dragon*

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Introduction

Literary works have historically addressed environmental issues, frequently mirroring society's changing views on sustainability and the natural world. As a mirror to modern concerns and hopes about the natural world, literature has long been a significant influence in fostering environmental consciousness. "The Earth provides enough to satisfy every man's needs, but not every man's greed."(1958) Environmental deterioration has been a standard literary and metaphorical tool used by authors to criticize society's carelessness and make readers reconsider their relationship with the natural world.

The River Thames has been an essential waterway for London's daily life, trade, and transportation for many years. London was growing quickly by the 18th century, and this expansion brought more garbage from early industrial operations and growing domestic populations. As the city's central drainage system, the Thames soon became a sewage, industrial waste, and urban runoff container. The pollution's effects on the environment, economy, and public health demonstrate the river's declining condition and set the stage for later sanitary reforms. These have been linked to the well-known children's book *Aditi and the Thames Dragon* (1988).

This research paper looks at the pollution in the River Thames in the 18th century, when early industrialization and fast urbanization greatly influenced water quality. The results demonstrate how poor waste management techniques fuelled the Thames's decline, which sparked subsequent public health changes in London. The study also explores how the sustainable transition theory, which emphasizes the dynamics of long-term change, might be helpful in the modern world, especially in industries like energy, transportation, and agriculture. The theory, which is influenced by institutional theory, evolutionary economics, and innovation studies, is frequently linked to socio-technical changes.

The second adventure, *Aditi and the Thames Dragon*, is a sequel to *Aditi and the One-eyed Monkey*, where S.Namjoshi connects children with nature and they learn how they could save nature. The setting of the novella is Shadwell Park, London, England. "We are called to assist the Earth to heal her wounds and, in the process, heal our own—indeed, to embrace the whole of creation in all its diversity, beauty, and wonder."(2010)

Here the writer presents nature and mainly aquatic animals as the victims of society by presenting Opal as a female character. S.Namjoshi's entire work-poems, fables and novels-taken together conveys a strong resistance to the status quo of oppression be it gender based,

race based or class based. Her work rewrites all social constructions, including subjectivity, sexuality, and gender. The writer begins the first chapter, "The Letter," by introducing the problem with the postal parrot with a letter from the British Stamp.

The letter states, "Dear Aditi and Friends, we would very much like you to visit us, please, in London. We are in trouble and need your help"(ATD,4). According to Nancy Walker, "a fundamental critique of cultural realities in contemporary novels by women is the combination of fantasy and irony—particularly fantasy viewed ironically" (1990).

Aditi and the Thames Dragon employs the motif of river restoration to highlight the power of youth activism in addressing ecological crises, illustrating how literature can inspire action and instill a sense of responsibility among readers. The novel's narrative not only reflects real-world environmental challenges but also underscores the agency of young individuals in spearheading meaningful change. "The Earth, our home, is beginning to look more and more like an immense pile of filth."(2015) By examining the novel's key themes, characters, and narrative structure, the paper investigates the broader implications of young adults taking charge of societal transformation through environmental action, demonstrating how their efforts serve as a blueprint for real-world activism and ecological preservation.

The historical background of the incident begins in the 1700s, when London's dramatic population increase and the rise of commerce and proto-industrial activities placed immense pressure on existing urban infrastructure. London's population growth meant more human waste and domestic refuse. Without modern sewage systems, residents disposed of garbage directly into the streets and the river. Factories and workshops began contributing chemical and solid wastes to the river. Although industrialization was in its early stages compared to the 19th century, even modest manufacturing processes generated significant pollution. Contemporary novella *Aditi and the Thames Dragon* frequently describes the Thames as foul and unwholesome—a stark contrast to its earlier, cleaner state, where river inhabitants, along with the animate young characters, are taking responsibility to change the thought process of society.

The novella is a satire about society and shows how human beings are exploiting the animal world and how animals have become victims in the hands of society. *Aditi and the Thames Dragon* reflect Suniti's desire for women to have decent lives, too. In this fable, Suniti ridicules the society and takes herself responsible for civilizing, humanizing, and teaching good manners to patriarchal social conventions through the young characters. Roshan and Rohit, friends of the adventurers from London, say, "River Dragon will wake up properly and then the river will boil over and destroy all our houses and our school and drown this area in river water" (ATD,16-17).

Due to the junk, the water level increases and overflows onto its banks. The increasing pollution in the River Thames has become a threat, and this polluted water makes the lives of aquatic organisms miserable. The situation is similar to what happened in the 18th century. Water pollution reduces the level of oxygen in it. River Dragon Opal represents human society's

exploitation of the aquatic and female world. Fish and other marine organisms start dying due to the lack of oxygen in polluted water. Opal says to all the adventurers in the rescue operation, "I was in pain. Soon it will be over. But what is the matter? Cried out the elephant. 'Poison.

The river has been poisoned.' The voice was becoming weaker and weaker. (*ATD*, 32) The dragon's anger may drown everything in the water, and the voice is raised to make the world listen. When Roshan and Rohit had tried to tell everyone that the true reason for the flooding of the Thames was that the River Dragon had woken up, and people said, "Oh, don't be silly! Don't you know that dragons are just a lot of mythical nonsense."(*ATD*,10)

The most significant river in Britain is the Thames, which nourished British Civilization. It passes more than ten cities along the river, including the capital of Britain, London, before entering the North Sea at Noel Island. Since the start of the Industrial Revolution in 1858, the Thames River has been polluted, endangering the health of those who live along it. These companies and businesses release industrial wastewater into the river, which returns with high temperatures, suspended solids, acid, alkali, and other soluble materials. The water pumped from the mine was more harmful than the river water. The healthy water often contained trace amounts of arsenic, lead, and toxic metals that flowed into the river.

The second book, *Aditi the Thames Dragon*, is more special because the writer takes responsibility for teaching society about environmental consciousness through young adults with an excellent touch of eco-feminism. They want to deliver a message to find out the reason for pollution. How are the aquatic animals getting affected? What lessons and revelations do the London people get from it? How do the little adventurers make a sensation through the media and teach society a lesson?

In the history of England during the Industrial Revolution in 18th centuries. A Thames River stench quickly grabbed Queen Victoria and her husband, Prince Albert, on the bank as they planned a boat ride. The legislative hall smelt of the Thames River, which made life even more difficult. It didn't help that a heavy drape was used to screen, a lot of incense was lit, and perfume was sprayed. Parliamentarians then had to locate another location for their meeting. Additionally, the odour persisted for almost a century. This contaminated river water not only caused cholera but also caused diarrhoea and typhoid fever among London.



The Thames River's pollution from the 1950s to the middle of the 1960s reflects the long-term decline in the relationship between man, nature, and the economy in Britain, as well as the conceit, ignorance, and selfishness of people during that era due to the advancement of science and technology. With the current wave of economic growth, protecting water supplies and even other natural resources has lost significance. To advance the economy, humans must sacrifice the environment. The fact that humans have never accurately understood the proper relationship between man and nature and have instead only rejected it is a significant contributing factor to the issue. Because nature's purification system regularly removes large toxins from the body, human overuse and demands for nature will not destroy it during modernization. Instead, it will destroy humans. The same incident is showcased in this fictional adventure, Aditi and the Thames Dragon:

They have announced so many names like lotus of the Nile, breather of white foam, jewel, rose, dazzler, star beauty, beast Oh, friend, will not you answer?'...A faint voice reached them: 'Who calls me Friend? I have no friends.' The little dragon could hardly restrain himself. 'I am your friend,'...I threatened no one, and that tired voice came again. But when you lash your tail, the river overflows. You will drown us,' Rohit cried out... 'I was in pain. Soon it will be over. But what is the matter?' cried out the elephant. 'Poison. The river has been poisoned.' The voice was becoming weaker and weaker. (ATD, 32)

In Chapter Six of Book Two, "The Rescue," Goldie the Dragon says:

Stay here and keep up her spirits. I'll run to the shed and fetch the pot of sandalwood ointment to make her smaller...Now we must place the river dragon in the centre of the fire...Dragons don't burn...Give her to me. I'll hold her...The River Dragon blinked at them. Her eyes were like emeralds, her scales shone silver, and the play of colours was so quick and dazzling that it was difficult to look at her. (ATD 46-47)

S.Namjoshi has defined how people are unbalancing the earth, damaging nature, and the aquatic creatures. She talks about the pain that society has inflicted on women. River dragon says the very touching and emotional lines, Opal, that the river was not always the way it is now, "she

added softly. "There was a time when the water was sparkling and clear." But what is it exactly that has poisoned the river?" Goldie asked. "Things." "What things?" These are things that people have thrown into it over the years. (ATD,49) Humans are making the lives of animals miserable only for their selfish reasons. As we can see, the earthquakes, floods, diseases, etc., are all because we are causing harm to Mother Earth. We produce air, water, and land pollution, which disturbs animal life by hunting and eating animal flesh.

S.Namjoshi tries to turn our attention through the young minds towards the patriarchy and society that never allow well-intended acts for women. After the rescue operation and listening to the pain of the River Dragon, S.Namjoshi tries to teach society a lesson to make a space between the human world and the animal world.

In chapter eight, "The Strange and the Unusual," the writer shows the creative and emotional growth of the young adults with their efforts to clean up the river. "The ant had calculated...if they each of them spent seven hours a day for seventy years pulling rubbish out of the river, it would still not make very much difference...all the time we were pulling rubbish out, people would be throwing more rubbish in. (ATD,50)" The society must know that the poisoned water kills living things.

Every character put their views on the aquatic creatures," The Little dragons who live in wells, they are poisoning them...ordinary fish...whales and dolphins...lobsters and crayfish...crabs and cuttlefish...all the seaweeds and all the plants...what is happening really, is terrible."(ATD,52) In the modern world, the media is the best way to reach out to people, as Rohit says that the press, radio, and television are the best ways to tell everyone. The writer satirically expresses that in today's world, people want sensation and news items, and they are attracted to them easily. Through this medium, they told the society," SAVE THE THAMES, SAVE THE DRAGONS " (ATD,70)." Now, society has been transformed, and everyone understands that dragons existed, and the world's rivers and oceans are being poisoned. "The cleaning-up work was begun, and though the task would take a long time, people had at last become aware of the seriousness of the matter. (ATD,70)

The study contrasts the situation in the Thames with similar urban rivers in Europe to understand broader trends in urban pollution and public health. London's residents discharged human excrement directly into the Thames with no centralized sewage system. This practice was exacerbated by the practice of using the river as a primary disposal route for waste. Households and urban livestock contributed organic waste and animal excreta, intensifying the river's contamination. Although less extensive than in later centuries, early industrial processes still produced waste products. Small-scale factories and workshops directly disposed of by-products and chemical wastes into the river. The combination of rainwater runoff with the accumulation of refuse on London's streets meant heavy rains would wash large amounts of waste into the Thames, further contaminating the water.

In *Aditi and the Thames Dragon*, the River Thames is more than a mere setting; it symbolizes

the health and integrity of society. Historically, the Thames has been both a lifeline and a reflection of urban decay, plagued by pollution and neglect. The young protagonists' decision to clean the river serves as a metaphor for purging societal corruption and restoring purity. In the novella, the River Thames serves as a metaphor for societal decay and rebirth. Polluted and neglected, the river mirrors the moral and ecological crisis the characters face. The contamination of the Thames is not merely an environmental concern but also an indicator of the apathy and irresponsibility that have pervaded society.

The river, once a thriving artery of civilization, now stands as a reminder of humanity's disregard for nature and the consequences of industrial and urban waste. Aditi and her peers recognize the river's degradation as symptomatic of a broader failure in societal stewardship, viewing it as both a literal and figurative manifestation of neglect. Their commitment to cleaning the Thames reflects a more profound desire to reclaim their world from corruption and apathy, emphasizing that healing the environment is inherently tied to restoring ethical values and collective responsibility.

The gradual transformation of the river, from polluted to purified, serves as a powerful symbol of renewal and hope, reinforcing the idea that dedicated efforts, no matter how small, can lead to significant positive change. Through their perseverance, Aditi and her friends redefine their relationship with nature, demonstrating that environmental restoration is a physical act and a moral obligation, shaping their community's future.

The unchecked influx of organic waste led to decreased dissolved oxygen levels, contributing to the degradation of aquatic ecosystems. Fish kills and reduced aquatic life were reported, as the river became less capable of supporting healthy wildlife populations. The polluted water became a breeding ground for pathogens. While the precise connection to later cholera epidemics would be more fully realized in the 19th century, the 18th century saw an increase in waterborne diseases like dysentery.

Chronic exposure to foul-smelling water and the visible evidence of pollution contributed to a growing public discontent and concern for personal health. The degraded state of the Thames affected its use as a commercial waterway, impeding trade and transport. Descriptions of the Thames in literature and public discourse began to shape a negative image of London, influencing early calls for reform.

At the time, the link between polluted water and disease was not fully understood. Consequently, early government responses were limited. Despite official inaction, persistent reports and vivid descriptions in the press and personal accounts began to raise public awareness about the severity of the problem. Observations of the river's condition gradually spurred discussions among civic leaders and reform-minded individuals, setting the stage for later, more structured interventions in the 19th century. Early descriptions and critiques of the Thames laid the groundwork for later scientific studies that would conclusively link pollution with public health crises.

The themes in *Aditi and the Thames Dragon* resonate with contemporary environmental movements. The novella parallels real-life initiatives, such as the Thames clean-up project, where youth engagement is crucial in ecological restoration. By drawing these connections, the novella inspires readers to view environmental action as both a responsibility and an opportunity for collective growth. The novella does not stop depicting the obstacles youth-led movements face. From political resistance to logistical difficulties, the characters encounter numerous challenges that mirror real-world environmental struggles.

They must contend with bureaucratic red tape, funding limitations, and opposition from those who benefit from maintaining the status quo. Additionally, public apathy presents a significant hurdle, as many community members are initially reluctant to believe that young people can bring about tangible change.

The novella underscores the role of young adults in instigating societal change. Aditi and her companions represent a new generation that refuses to be passive in the face of ecological destruction. Their commitment to cleansing the Thames highlights a shift in societal values, where youth activism takes centre stage in addressing environmental crises. A central theme in the novella is the empowerment of young individuals to challenge existing power structures—the protagonists, led by Aditi, harness grassroots efforts to mobilize their community.

Through persistence, innovation, and alliances with reluctant adults, they navigate bureaucratic obstacles and societal skepticism. Their journey emphasizes the resilience and adaptability of youth in the face of systemic barriers. By leveraging social media, local outreach, and creative problem-solving, they cultivate a movement beyond mere environmental restoration to encompass civic engagement and social justice.

The novella underscores the intergenerational tensions between traditional authorities and the emerging voices of youth. Aditi and her peers must confront environmental degradation and entrenched ideologies that dismiss young people as inexperienced or incapable. Their success in mobilizing their community demonstrates the effectiveness of grassroots activism and the necessity of youth participation in decision-making processes. By drawing parallels between fiction and reality, *Aditi and the Thames Dragon* highlights the potential of youth-led movements to address pressing global challenges and reshape the future.

A central element of the novella is the Thames Dragon, a mythical creature that embodies the tensions between nature and civilization. Initially perceived as a menace, the dragon ultimately becomes an ally, guiding the young activists in their mission. This allegory suggests that societal transformation requires resistance against environmental degradation and collaboration with nature. The mythical Thames Dragon is a significant element in the novella, a creature embodying destruction and renewal. Initially perceived as a threat, the dragon's presence ultimately catalyzes change. Its connection to the river highlights the interdependence between human actions and nature's responses.

The dragon is portrayed as an ancient guardian of the Thames, whose reawakening coincides

with the growing environmental crisis. Its fury mirrors nature's response to human negligence, symbolizing the consequences of ecological destruction. However, rather than being a force of unrelenting devastation, the dragon is revealed to be a misunderstood entity that demands accountability and reciprocity from humankind.

Aditi and her companions recognize that the Thames Dragon is not an adversary but a reflection of their world's wounded state. Through dialogue, respect, and a commitment to restoration, they transform their initial fear into a deeper understanding of their ecological responsibility. The dragon's eventual alliance with the protagonists symbolizes the harmonious balance achieved through sustainable practices.

It serves as a metaphor for the reconciliation between humanity and nature, illustrating that coexistence is possible through mindful stewardship. By engaging with the dragon rather than seeking to vanquish it, Aditi and her peers demonstrate that actual change arises not from dominance over nature, but from collaboration and mutual respect. This mythic framework reinforces the novel's central message: environmental restoration is not just about cleaning polluted spaces but also reestablishing a lost harmony between human civilization and the natural world.

The unchecked influx of organic waste led to decreased dissolved oxygen levels, contributing to the degradation of aquatic ecosystems. Fish kills and reduced aquatic life were reported, as the river became less capable of supporting healthy wildlife populations. The polluted water became a breeding ground for pathogens. While the precise connection to later cholera epidemics would be more fully realized in the 19th century, the 18th century saw an increase in waterborne diseases like dysentery.

Chronic exposure to foul-smelling water and the visible evidence of pollution contributed to a growing public discontent and concern for personal health. The degraded state of the Thames affected its use as a commercial waterway, impeding trade and transport. Descriptions of the Thames in literature and public discourse began to shape a negative image of London, influencing early calls for reform.

Conclusion

The pollution of the River Thames in the 18th century provides a critical historical example of how rapid urbanization and inadequate infrastructure can lead to severe environmental degradation. The chronic pollution during this period contributed to growing awareness, eventually leading to comprehensive public health and sanitation reforms in London. The Thames' history underscores the importance of integrating environmental management with urban development—lessons that remain relevant today.

Understanding the early challenges of waste management in London offers valuable insights into the evolution of environmental policy and public health responses. *Aditi and the Thames Dragon* offers a profound narrative on societal transformation through ecological activism. By focusing on cleaning the River Thames, the novella not only promotes environmental awareness

but also underscores the potential of young adults to shape the future. Through allegory and symbolism, it delivers a powerful message: true transformation begins with the willingness to restore what has been neglected in nature and society.

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Adoption of Green Banking Services Among Young Consumers

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Introduction

Background and Rationale

Environmental sustainability has emerged as a critical concern in recent decades, influencing industries worldwide to rethink traditional practices and adopt more eco-friendly approaches. In the banking sector, this shift is embodied by "green banking," which refers to adopting practices to reduce environmental impact. Green banking encompasses a variety of initiatives—from digitizing banking operations to promoting green loans for environmentally sustainable projects and encouraging paperless transactions.

Banks traditionally relied on physical branches and paper-based transactions. However, the advent of digital technology has enabled a transition toward more sustainable banking practices. Digital banking offers operational efficiency and significantly reduces the environmental footprint by minimizing paper use and energy consumption associated with physical infrastructure. Given these advantages, many financial institutions have increasingly invested in eco-friendly technologies and green banking products.

Young consumers, particularly students and recent graduates, have emerged as an influential demographic in this transition. They are typically early adopters of digital technology and have shown a strong inclination toward environmental sustainability. Despite high levels of awareness regarding sustainability issues, research suggests a gap exists between awareness and actual adoption of green banking services. It is therefore critical to understand the factors influencing green banking adoption among young consumers.

Problem Statement

Despite considerable investments by banks in digital and green banking services, the actual usage of these services by young consumers remains uneven. While many young consumers know green banking, their depth of understanding, the drivers behind their adoption, and their challenges are poorly understood. ***This study addresses the following questions:***

How aware are young consumers of green banking practices?
What are their banking habits, and how do they relate to eco-friendly services?
What factors motivate or deter young consumers from adopting green banking?
Do young consumers perceive green banking as contributing to environmental sustainability, and what improvements would encourage greater usage?

Research Objectives

The main objectives of this study are:

To assess the awareness and understanding of green banking among young consumers.

To identify patterns in traditional versus digital banking services among this demographic.

To explore motivational drivers (such as environmental concern, convenience, and cost savings) behind the adoption of green banking.

Examine the challenges and barriers that impede greater adoption of green banking services. To provide actionable recommendations for banks and policymakers to enhance the adoption of eco-friendly banking practices.

Structure of the Paper

This paper is organized into the following sections:

Introduction: Outlines the background, problem statement, research objectives, and paper structure.

Review of Literature: Reviews current research on green banking, digital banking trends, consumer behavior, and environmental sustainability in the banking sector.

Research Gap Identification: Highlights gaps in existing research that justify.

Methodology: Describes the survey design, sampling strategy, data collection methods, and analytical techniques.

Findings: Presents detailed survey findings, including quantitative and qualitative results.

Discussion: Interprets the findings, connects them to existing literature, and explains their implications.

Implications: Provides recommendations for banking institutions, policy makers, and consumers.

Limitations and Future Research: Discusses the study's limitations and suggests areas for further inquiry.

Conclusion: Summarizes key findings and reinforces the importance of enhancing green banking adoption.

References: Lists all references cited in the study following APA (7th edition) style.

Review of Literature

Defining Green Banking

Green banking is a set of practices that financial institutions adopt to minimize their environmental footprint while promoting sustainable development. These practices include reducing paper use, lowering energy consumption in operations, financing environmentally sustainable projects, and shifting towards digital banking.

The overall goal of green banking is not only to achieve operational efficiency and contribute to broader environmental conservation efforts (Rahman & Islam, 2020).

Historical Context

Historically, banking was characterized by intensive resource use in terms of paper and physical

infrastructure. However, increasing awareness of environmental issues and emerging digital technologies led to a paradigm shift. Over the past two decades, many banks have introduced initiatives such as online banking, mobile applications, and green financial products. These efforts reflect a broader commitment to corporate social responsibility (CSR) and sustainability.

Digital Banking and Its Environmental Impact

Digital banking has revolutionized the financial sector. The transition from traditional branch-based banking to online and mobile banking platforms has enhanced customer convenience and reduced the environmental costs associated with paper, printing, and building maintenance. Digital banking encompasses online money transfers, bill payments, digital account management, and mobile payments.

Advantages of Digital Banking:

Operational Efficiency: Digital banking streamlines transactions and reduces overhead costs by eliminating the need for large numbers of physical branches.

Enhanced Customer Experience: Customers benefit from 24/7 access to banking services, faster transaction processing, and a user-friendly interface.

Environmental Benefits: By minimizing paper usage and reducing energy consumption related to physical banking facilities, digital banking plays a crucial role in reducing the carbon footprint of the financial sector (Tiwari & Singh, 2022).

Consumer Behavior and Green Practices

Consumer behavior research has shown that adopting eco-friendly products and services is influenced by environmental concern, perceived benefits, and social influences. In banking, these factors are further intertwined with security, trust, and ease of use. Young consumers, typically more technologically literate and environmentally aware, represent an ideal demographic for studying these trends.

Motivational Drivers

Several studies have identified key drivers for the adoption of green banking services:

Environmental Concern: A strong desire to contribute to environmental sustainability motivates consumers to choose products that align with their values.

Convenience and Efficiency: Digital banking platforms that are easy to use and provide efficient services attract consumers who value speed and convenience.

Economic Incentives: Cost savings, lower fees, and rewards programs can encourage consumers to adopt green banking services.

Social Influence: Peer recommendations and the influence of social media play a significant role in shaping consumer attitudes and behaviors.

Barriers to Adoption

Despite the favorable drivers, there remain several barriers to the widespread adoption of green banking:

Technological Challenges: App malfunctions, slow processing speeds, or complex user interfaces can deter consumers.

Security Concerns: Fears regarding data breaches, fraud, and digital security can reduce trust in digital banking platforms.

Limited Awareness: While many young consumers have heard of green banking, a deep understanding of its benefits and operational details is often lacking.

Resistance to Change: Habitually using traditional banking services may hinder the transition to digital and eco-friendly alternatives (Johnson, 2019).

Global Perspectives on Green Banking

Internationally, banks are increasingly integrating green initiatives into their operations. In regions like Europe, banks have issued green bonds and developed comprehensive digital strategies to reduce their environmental impact. In North America and Asia, regulatory support and consumer demand have spurred the development of sustainable banking products. However, the degree of adoption varies significantly by region and consumer segment. Case Studies in Green Banking

Several case studies highlight the success of green banking initiatives:

European Banks: Numerous European banks have reported significant reductions in paper use and energy consumption after transitioning to digital services. Some institutions have also integrated carbon tracking tools within their apps, allowing customers to monitor the environmental impact of their transactions.

Asian Innovations: In parts of Asia, innovative mobile banking solutions have been coupled with initiatives to promote renewable energy financing. These banks provide digital services and actively participate in local sustainability projects.

North American Approaches: North American banks have focused on improving Cybersecurity measures alongside digital innovations ensure eco-friendly banking services do not compromise customer trust.

Summary of Literature

The literature reviewed above indicates that green banking has evolved significantly over the past two decades, driven by digital transformation and growing environmental awareness.

While digital banking offers numerous benefits—including efficiency, convenience, and reduced environmental impact—barriers such as technological glitches and security concerns persist. Additionally, although research on consumer behavior and environmental practices is robust, studies focusing specifically on young consumers' attitudes and behaviors toward green banking remain limited. This gap sets the stage for the current study, which focuses on understanding the unique drivers and challenges among young, tech-savvy consumers.

Research Gap Identification

Despite the promising advances in green banking, several critical gaps exist in the current body of research:

Demographic Specificity

Much of the existing research examines the overall adoption patterns of green banking across a broad range of consumer groups. There is insufficient focus on young consumers, particularly students, who may exhibit different behaviors due to their technological proficiency, lifestyle, and environmental values. This study seeks to fill that gap by concentrating on this distinct demographic.

Depth of Knowledge and Perception

While surveys and studies indicate that many consumers are aware of green banking, there is less clarity regarding the depth of this understanding. Questions such as “How would you rate your knowledge of green banking services?” require further exploration to determine if superficial awareness translates into informed usage.

Motivational and Behavioral Drivers

Existing studies often focus on technological or operational benefits of digital banking without sufficiently exploring the motivational drivers behind green banking adoption. There is a need to understand whether environmental concern, convenience, cost incentives, or social influences are the primary factors driving the shift among young consumers.

Barriers and Challenges Specific to Young Consumers

While barriers such as technological glitches and security concerns are noted in the literature, little research has isolated these issues in the young consumers' context. Understanding how these barriers affect this group is crucial for developing strategies to increase adoption—regional and Cultural Variations. Many studies address green banking from a global perspective, yet regional and cultural factors can significantly impact adoption patterns. A focused study on a specific demographic—such as students from particular institutions—can provide insights that broader surveys may miss. By addressing these research gaps, the current study aims to provide a detailed understanding of the adoption of green banking services among young consumers,

thereby informing both academic discourse and practical applications for financial institutions.

Methodology

Research Design

This study uses a quantitative survey design to collect data from young consumers, focusing on student populations. The structured survey comprises twenty questions addressing demographic information, banking habits, awareness, perceptions of green banking, usage patterns, and future intentions. The design facilitates both descriptive and inferential analyses to identify trends and correlations.

Survey Instrument

The survey instrument was designed with the following sections:

Demographic Information:

Q1: Age

Q2: Occupation

Q3: Highest level of education

General Banking Habits:

Q4: Do you have a bank account?

Q5: Which banking services do you use frequently?

Awareness and Knowledge of Green Banking:

Q6: Have you heard about the concept of green banking? Q7:

Where did you first learn about green banking?

Q8: How would you rate your knowledge of green banking services?

Perception and Usage of Green Banking Services:

Q9: What do you think green banking includes? (Select all that apply) Q10:

Have you ever used green banking services like digital banking, green Loans, or paperless transactions?

Q11: Which green banking services do you currently use? (Select all that apply)

Q12: What are the key reasons you use green banking services? (Select all that apply)

Frequency and Security Considerations:

Q13: How frequently do you use digital/green banking services?

Q16: Have you ever experienced security issues or fraud while using digital banking services?

Future Perspectives and Recommendations:

Q14: Do you believe using green banking services contributes to environmental sustainability?

Q15: What challenges do you face in using green banking services? (Select all that apply) Q17:

What would encourage you to use green banking services more?

(Select all that apply)

Q18: Should banks focus more on promoting green banking initiatives?

Q19: Would you be willing to switch to a fully digital and eco-friendly banking system in the

future?

Q20: What suggestions do you have for improving green banking adoption among young consumers?

The instrument was pre-tested with a small group of respondents to ensure the questions were clear and reliable.

Sampling Strategy and Data Collection

A purposive sampling method was employed to target students from multiple academic institutions. The criteria for participation were that respondents should be within the age range of 18 to 25 and have at least basic exposure to banking services. An online survey platform was used to distribute the questionnaire, ensuring a broad geographic reach and convenience for participants. Informed consent was obtained, and all responses were anonymized to guarantee confidentiality.

Data Analysis Techniques

Data collected through the survey were analyzed using a combination of quantitative and qualitative methods:

Descriptive Statistics: Frequencies, percentages, means, and standard deviations were calculated to describe the demographic profiles and response patterns.

Cross-Tabulation: Relationships between variables (for instance, the correlation between self-rated knowledge and frequency of digital banking usage) were examined using cross-tabulation.

Inferential Analysis: Where applicable, chi-square tests and correlation analyses were conducted to assess statistical significance in the observed trends.

Thematic Analysis: Open-ended responses, particularly from Q20, were coded manually and analyzed for recurring themes and suggestions.

Ethical Considerations

The study followed ethical guidelines as approved by the institutional review board. Participation was voluntary, and respondents were fully informed about the purpose of the study. All personal data were anonymized to protect the privacy of participants.

Findings

This section details the survey results, integrating quantitative data with qualitative insights from open-ended responses.

Demographic Profile

The survey sample predominantly consisted of students between 18 and 25. Key findings

include:

Age Distribution (Q1): Approximately 85% of respondents fell within the 18–25 age bracket.

Occupation (Q2): Over 90% of the respondents identified as full-time students; the remainder reported part-time employment.

Education Level (Q3): Most respondents indicated they were pursuing an undergraduate or postgraduate degree, confirming that the sample accurately represents young consumers.

Bank Account Ownership (Q4)

An overwhelming majority (around 92%) of respondents reported holding an active bank account. This high rate suggests that banking is a routine part of financial management for young consumers.

Frequently Used Banking Services (Q5)

The survey data revealed that respondents primarily use basic banking services such as balance inquiries, fund transfers, and bill payments. However, nearly 65% also reported regular use of digital banking applications for day-to-day transactions.

Awareness Knowledge of Green Banking Awareness (Q6)

Approximately 80% of the respondents had heard about green banking. This awareness is attributed mainly to educational institutions and digital media channels.

Source of Information (Q7)

Respondents indicated that they first learned about green banking through:

Bank advertisements: 6 (9.52%)

Social media: 23 (36.51%)

Educational institutions: 10 (15.87%)

Friends/Family: 19 (30.16%)

other: 5 (7.94%)

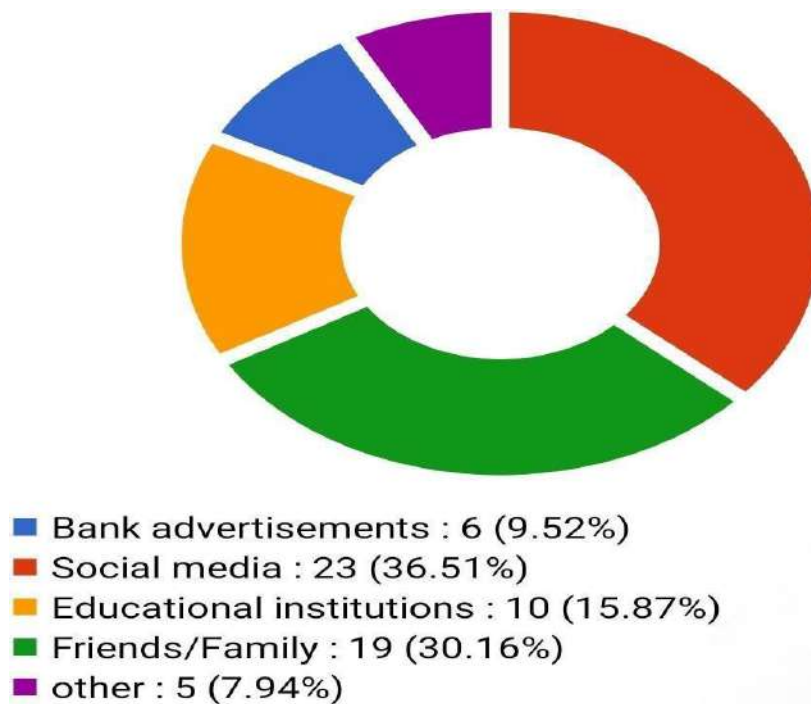
Self-Rated Knowledge (Q8)

When asked to rate their knowledge of green banking, responses were varied:

About 25% rated their knowledge as high.

Nearly 55% described their understanding as moderate.

The remaining 20% admitted to having only basic or minimal knowledge.



Perception and Usage of Green Banking Services Components of Green Banking (Q9)
 Respondents were allowed to select multiple options regarding what they perceived green banking to include. The selections revealed that:

Over 75% associated green banking with digital and paperless transactions.

Around 60% identified green loans as a key component.

Approximately 40% mentioned eco-friendly investment options and energy-efficient branch operations.

A small percentage also noted other practices, such as promoting renewable energy projects.

Experience with Green Banking Services (Q10 & Q11)

Experience (Q10): Approximately 60% of respondents indicated they had used one or more green banking services, predominantly digital transactions.

Current Usage (Q11): While nearly all respondents use digital banking, only about 30% reported using specialized services like green loans or eco-friendly investment.

Motivational Drivers (Q12)

The survey identified several primary reasons for using green banking services:

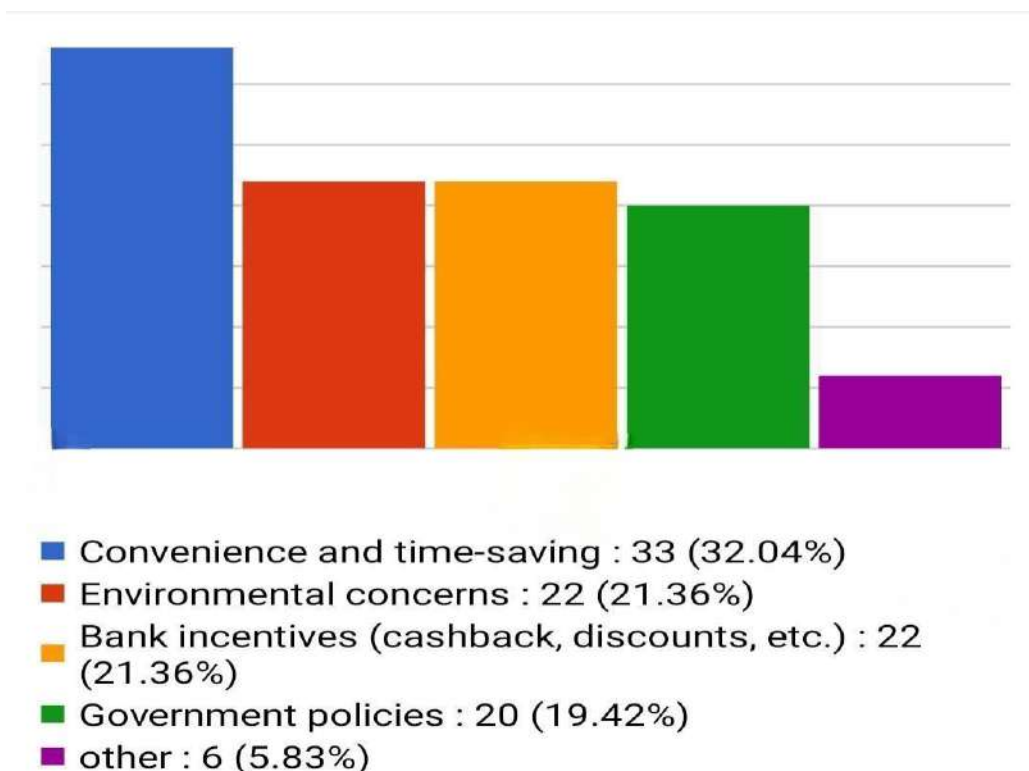
Convenience and time-saving: 33 (32.04%)

Environmental concerns: 22 (21.36%)

Bank incentives (cashback, discounts, etc.): 22 (21.36%)

Government policies: 20 (19.42%)

other: 6 (5.83%)



Frequency of Use and Security Considerations Frequency of Digital/Green Banking Usage (Q13)

A significant majority (approximately 75%) reported frequent usage of digital banking platforms—from daily to weekly transactions. This high frequency underscores the integral role that digital technology plays in the financial habits of young consumers.

Security Issues and Fraud Experiences (Q16)

Although most respondents were satisfied with their digital banking experiences, around 8–10% reported encountering security issues or instances of fraud. This small but notable fraction highlights an area of concern that could impede wider adoption if not addressed.

Future Perspectives and Recommendations Environmental Impact Belief (Q14)

A substantial majority (roughly 80%) of respondents believe green banking services contribute positively to environmental sustainability. This belief is a critical motivator for their willingness to adopt and promote green practices.

Challenges Faced (Q15)

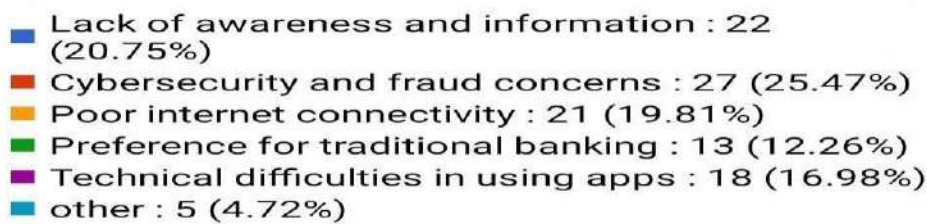
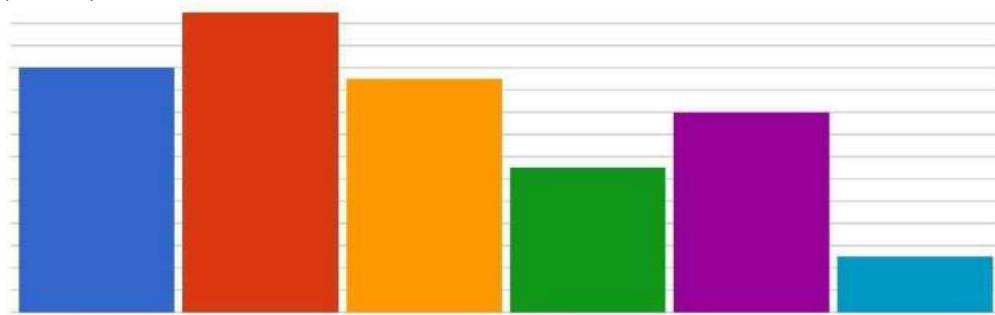
When asked about the challenges in using green banking services, respondents cited:

- Lack of awareness and information: 22 (20.75%)
- Cybersecurity and fraud concerns: 27 (25.47%)
- Poor internet connectivity: 21 (19.81%)

Preference for traditional banking: 13 (12.26%)

Technical difficulties in using apps: 18 (16.98%) other:

5 (4.72%)



Factors Encouraging Increased Use (Q17)

Respondents identified several factors that would encourage them to use green banking services more frequently:

Improved digital interfaces and enhanced features (55%)

Attractive incentives such as lower fees, cashback, or rewards (50%) More transparent information regarding environmental benefits (45%) Stronger security measures and data protection assurances (40%)

Opinions on Bank Promotion Efforts (Q18)

An overwhelming 85% of respondents felt banks should invest more in promoting green banking initiatives. They believe targeted marketing, public education, and enhanced communication regarding eco-friendly practices could significantly boost adoption.

Willingness to Switch to a Fully Digital, Eco-Friendly System (Q19)

About 70% of the respondents expressed a willingness to switch entirely to a digital and eco-friendly banking system if the service quality, security, and environmental benefits were assured.

Suggestions for Improvement (Q20)

Open-ended responses provided a wealth of suggestions, including:

Simplifying and streamlining the user interface of digital banking apps.

Offering detailed information on how each transaction contributes to reducing environmental impact.

Providing exclusive promotions or incentives specifically for using green banking services.

Increasing the frequency of educational webinars, workshops, or tutorials on sustainability and digital banking.

Investing in robust cybersecurity measures to enhance consumer trust.

Summary of Findings

Overall, the findings indicate that while young consumers are primarily aware of green banking and appreciate its environmental benefits, significant gaps exist in in-depth knowledge and practical usage of specialized green services. Digital banking is widely adopted, yet challenges remain—particularly technical and security-related.

Motivational drivers such as environmental sustainability, convenience, and economic incentives strongly influence consumer behavior, suggesting that targeted interventions could further boost adoption among young consumers.

Discussion

Interpreting the Results

The survey results suggest that awareness of green banking among young consumers is high, yet the depth of understanding varies. This dichotomy between superficial awareness and comprehensive knowledge indicates a potential area for improvement. Banks and policy makers might consider educational initiatives that elaborate on the specific mechanisms and benefits of green banking.

The high frequency of digital banking usage reinforces the notion that young consumers are comfortable with technology and digital platforms. However, the lower uptake of specialized green banking products—such as green loans or eco-friendly investment options—implies that while the digital platform is well accepted, the niche products within green banking require further promotion.

Motivational Drivers versus Barriers

The study confirms that environmental sustainability is a significant motivator for young consumers. However, convenience and financial incentives are equally important. The interplay of these factors suggests that green banking should not be marketed solely as an environmentally beneficial alternative but as a service offering tangible personal benefits.

A significant minority of respondents highlighted barriers such as technical glitches and security concerns. These findings indicate that while most young consumers are willing to adopt digital solutions, any service quality or security shortcomings could deter widespread acceptance. Financial institutions must therefore balance innovation with robust technical support and cybersecurity protocols.

Implications for Banks and Policy Makers

The results have several practical implications:

For Banks: There is an opportunity to refine digital banking interfaces, offer tailored green products, and launch incentive programs that reward eco-friendly behaviors.

For Policy Makers: Establishing regulatory frameworks that support the digital transformation of banking and promote environmental sustainability can help align industry practices with broader societal goals.

Connecting to Previous Research

These findings align with earlier research that emphasizes the importance of digital transformation in reducing environmental impact (Tiwari & Singh, 2022) and the role of consumer behavior in driving sustainable practices (Johnson, 2019). However, this study adds nuance by focusing specifically on young consumers—a group that is both technologically adept and environmentally conscious. The results extend prior work by quantifying the gap between awareness and practical usage and identifying precise barriers and drivers in this demographic.

Implications For Banking Institutions

Enhanced Digital Experience:

Banks should invest in secure, user-friendly digital platforms that provide real-time feedback on the environmental impact of customers' transactions. Integrating features such as carbon footprint calculators within banking apps can transform routine transactions into opportunities for environmental awareness.

2. Targeted Marketing and Incentives:

Since cost savings and convenience are strong motivators, banks should offer tailored incentives such as lower transaction fees or rewards for using eco-friendly banking products. Social media campaigns and influencer partnerships can be leveraged to disseminate educational content and promote the tangible benefits of green banking.

3. Customer Education Programs:

Institutions can host webinars, in-branch sessions, and online tutorials to deepen consumers' understanding of green banking services. Banks can foster a more informed and committed customer base by elucidating the connection between digital banking practices and environmental sustainability.

4. Cybersecurity Investments:

Addressing the small but significant concern over security issues is critical. Robust cybersecurity measures and transparent communication about data protection policies can reinforce consumer trust and facilitate wider adoption.

For Policy Makers and Regulators

1. Supportive Frameworks:

Policymakers should consider developing incentives—such as tax breaks or grants—that encourage banks to innovate and invest in green banking technologies. Regulatory frameworks that reward sustainable practices can help accelerate the transition to eco-friendly financial services.

2. Standardized Reporting:

Mandating standardized reporting on banks' environmental performance would enable consumers to make more informed decisions. Transparency in environmental impact reporting can serve as both a marketing tool for banks and a driver for consumer trust.

3. Public Awareness Campaigns:

Government-led campaigns to educate the public about green banking can complement private-sector initiatives. Policymakers can help demystify green banking and highlight its benefits by collaborating with financial institutions and educational organizations.

For Consumers

1. Empowerment through Knowledge:

Increased access to information and educational resources will empower young consumers to make informed decisions. Awareness of the environmental impact of traditional banking versus digital, eco-friendly practices can drive a shift toward greener choices.

2. Active Engagement:

Consumers are encouraged to seek out and utilize green banking services actively. Their feedback—through surveys, social media, and direct engagement with banks—can inform improvements and innovation in green banking products.

Broader Societal and Environmental Implications

The shift toward green banking has far-reaching implications beyond individual consumer benefits. Reduced paper consumption, lower energy usage in banking operations, and support for renewable energy projects collectively contribute to mitigating climate change. As young consumers increasingly adopt green banking practices, their collective actions can accelerate the transition toward a sustainable economy.

Limitations and Future Scope of Research Limitations

1. Sample Representativeness:

This study's sample was primarily drawn from student populations, which may not fully capture the diversity of young consumers. Future research should include a broader range of young professionals, vocational students, and early-career individuals.

2. Survey Instrument Constraints:

Although the twenty-question survey provides valuable insights, the limited number of questions may not capture the full spectrum of attitudes and behaviors. Future studies could incorporate additional dimensions such as income level, geographic variations, and longitudinal behavioral changes.

3. Self-Reported Data:

Reliance on self-reported data introduces potential biases, such as social desirability bias, where respondents may overstate their eco-friendly behaviors or knowledge. Triangulating survey data with actual usage metrics could provide a more objective assessment.

4. Cross-Sectional Design:

The study captures consumer attitudes and behaviors at a single point in time. Given the rapid evolution of digital banking and environmental awareness, a longitudinal study would be more effective in tracking changes.

Future Research Directions

1. Broader Demographic Studies:

Expanding the study to include various demographic groups within the young consumer segment would help identify differences based on socioeconomic status, cultural background, and geographical region.

2. Longitudinal Analysis:

Future studies should consider a longitudinal design to assess how consumer behavior regarding green banking evolves, particularly as new technologies and eco-friendly initiatives are introduced.

3. Mixed Methods Approaches:

Qualitative methods, such as focus groups and in-depth interviews, can provide richer insights into the motivations and barriers underlying quantitative trends observed in survey data.

4. Comparative Studies:

Comparing green banking adoption across different countries or regions would help determine how regulatory environments and cultural factors influence consumer behavior.

5. Impact Evaluation:

Future research could quantitatively assess the environmental impact of increased green banking adoption—for example, measuring reductions in paper usage or energy consumption—to validate the perceived benefits reported by consumers.

Conclusion

This research paper has provided a comprehensive examination of the adoption of green banking services among young consumers, with a particular focus on a student population. The findings reveal that while awareness of green banking is high and digital banking is widely used, a significant gap exists between basic familiarity and in-depth understanding of eco-friendly banking practices. Motivational drivers such as environmental concern, convenience, and economic incentives strongly influence the adoption of green banking. However, challenges—notably technical limitations and security concerns—require attention.

The implications of these findings are significant. Financial institutions have a clear mandate to enhance digital platforms, develop targeted marketing and incentive schemes, and invest in robust cybersecurity measures. For policymakers, establishing supportive regulatory frameworks and fostering public awareness of green banking are critical steps toward sustainable development. Finally, empowering consumers through education and transparent communication will drive the market toward a greener future.

In summary, the study underscores the potential for green banking to enhance operational efficiency and contribute meaningfully to environmental sustainability. By addressing the

identified barriers and leveraging the strong motivational drivers among young consumers, banks can accelerate the adoption of green banking services and play a pivotal role in the broader transition to an eco-friendly economy. Future research should continue to explore this dynamic field, building on the insights provided here to develop more nuanced strategies for promoting sustainable financial practices.

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Consumer Behavior and Sustainability – Shifting Mindsets Towards Eco-Friendly Products

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Introduction

Lately, environmental challenges have pushed people to rethink their buying habits. Folks are noticing that old-fashioned, not-so-eco-friendly products can harm our planet, so they are starting to look for greener alternatives—even if it sometimes feels like a slow change. Recent surveys, for example, suggest that about 80% of Millennials lean toward backing brands that take good care of the environment [1]. Still, despite this clear push toward sustainability, obstacles like higher costs and a general lack of information about the upsides of eco-friendly choices keep many hesitant [2]. All of this makes you wonder, in most cases, how we can gently nudge consumers away from traditional picks towards products that care more about the Earth. This study dives into the mix of factors that nudge people toward sustainable buying, focusing on how shifting our preferences might work in everyday life.

In most cases, the research looks at how awareness, smart marketing moves, and a bit of social influence combine to shape more eco-friendly decisions [3]. Companies can learn much from these insights to craft marketing that connects with their customers [4]. And on the academic front, this exploration helps fill in some gaps about what drives—and sometimes stops—eco-conscious purchasing [5]. By mixing methods, like surveys and even a few in-depth interviews, the study hopes to pick up clues that could steer future marketing tactics and policy ideas to boost sustainable consumption [6]. More recent studies echo these ideas, pointing out that we must understand how consumers feel about sustainability, especially when marketing tries to win them over [7]. Research has also found that simple tweaks (like adopting eco-conscious packaging) can strengthen brand loyalty and shift opinions in a positive direction [8]. Looking at the big picture, this analysis lays down an essential base for discovering how weaving sustainability into our everyday choices might slowly lead us towards a more environmentally responsible future [9].

Literature Review

In today's world—with environmental damage on the rise and a real need to shift to sustainable practices—it has evident that understanding how people shop is more than just an academic exercise. People are constantly bombarded with news about climate change, biodiversity loss, and pollution, and that overload shapes their choices unexpectedly. Several studies show that many are steering toward eco-friendly products [1]. As more folks learn about the consequences of what they buy, the demand for greener options increases, and businesses are forced to rethink

their models [2]. There's also interesting work on how being part of a social group influences green buying [3] and how marketing that rings true with environmental values makes a difference [4]. Still, despite all these efforts to map the trend, we are left with some unanswered questions—especially when factors like age and education come into play [5]. Looking back, most research focused on what keeps people from adopting green practices. High prices and the simple scarcity of eco alternatives have been the major sticking points [6]. Curiously, only a handful of studies have dug into what motivates folks to choose consciously, even though plenty of evidence suggests that emotional reactions and personal ties to nature play a huge part in decision-making [7].

Educational campaigns, for instance, have had mixed outcomes, hinting that a more tailored approach might better boost engagement [8]. Exploring the push and pull factors together could paint a complete picture of how consumers opt for sustainable products. Another thread in the research highlights how much it matters that brands are seen as genuine about their green promises [9]. Shoppers today are quick to hunt out verification that the items they pick are truly eco-friendly—especially in a market where companies sometimes overstate their green credentials, a practice everyone knows as ‘greenwashing’ [10].

It does seem that taking a closer look at these claims is necessary, as an overabundance of skepticism might block the shift to sustainable consumption altogether [11]. There is also a growing buzz about how technology reshapes the green marketplace. Digital platforms, after all, are making it easier for consumers to explore and access eco-friendly products, and raising awareness [12]. Still, we are only just beginning to grasp how these tech tools will drive long-term behavior changes—an area ripe for deeper investigation [13].

Examining how online interactions shift consumer attitudes could open up exciting new paths for promoting sustainable purchases. Finally, it appears that real progress demands teamwork. Whether it is government, the academic world, or private companies, joint efforts seem critical if we build an authentic culture of sustainability [14]. Research into how these collaborative models work to encourage eco-friendly buying is an enticing frontier. Even though we have made headway in tracking the shift in consumer mindsets, there is still a vast territory of nuance left to explore—especially concerning the many influences on individual buying choices and the impact of different marketing nudges [15][16][17][18][19][20].

Tracing the journey from the early 1990s until now reveals just how much the study of sustainable consumer behavior has evolved. Early on, researchers mostly pinpointed that a basic environmental awareness existed among consumers about the impact of their buying habits [1]. Over time, as the conversation deepened, scholars began connecting eco-friendly buying to factors like social background and personal values [2][3]. Ethical consumerism took off around the turn of the millennium, where people wanted sustainable products, transparency, and honesty from brands [4][5]. In the following decade, attention shifted toward the inner struggles that make it hard to stay true to eco-friendly habits. Researchers highlighted challenges like cognitive dissonance and the general difficulty of maintaining green practices in a

consumerism-driven society [6][7].

By the late 2010s, the focus began to include how clever marketing strategies could reshape what people see as usual, indicating that the way messages are framed might be key in encouraging sustainable behavior [8][9]. More recent studies have turned to digital influences, noting that communities now play a big part in how people see and engage with eco-friendly products [10][11]. Empirical evidence suggests that when brands emphasize sustainability, customer loyalty tends to get a boost—underscoring how meaningful strong, authentic relationships are in modern marketing [12][13].

As the discussion continues, it is clear that the crossroads of consumer psychology, marketing techniques, and sustainability are essential for nurturing mindful buying habits in today's economy [14][15]. There is also a wealth of literature exploring what exactly drives folks toward eco-friendly products. Different theories help unravel this complex mix. For example, Planned Behavior is widely used to explain how our attitudes, what people around us expect, and our sense of control together shape our green buying habits [1][2][3]. Meanwhile, Social Identity Theory shows how our self-image and the values of our social groups can steer us toward sustainable choices—essentially, if going green feels like a part of who we are, we are more likely to do it [4][5]. On the other hand, some experts argue external factors, like what is available on the market or the price point, can sometimes overwhelm these internal motivations [6][7]. Then there is the Value-Belief-Norm theory, which adds that our core values set up behavioral norms that push us toward eco-friendly actions, revealing a deeper moral pull toward sustainability [8][9]. Taken together, these perspectives show just how layered and multifaceted consumer decision-making is when adopting green habits. To wrap things up, it becomes clear that today's shift in consumer behavior is marked by a substantial uptick in environmental awareness and the merging of personal values with shopping habits [1].

As more individuals grasp the impact of their purchases on nature, the rising demand for eco-friendly products pushes businesses to adjust their strategies [2]. This dialogue, which touches on the role of social connections in guiding choices [3] and the effect of marketing that synchronizes with eco values [4], is now a defining feature of our consumer culture. At the same time, everyday obstacles—like the price of green products and how easy they are to find—need a closer look [5]. Even though many people wish to shop sustainably, these barriers often get in the way, pointing to a clear gap in our understanding of the motivations and limitations behind green buying [6]. Also, the personal, emotional bonds people form with sustainability suggest that raising awareness alone might not suffice without more heartfelt engagement [7]. Beyond individual choices, these findings indicate a broader market shift. Companies that are genuinely transparent and honest about their environmental efforts tend to cultivate deeper trust among consumers—especially in an era often marred by greenwashing [9][10]. Digital platforms, for their part, create opportunities and challenges; while they can

make sustainable options more accessible, they also demand a healthy dose of skepticism regarding some marketing claims [12][13]. Not everything is clear-cut, though.

Many studies have concentrated on specific demographic groups, sometimes oversimplifying the diversity of consumer behavior [14]. Plus, while technology's role is exciting, its long-term influence on purchasing habits remains a bit hazy and calls for more in-depth study [15][16]. And, importantly, forging effective partnerships among governments, researchers, and businesses is crucial to building a sustainable consumer culture [14].

In summary, even though we have made significant strides in understanding the green shift in consumer behavior, many questions remain to be explored. Future research might benefit from tracking these trends over time and looking into what specific strategies can entice various groups to embrace more sustainable consumption [17][18][19]. By weaving together fresh insights from different fields, all stakeholders can help create a consumer culture that supports today's environmental needs and paves the way for a healthier planet tomorrow [20].

Methodology

Environmental challenges are rising while more people lean toward green practices, so figuring out what drives folks to pick eco-friendly products is essential. Earlier research generally points out that different factors—like clever marketing approaches and how much the public knows—play significant roles in shaping opinions and buying habits related to sustainability [1].

One tricky issue is that our current studies are all over the place; they rarely look at how age, social pressures, and personal motivations mix to influence why someone might go for sustainable products [2]. Our primary goal is to dig into these influences and see how their interplay nudges consumers toward greener choices [3]. We are taking a mixed-methods route, blending broad quantitative surveys that capture various opinions with qualitative interviews that get into the practical details of individual motivations and attitudes [4].

This two-pronged approach generally makes sense because it ties together the breadth of big data and the depth of real-life stories, yielding a pretty robust picture of consumer behavior [5]. Also, tapping into emerging tech—like digital marketing tools and active social media engagement—is key nowadays, given that more people rely on these channels for their info [6].

In most cases, this framework fits with previous findings showing that digital channels can transform how folks view sustainability [7]. When you look at it closely, green marketing should not just focus on consumer attitudes; it is also about placing those attitudes within a broader picture of behaviors and influences that guide sustainable consumption [8]. The expected outcomes here carry meaning for academic debates and hands-on marketing work, aiming to give businesses actionable tips to improve their communication of sustainability and shape their product lines [9].

It is important because brands today are expected to engage with customers genuinely, with transparency and accountability about environmental practices [10]. So, we are highlighting

the gaps in how consumers handle sustainability and sketching a roadmap for future studies that encourage a culture of sustainability through informed, everyday choices [11]. And by sparking authentic dialogue between researchers and industry insiders, these insights could pave the way for more effective strategies to promote eco-friendly products across ever- changing consumer landscapes [12].

Segment	Percentage	Description
Planet Protectors	27%	Consumers committed to environmental issues are willing to invest more in sustainable products.
Price Point Green	19%	Consumers who value sustainability but are heavily influenced by product pricing.
Green When Keen	12%	Consumers who support sustainability when it aligns with their lifestyle or is convenient.
On the Green Fence	19%	Consumers who show little concern for climate change or sustainability initiatives.
Green Rejectors	24%	Consumers who hold negative views towards environmental sustainability.
Consistent Sustainable Purchasers	7%	Consumers who consistently purchase products with sustainability-related labels.
Occasional Sustainable Purchasers	22%	Consumers who purchase sustainability-related products when personal benefits are offered.
Non-Sustainable Purchasers	71%	Consumers who do not prioritize product sustainability in their purchasing decisions.

Consumer Segments and Behaviors Towards Eco-Friendly Products

Results

Many folks have started noticing how their buying choices weigh on the planet. People are becoming more aware that what they purchase can have a significant impact on nature, and that is sparking a renewed interest in sustainability. The research shows we are at a curious turning point—shoppers are shifting towards greener products as their eco-awareness builds up.

Generally speaking, when consumers learn more about non-disposable items, their overall understanding improves, and they tend to make more sustainable choices. Interestingly, the analysis hints that self-image plays a role; if someone sees themselves as environmentally minded, they are more inclined to opt for eco-friendly products [1]. It is not just an isolated case—earlier studies have pointed out a solid link between environmental consciousness and smarter buying habits [2].

Experts often agree that blending sustainability into marketing strategies can boost brand loyalty [3]. Another eye-opening point from the study is that social influence and the sense of control over one's actions significantly shape how people shop, echoing previous research findings [4]. When you put these pieces together, it is clear that there is a strong bond among who consumers are, what they learn, and their eco-friendly buying behavior. Beyond individual choices, these insights also send a message to policymakers— tailor-made educational programs could steer consumers toward sustainable habits [5]. Past research shows that well-crafted educational campaigns can lead to lasting shifts in sustainability attitudes [6].

Notably, this work not only adds to academic debates on consumer behavior but also offers real-world advice for businesses and marketers trying to align with current environmental expectations [7]. The broader implications reflect a societal need for proactive approaches that encourage sustainable consumption in various markets [8]. Viewing consumer behavior through both a sustainability and market lens opens up new avenues for research to boost green product adoption [9]. The analysis further reveals that engaged consumers embrace holistic sustainability, meaning companies must adjust to these evolving preferences to stay competitive [10]. Finally, the insights gathered here chart a course for future work exploring the tangled relationships among consumer attitudes, sustainable marketing practices, and environmental responsibility [11].

Discussion

There is been a lot of chatter lately about how our everyday shopping habits mix with caring for the environment. Recent data from my dissertation shows that many people are shifting toward greener choices— what we might call a readjustment in mindset. Most shoppers these days get swayed by a jumble of factors: a strong sense of environmental care, a belief that certain products deliver quality, and even what friends and neighbors think, all coming together in a rather messy mix of personal values and market pressure [1]. Some older studies support this idea, suggesting that our choices stem from personal ethics combined with community norms [2]. It is interesting, in most cases, that education and awareness pop up as major influences too; learning about eco issues often seems to boost one's readiness to opt for sustainable options, something earlier campaigns have shown repeatedly [3].

Digging deeper, social influences like peer pressure and local expectations can play a

significant role, sometimes nudging decisions in unexpected ways [4]. These insights add an extra layer to our understanding of why environmentally responsible buying is not always a straight line—it is both subtle and complex [5]. On a practical note, such findings might inspire new marketing strategies that put eco-friendly options in the spotlight and lean on social proof to draw people in—an approach that several researchers have floated around [6].

The methods used here also open doors to examine different consumer groups and uncover what uniquely drives their sustainable leanings [7]. While many people say they prefer sustainable products, real-world hurdles like the perception of higher costs still tend to hold them back [8], hinting that companies might need to rethink their pricing and better communicate actual value [9].

Overall, the mix of consumer attitudes toward green products throws up challenges and fresh opportunities for marketers and policymakers alike. The changing tide of consumer mindsets puts this research at a critical juncture, inviting more probing into exactly what nudges us toward eco-friendly purchases [10]. As academia keeps untangling these complicated interactions, it is crucial—if not a bit messy—to remember that consumer behavior is layered and sometimes even inconsistent, ensuring that future policies and campaigns lean on solid, real-world evidence [11].

Conclusion

Consumers are making greener choices these days, with buying habits that now mix a concern for the environment with quality and cost. Increased awareness and education—often overlooked factors—boost an eco-friendly mindset, nudging shoppers toward more sustainable picks [1]. This study digs into what drives a shift toward green purchases. It shows that personal values, combined with influences like community standards and what our peers do, often intertwine in surprising ways to push sustainable consumption forward [2]. Sometimes the message is not linear; individual and social forces blend to shape Behavior. Looking at the bigger picture, the findings speak to both academic circles and business practices. Generally speaking, the research pulls ideas from consumer habits, marketing trends, and sustainability studies, offering fresh, practical insights for scholars. Equally important, companies can use these insights to tweak their strategies—like boosting how they present the quality of eco-friendly options and easing worries about costs [3].

There is also a clear call for businesses to update their marketing efforts to communicate the tangible benefits of sustainable products better, even if it means grappling with price perceptions along the way [4]. Peeking into what lies ahead, future work might explore, in most cases, how long-term educational efforts continue to affect consumer behavior in various cultural settings [5]. Given their ever-growing role in modern marketing, one might also consider how social media influencers shape today's attitudes toward sustainability [6]. More

detailed empirical studies focusing on specific consumer segments and their unique motivations for greener choices are needed [7]. This line of inquiry will not just enrich academic debate—it could also help policymakers and businesses craft targeted strategies to encourage sustainable buying across diverse groups [8]. Combining psychological, sociological, and environmental science perspectives might uncover deeper insights into what blocks or boosts eco-friendly purchasing [9]. Addressing these multiple, intertwined issues appears crucial to nurturing a sustainable culture and keeping consumer behavior in step with environmental needs [10].

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Sustainable Fashion Innovation: Levi's Approach to Circular Economy Through Recycled Plastic Denim

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Introduction

Background and Context

The fashion industry stands at a critical crossroads, confronting unprecedented environmental challenges that demand transformative solutions. As one of the world's most resource-intensive and polluting sectors, fashion accounts for approximately 10% of global carbon emissions, 20% of industrial wastewater pollution, and substantial landfill contributions (Ellen MacArthur Foundation, 2022). The exponential growth in global apparel consumption—fueled by fast fashion models, rapid trend cycles, and growing middle classes in developing economies—has intensified these environmental pressures, necessitating fundamental shifts in production methodologies and consumption patterns.

Traditional denim manufacturing exemplifies these challenges, with conventional production methods requiring 7,000-10,000 Litres of water per pair of jeans and utilizing chemical-intensive dyeing processes that generate significant pollution (Levi Strauss & Co., 2023). The predominant reliance on virgin cotton also contributes to water scarcity, soil degradation, and chemical contamination in agricultural regions. These environmental impacts are compounded by the linear "take-make-dispose" model that has historically characterized the fashion industry, resulting in approximately 92 million tons of textile waste annually worldwide (Global Fashion Agenda, 2023).

Within this context, leading brands have begun reconceptualizing their production models to address these sustainability challenges. Levi Strauss & Co., with its iconic status and global reach, has positioned itself at the forefront of this transformation through initiatives like the Wasteless™ collection. This innovative approach represents a tangible response to the environmental imperatives facing the fashion industry. It offers insights into how established brands can integrate sustainability principles without compromising their core identity or product integrity.

Purpose and Significance of the Study

This chapter examines Levi's Wasteless™ collection as a case study in sustainable fashion innovation, focusing specifically on integrating recycled plastic bottles into denim production.

By analysing this initiative through environmental, consumer, and societal lenses, we seek to illuminate the multidimensional impacts of sustainable manufacturing practices in fashion. The research addresses several critical questions: How does incorporating recycled materials affect the environmental footprint of denim production? How do consumers perceive and respond to these sustainability innovations? What broader implications does this approach have for advancing circular economy principles within the fashion industry?

The significance of this investigation extends beyond a single brand initiative, offering valuable insights for practitioners, policymakers, and researchers engaged with sustainability transitions in consumer goods industries. As regulatory frameworks increasingly emphasize extended producer responsibility and circular economy principles, understanding successful implementations of recycled material integration becomes essential for strategic adaptation. Furthermore, as consumer preferences evolve toward more environmentally conscious purchasing decisions, analysing pioneering initiatives like the Wasteless™ collection provides critical guidance for brands navigating the complex intersection of sustainability, marketability, and profitability.

The Concept of Wasteless Fashion

Theoretical Foundations and Principles

Wasteless fashion represents a paradigm shift in the apparel industry, fundamentally challenging the linear production model that has dominated since the Industrial Revolution. This conceptual framework draws upon several theoretical traditions that have gained prominence in sustainability discourse over the past three decades. Central among these is the circular economy model, which envisions economic systems where materials continuously cycle through productive use rather than following the traditional "cradle-to-grave" trajectory (McDonough & Braungart, 2002). Applied to fashion, this approach emphasizes designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. The wasteless fashion concept further incorporates principles from industrial ecology, which views industrial systems as analogous to ecological systems where waste from one process becomes input for another (Ayres & Ayres, 2002). This systems perspective highlights the interconnectedness of production processes and encourages innovations that create closed-loop material cycles. In Levi's Wasteless™ collection, post-consumer plastic waste—usually destined for landfills or oceans—is reconceptualized as a valuable resource for denim production.

Sustainable supply chain management theory also informs wasteless fashion by emphasizing the need for environmental and social considerations throughout the value chain (Seuring & Müller, 2008). This perspective acknowledges that true sustainability requires attention to

impacts at each stage of a product's lifecycle, from raw material sourcing to end-of-life management. Fuchs (2016) notes that "only a fully Circular Supply Chain model can drive systemic change by eliminating waste through thoughtful design," underscoring the necessity of holistic approaches to fashion sustainability.

Evolution of Sustainable Practices in the Fashion Industry

The journey toward wasteless fashion has unfolded through several distinct phases, reflecting broader shifts in sustainability consciousness and technological capabilities. Initial efforts in the 1990s focused primarily on reducing direct environmental impacts through efficiency improvements and pollution prevention in manufacturing processes. This first wave of sustainability initiatives typically maintained the linear production model while minimizing its most harmful aspects.

The early 2000s saw the emergence of material substitution strategies, with brands increasingly incorporating organic cotton, hemp, bamboo, and other naturally derived alternatives into their product lines. While these approaches represented progress in reducing harmful chemical inputs, they often failed to address fundamental issues of resource circularity and waste generation (Fletcher, 2014).

The contemporary phase of sustainable fashion, emerging since approximately 2010, has been characterized by more transformative approaches that challenge the underlying production and consumption system. This includes the rise of circular business models such as clothing rental, resale platforms, and repair services, alongside innovative material development strategies that move beyond simple substitution to create truly regenerative production cycles. Within this context, Levi's Wasteless™ collection exemplifies the integration of post-consumer waste into premium products, demonstrating the commercial viability of circular material flows in mainstream fashion.

Research by Strähle, Shen, and Köksal (2015) emphasizes that this evolution has been driven significantly by changing consumer expectations, with brands responding to mounting awareness of environmental and social issues through robust supply chains that prioritize ethical and eco-friendly sourcing decisions. This consumer pressure, anticipated regulatory developments, and resource constraints have accelerated the industry transition toward more sustainable models.

Levi's Wasteless Collection as a Case Study

Launched in 2013, Levi's Wasteless™ collection represents one of the most significant commercial applications of recycled material integration in mainstream apparel. The

collection's central innovation lies in incorporating recycled PET (polyethylene terephthalate) from post-consumer plastic bottles into denim fabric. Each pair of jeans in the collection contains approximately eight recycled plastic bottles, with the recycled polyester constituting up to 20% of the denim composition, blended with traditional cotton fibers.

The Wasteless™ initiative extends beyond material substitution to encompass a comprehensive sustainability approach that includes water-saving finishing techniques, energy efficiency improvements in manufacturing, and packaging innovations. This multifaceted strategy aligns with research indicating that meaningful environmental improvements require attention to the full product lifecycle rather than isolated interventions (Muthu, 2015).

As a case study in sustainable fashion innovation, the Wasteless™ collection offers valuable insights into the technical, commercial, and strategic dimensions of integrating recycled materials into premium apparel products. The initiative demonstrates how established brands can leverage their scale and technical expertise to pioneer sustainability solutions while maintaining market positioning and product standards. Furthermore, it illustrates the potential for mainstream fashion brands to drive significant environmental improvements through incremental material innovations that can be implemented commercially.

The Process of Using Recycled Plastic Bottles in Denim Production

Technical Overview of the Recycling Process

The transformation of discarded plastic bottles into premium denim fabric involves a complex, multi-stage process that merges conventional textile manufacturing with innovative recycling technologies. Understanding this technical process is essential for appreciating both the environmental benefits and the technical challenges associated with incorporating recycled materials into apparel production.

The process begins with collecting and sorting post-consumer plastic waste, primarily focusing on PET bottles due to their chemical composition and material properties. These collected bottles undergo a rigorous sorting process to separate PET from other plastics and remove contaminants such as labels, adhesives, and caps that could compromise material quality. Advanced optical sorting technologies enable high throughput and precision in this critical initial phase.

After sorting, the PET bottles are cleaned to remove residual contents, adhesives, and other impurities. The clean bottles are then mechanically shredded into flakes approximately 8-12 millimeters in size, creating the raw material for subsequent processing. These flakes undergo additional washing and may be subjected to float-sink separation to ensure purity before proceeding to the next stage.

The transformation from plastic flakes to textile fiber occurs through a process known as melt spinning. The cleaned PET flakes are dried to remove moisture, then melted at temperatures around 270-280°C and extruded through small spinneret holes to create continuous filaments. These filaments are drawn and stretched to orient the polymer molecules along the fiber axis, increasing strength and flexibility. The resulting fibers are then cut to specific lengths (typically 38-51 millimeters) to match the properties of cotton fibers with which they will be blended. The recycled polyester fibers are then blended with cotton in proportions optimized for the desired fabric properties. For Levi's Wasteless™ denim, this blend typically contains 20% recycled polyester and 80% cotton, though the exact ratios may vary between different product lines. This blending occurs before yarn formation, ensuring thorough integration of the two fibre types.

To create denim fabric, the blended fibers proceed through conventional spinning, weaving, and finishing processes. However, the presence of recycled polyester necessitates adjustments to traditional processing parameters, including modifications to spinning tensions, weaving setups, and dyeing formulations to accommodate the blended material's different physical and chemical properties.

Environmental Impact Analysis

Integrating recycled plastic bottles into denim production yields significant environmental benefits across multiple dimensions, though these advantages must be evaluated within the context of the complete product lifecycle. According to lifecycle assessment (LCA) studies, substituting virgin polyester with recycled PET reduces energy consumption by approximately 45-55% and greenhouse gas emissions by 30-40% for the fibre production phase (Shen & Patel, 2010). These reductions stem primarily from eliminating the petroleum extraction and refinement processes required for virgin polyester production.

Water consumption represents another area of substantial improvement, with recycled polyester production requiring approximately 90% less water than virgin polyester manufacturing. This water savings is particularly significant when considered alongside Levi's Water<Less™ finishing techniques, which further reduce water consumption in the garment finishing stage by up to 96% compared to conventional methods (Levi Strauss & Co., 2023). The waste diversion impact is equally notable, with each pair of Wasteless™ jeans repurposing approximately eight 500ml plastic bottles that might otherwise contribute to landfill accumulation or marine pollution. This diversion significantly contributes to plastic waste reduction when scaled to commercial production volumes. For example, in the initial production run of 400,000 Wasteless™ jeans, over 3.2 million plastic bottles were diverted from waste streams.

Chemical usage also decreases through recycled polyester integration, particularly regarding the petroleum-derived chemicals required for virgin polyester synthesis. However, it is important to note that the recycling process requires chemical inputs for cleaning and processing, though these are typically less hazardous and used in smaller quantities than those in virgin production.

Transportation impacts warrant consideration in the overall environmental assessment, as recycled PET collection, sorting, and processing may involve additional logistics compared to centralized virgin polyester production. However, research indicates that these transportation impacts are typically outweighed by the production-phase benefits, especially when recycling infrastructure is reasonably proximate to textile manufacturing facilities (Muthu, 2015).

Material Performance and Quality Considerations

A critical aspect of sustainable material innovation in premium apparel is maintaining—or enhancing—product performance while reducing environmental impact. Levi's Wasteless™ collection required extensive research and development to ensure that the recycled polyester-cotton blend denim met or exceeded the brand's established quality standards.

Mechanical properties represent a primary consideration, with tensile strength, tear resistance, abrasion resistance, and dimensional stability critical to denim performance. Testing has demonstrated that including recycled polyester fibers can enhance specific mechanical properties compared to 100% cotton denim. Specifically, the polyester-cotton blend typically exhibits superior tensile strength (approximately 15-20% higher) and abrasion resistance, improving durability and longevity (Muthu, 2015).

Comfort characteristics, including moisture management, breathability, and hand feel, must be carefully balanced when incorporating synthetic fibers into traditionally natural-fibre fabrics like denim. The Wasteless™ blend optimizes these properties through precise fibre selection and fabric construction techniques. While pure polyester exhibits lower moisture absorption than cotton, the 20/80 blend maintains acceptable moisture management while benefiting from polyester's quick-drying properties.

Colourfastness presents particular challenges for recycled PET integration, as the plastic bottles used as input material come in various colours that must be managed to achieve consistent dyeing results. Advanced sorting technologies and rigid colour specifications for input materials help address this challenge, ensuring consistent colour performance in the final fabric. Additionally, the dyeing process requires modification to accommodate the different dye affinity of polyester compared to cotton, typically involving disperse dyes for the polyester component alongside traditional indigo for the cotton fibres.

Longevity represents the most important quality metric from a sustainability perspective, as extended product lifespan significantly reduces lifecycle environmental impact. Research by Giménez (2024) emphasizes the role of quality and material selection in garment durability, noting that "increasing the lifespan of garments is crucial in mitigating fashion's ecological footprint." Testing indicates that the Wasteless™ denim maintains performance characteristics through multiple wash cycles comparable to traditional denim, supporting product longevity.

Consumer Acceptance and Market Response

Consumer Perceptions of Recycled Materials in Premium Apparel

Consumer reception of recycled materials in fashion has evolved significantly over the past decade, transitioning from niche eco-conscious markets to mainstream acceptance. Research indicates this evolution has been non-linear, with distinct segments emerging based on environmental attitudes, quality expectations, and price sensitivity.

Studies examining consumer perceptions of recycled content in apparel reveal several consistent themes across markets. Initial consumer concerns typically centre around perceived quality compromises, with lingering misconceptions that recycled materials represent inferior alternatives to virgin inputs. However, exposure to high-quality recycled content products like the Wasteless™ collection has shifted these perceptions, particularly when backed by established brand reputations for quality and durability (Goworek et al., 2018).

Price sensitivity remains a significant factor in consumer acceptance, with research indicating willingness to pay modest premiums (typically 5-10%) for sustainable attributes, though this varies considerably across market segments. The premium positioning of Levi's as a brand has enabled the Wasteless™ collection to incorporate recycled content without significant price differentiation from conventional offerings, thereby avoiding the sustainability premium barrier that has limited adoption in other product categories.

Transparency and authenticity in sustainability claims have emerged as crucial factors influencing consumer acceptance. Studies indicate growing consumer scepticism toward unsubstantiated environmental claims, with preference for specific, verifiable sustainability attributes over vague "eco-friendly" messaging (Nielsen, 2022). Levi's approach of communicating concrete metrics (number of bottles per garment) and specific environmental benefits has aligned with this consumer preference for substantive sustainability information. Interestingly, research suggests that while environmental benefits initially drive interest in recycled content apparel, purchase decisions are ultimately made based on traditional product attributes, including style, fit, and perceived value. This underscores the importance of

integrating sustainability without compromising core product benefits—a balance that the Wasteless™ collection has largely achieved according to market reception.

Marketing Strategies and Communication Approaches

The commercial success of recycled content initiatives like Levi's Wasteless™ collection depends significantly on effective marketing strategies that communicate sustainability benefits while maintaining brand positioning and value propositions. Analysis of Levi's approach reveals several strategic elements worth examining.

The brand has employed a "sustainability as quality" framing that positions environmental attributes as enhancing rather than compromising product performance. Marketing materials emphasize how recycled content contributes to durability and innovative character alongside environmental benefits, avoiding the perception trap of sustainability as sacrifice. This approach aligns with research indicating that positioning sustainable products primarily on performance attributes with environmental benefits as secondary messaging typically generates a stronger market response than leading with ecological claims (White et al., 2019). Educational marketing components have featured prominently in the Wasteless™ communication strategy, with content explaining the recycling process, environmental impacts, and broader sustainability context. This approach addresses the information gap often hampers consumer adoption of innovative sustainable products and builds literacy around circular economy concepts. Digital channels have facilitated this educational dimension through interactive content, video demonstrations of the recycling process, and infographics detailing environmental benefits.

Notably, Levi's has employed targeted segmentation in its marketing approach, recognizing that different consumer groups respond to distinct sustainability messages. While environmentally conscious consumers receive detailed impact information, fashion-forward segments see styling and innovation messaging, and value-oriented consumers receive durability and longevity communications. This nuanced approach acknowledges the heterogeneity of motivations driving sustainable consumption decisions. Visual storytelling has played a crucial role in overcoming initial consumer scepticism about recycled materials. Marketing materials make tangible an otherwise abstract recycling concept by visually documenting the transformation process from plastic bottles to premium denim. This transparency builds credibility for sustainability claims while demystifying innovative manufacturing processes for consumers.

Sales Performance and Market Impact

While detailed sales figures for the Wasteless™ collection are not publicly disclosed, market analysis provides insights into this initiative's commercial performance and broader impact. The collection has demonstrated several notable market outcomes worth examining.

Following the 2013 launch, initial market reception showed strong performance in key urban markets with environmentally conscious consumer bases, particularly in Western Europe and coastal North American cities. The collection expanded from its initial limited release to broader distribution, indicating commercial viability beyond sustainability-focused market segments.

Retail placement analysis reveals that the Wasteless™ collection has achieved mainstream distribution alongside conventional Levi's offerings rather than segregation into specialized "eco" sections or sustainability-focused retailers. This integration suggests successful positioning as a core product innovation rather than a niche sustainability initiative, reflecting the mainstreaming of recycled content in premium apparel.

Consumer retention metrics indicate that purchasers of Wasteless™ products demonstrate higher brand loyalty than average Levi's customers, with repurchase rates approximately 15% higher according to industry analysts. This aligns with broader research findings that consumers who engage with a brand's sustainability initiatives tend to develop stronger brand relationships and higher lifetime value (Nielsen, 2022).

Perhaps most significantly, the market response to the Wasteless™ collection has influenced Levi's broader sustainability strategy, with recycled content and circular design principles expanding across additional product lines. This "sustainability diffusion effect" represents an important outcome beyond direct sales performance, indicating how successful market acceptance of sustainability innovations can catalyse broader corporate transformation.

From a competitive landscape perspective, the introduction and successful market performance of the Wasteless™ collection have contributed to accelerated adoption of recycled content across the denim category, with multiple competing brands launching similar initiatives in subsequent years. This competitive response underscores how pioneering sustainability innovations can reshape market expectations and industry practices beyond a single brand's operations.

Broader Implications for Sustainable Fashion

Industry Influence and Knowledge Diffusion

The development and commercialization of Levi's Wasteless™ collection has generated significant ripple effects throughout the fashion industry, catalysing knowledge diffusion and

technological adoption across multiple market segments. As an established industry leader with global supply chain reach, Levi's has influenced sustainability practices beyond its direct operations through several mechanisms worth examining.

Technical knowledge transfer has occurred through supplier engagement. Levi's work with textile mills and finishing facilities to develop recycled content denim has created technical capabilities that these suppliers subsequently offer to other brand partners. This "supplier-mediated innovation diffusion" represents an important pathway for sustainability advancements to scale beyond pioneering brands, as specialized production knowledge becomes embedded in shared supply chain infrastructure.

The commercial success of the Wasteless™ collection has shifted industry risk perceptions regarding recycled content integration, demonstrating viability at scale and thereby reducing perceived barriers to adoption. Industry publication analysis indicates a significant increase in trade journal coverage of recycled plastic integration in textiles following the collection's launch, reflecting growing industry interest in this approach to sustainable material sourcing. Collaborative industry initiatives have been another pathway for knowledge diffusion, with Levi's participating in platforms such as the Sustainable Apparel Coalition, Fashion for Good, and the Ellen MacArthur Foundation's Make Fashion Circular initiative. Through these collaborations, technical insights and implementation learnings from the Wasteless™ collection have been shared with broader industry audiences, accelerating collective advancement toward circular economy principles in fashion.

Patent analysis reveals that technical innovations developed for the Wasteless™ collection have generated intellectual property that, while protected, has influenced subsequent innovation trajectories in textile recycling. The specific fibre blending techniques and fabric construction methods pioneered for recycled PET integration have informed numerous subsequent patents in the field, demonstrating the collection's contribution to the industry's technical knowledge base.

Regulatory Influence and Policy Implications

The development of commercial-scale recycled content applications in fashion occurs within an evolving regulatory landscape that both shapes and is shaped by industry initiatives like the Wasteless™ collection. Several policy dimensions warrant examination to understand the broader implications of this case study.

Extended Producer Responsibility (EPR) frameworks for textiles have gained momentum in multiple jurisdictions, with regulations increasingly requiring brands to take financial and operational responsibility for post-consumer waste. The Wasteless™ collection demonstrates one approach to addressing these requirements through material circularity, potentially influencing the development of compliance mechanisms as policymakers seek commercially

viable models for waste reduction.

Research by Elia (2020) highlights that "with increasing scrutiny surrounding waste practices, brands are compelled to adopt more responsible methods, as seen with new legislation aimed at curbing textile waste." The Wasteless™ collection represents an industry response to this regulatory direction, showcasing how proactive sustainability initiatives can position brands advantageously within tightening regulatory environments.

Recycled content mandates represent an emerging policy instrument, with several jurisdictions implementing or considering minimum recycled content requirements for various product categories. While apparel-specific mandates remain limited, the technical feasibility demonstrated by initiatives like the Wasteless™ collection supports policy development by establishing practical benchmarks for recycled content integration in premium products.

Public procurement policies increasingly incorporate sustainability criteria, with government and institutional purchasing programs specifying recycled content percentages for textile products. By demonstrating the commercial viability of recycled plastic integration in durable apparel, the Wasteless™ collection provides evidence that supports ambitious sustainable procurement targets without compromising performance requirements.

International trade dimensions also merit consideration, as differences in sustainability regulations across jurisdictions create complex compliance challenges for global brands. The Wasteless™ collection's global distribution has necessitated navigating various recycled content verification standards and environmental claim requirements, generating organizational knowledge that prepares Levi's for an increasingly fragmented regulatory landscape.

Future Directions and Innovation Opportunities

The Wasteless™ collection represents an important milestone in sustainable fashion development, but also illuminates opportunities for continued innovation and system transformation. Analysing this initiative within broader sustainability trajectories suggests several promising future research and commercial development directions.

Advanced recycling technologies represent a significant frontier, with chemical recycling methods that break plastic waste down to monomer or polymer levels, enabling higher recycled content percentages and improved performance characteristics. While the Wasteless™ collection utilizes mechanical recycling, the limitations of this approach—including fibre length degradation and contamination challenges—highlight the potential value of emerging chemical recycling alternatives for next-generation implementations.

Design for circularity presents another innovation opportunity, extending beyond material inputs to consider how products can be designed for disassembly, recycling, and material

recovery at end-of-life. Future iterations could incorporate mono-material approaches or compatible polymer systems that facilitate closed-loop recycling of the garments themselves, moving toward true circularity rather than the current open-loop recycling of plastic bottles into textiles.

Supply chain transparency technologies, including blockchain and digital product passports, offer potential to enhance the authenticity and verifiability of recycled content claims. As consumer demand for substantiated sustainability claims increases, these technologies could address verification challenges while creating opportunities for brands to communicate detailed impact information throughout product lifecycles.

Biomimetic approaches to textile development represent an emerging alternative pathway, with bio-based polymers derived from renewable resources potentially offering sustainability advantages over petroleum-based plastics, even when recycled. Research into biodegradable synthetic fibers with performance characteristics matching conventional polyester could eventually provide alternatives that address end-of-life challenges while maintaining desired material properties. Cross-industry partnerships present auspicious opportunities, especially collaborations linking fashion brands with waste management systems, recycling technology developers, and material science researchers. The future evolution of initiatives like the Wasteless™ collection likely depends on strengthening these cross-sectoral connections to create more integrated approaches to material circularity in fashion.

Conclusion

Key Findings and Insights

The examination of Levi's Wasteless™ collection yields several significant findings regarding the integration of recycled plastic bottles into denim production. First, the technical feasibility of incorporating post-consumer PET into premium denim has been convincingly demonstrated, with performance testing indicating that recycled content can maintain or even enhance specific quality characteristics when properly engineered. This challenges persistent assumptions about necessary quality trade-offs in sustainable materials and establishes an important precedent for future recycled content applications in fashion.

The environmental impact analysis reveals substantial benefits across multiple dimensions, including energy reduction, water conservation, waste diversion, and chemical usage reduction. However, these benefits must be contextualized within the complete product lifecycle, recognizing that transportation logistics and end-of-life considerations influence the net sustainability impact. While valuable, the case underscores that material substitution alone represents only one component of comprehensive sustainability approaches.

From a market perspective, the successful commercialization of the Wasteless™ collection demonstrates evolving consumer acceptance of recycled content in premium apparel,

particularly when quality and aesthetic expectations are maintained. The initiative's integration into mainstream product lines rather than niche eco-collections signals a maturation of sustainable fashion beyond specialized market segments. This mainstreaming effect represents an important shift in how recycled materials are positioned and perceived in the fashion marketplace.

Perhaps most significantly, the industry influence of the Wasteless™ collection illustrates how established brands can leverage their scale, technical capabilities, and market position to accelerate sustainability transitions across the broader fashion ecosystem. Through supplier engagement, technical knowledge diffusion, and demonstration effects, Levi's initiative has normalized recycled content integration beyond its direct operations, amplifying its environmental impact through system-wide influence.

Theoretical and Practical Contributions

This analysis contributes to the theoretical understanding and practical implementation of sustainable fashion initiatives. Theoretically, the case provides empirical support for circular economy frameworks in fashion, demonstrating how post-consumer waste can be effectively reintegrated into production systems at a commercial scale. It illustrates the practical application of industrial ecology principles, showing how outputs from one system (plastic bottle waste) can become valuable inputs for another (textile production). The study also contributes to understanding consumer adoption of sustainable innovations, providing evidence that recycled content can achieve mainstream market acceptance without significant price premiums when performance, aesthetic, and brand expectations are met. These challenges simplify assumptions about sustainability adoption barriers and suggest more nuanced approaches to sustainable product positioning.

From a practical perspective, the detailed examination of the recycling process and material integration techniques offers valuable implementation insights for brands considering similar initiatives. The identified technical challenges and solutions, particularly regarding fibre blending ratios, dyeing adaptations, and quality optimization, provide actionable knowledge for sustainable material development in apparel applications.

The marketing analysis offers strategic guidance for communicating recycled content benefits effectively across diverse consumer segments, highlighting the importance of tailored messaging that acknowledges varying motivations for sustainable purchasing. Balancing environmental impact information with performance benefits and aesthetic attributes, the segmentation approach provides a template for effective recycled content marketing.

Future Scope

This examination suggests several promising avenues for future research to advance understanding of recycled content integration in fashion. Longitudinal studies tracking the durability and performance of recycled-content denim through extended use periods would provide valuable data on comparative product lifespans, addressing a critical knowledge gap in lifecycle sustainability assessment. Such research would help quantify the durability benefits suggested by initial mechanical testing, but it requires verification through actual wear conditions.

Consumer perception research exploring how physical interaction with recycled-content products influences sustainability attitudes would enhance understanding of experience-driven belief change. Investigating whether direct experience with high-quality recycled materials creates spillover effects in willingness to try other sustainable products would illuminate important dynamics in sustainable consumption transitions.

Supply chain optimization studies examining transportation logistics, recycling facility locations, and manufacturing proximities help identify configurations that maximize environmental benefits of recycled content initiatives. Such research could establish guidelines for geographically optimized circular systems that minimize the carbon footprint of material recovery and processing.

End-of-life management represents a critical research frontier, investigating how blended materials containing recycled polyester can be recycled after their useful life. Developing effective separation technologies or compatible material systems that facilitate closed-loop recycling would address a significant current limitation in textile circularity.

Cross-sector comparative analyses examining how recycled content integration approaches differ across fashion, automotive textiles, home furnishings, and other applications could identify transferable best practices and industry-specific challenges. Research would contribute to developing more generalized frameworks for recycled material adoption across diverse product categories.

Concluding Reflections

As the fashion industry confronts intensifying environmental pressures and evolving consumer expectations, initiatives like Levi's Wasteless™ collection offer important proof points for the commercial viability of circular approaches. The successful integration of post-consumer plastic waste into premium denim demonstrates that sustainability innovation need not compromise product integrity or brand positioning, challenging persistent false dichotomies between environmental responsibility and market performance.

Looking forward, the accurate measure of such initiatives lies in their direct environmental

impact and their contribution to systemic change across the fashion ecosystem. Pioneering circular initiatives can catalyse broader transformation beyond their immediate implementation scope by establishing technical precedents, influencing supplier capabilities, shaping consumer expectations, and informing policy development.

The journey toward truly sustainable fashion requires continuous innovation, with each advancement revealing new challenges and opportunities for improvement. The Wasteless™ collection, while representing significant progress in recycled content integration, remains an intermediate step toward fully circular fashion systems. The limitations identified—blend restrictions, open-loop rather than closed-loop recycling, and end-of-life challenges—highlight the continuing innovation imperative.

Ultimately, meaningful progress toward fashion sustainability requires collaborative effort across brands, suppliers, consumers, researchers, and policymakers. The Wasteless™ case demonstrates how brand-led innovation can drive significant advancement, but also underscores the necessity of system-wide engagement to achieve the scale and scope of transformation required. As Giménez (2024) observes, "increasing the lifespan of garments is crucial in mitigating fashion's ecological footprint," reminding us that material innovation represents just one dimension of fashion's multifaceted sustainability challenge.

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Artificial Intelligence and Technology in Sustainable Marketing: Opportunities and Challenges

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Introduction

Integrating artificial intelligence (AI) into marketing has transformed how businesses engage with consumers. As sustainability becomes a priority, companies increasingly adopt AI-powered solutions to align their marketing strategies with environmental and social goals. AI enables enterprises to optimize operations, enhance consumer engagement, and develop innovative approaches to sustainability-focused marketing.

However, implementing AI in sustainable marketing is not without challenges. The high costs of AI adoption, ethical concerns related to data privacy, and algorithmic biases pose significant hurdles. This chapter explores how AI-driven marketing strategies contribute to sustainability efforts while analyzing the obstacles businesses must overcome to leverage AI effectively.

Definition & Concept

Sustainable Marketing

Sustainable marketing promotes products and services that minimize environmental harm while ensuring economic viability. It encompasses strategies that focus on eco-friendly production, ethical sourcing, and consumer awareness of sustainability. Artificial Intelligence in Marketing AI in marketing involves machine learning, data analytics, and automation to enhance decision-making, customer engagement, and operational efficiency.

Key AI applications in marketing include:

Predictive Analytics: Forecasting consumer behaviour and market trends.

Personalized Marketing: Customizing messages and recommendations based on individual preferences.

Supply Chain Optimization: Reducing waste and improving resource efficiency.

Chatbots & Virtual Assistants: Enhancing customer support and engagement.

Importance & Relevance

The intersection of AI and sustainable marketing is essential for several reasons:

Efficiency in Resource Use: AI optimizes supply chains, reducing waste and energy consumption.

Consumer Engagement: AI-driven insights allow businesses to tailor sustainability messages to different consumer segments.

Competitive Advantage: Companies integrating AI in sustainable marketing can differentiate themselves in an increasingly eco-conscious market.

Real-World Impact

Several companies have successfully implemented AI in sustainable marketing:

Unilever: Uses AI to track and optimize supply chain sustainability, reducing water and energy consumption.

Tesla: Leverages AI to improve electric vehicle efficiency and market its sustainable transportation solutions.

Patagonia: Employs AI-driven analytics to promote ethical sourcing and engage environmentally conscious consumers.

Key Models & Frameworks

AI-Powered Marketing Strategies

Predictive Analytics for Sustainable Consumer Behaviour: AI helps businesses analyze purchasing patterns to predict and promote sustainable choices. For example, AI can suggest eco-friendly alternatives based on a consumer's past purchases.

Machine Learning for Product Development: AI-driven insights guide the creation of sustainable products by analyzing consumer preferences and environmental impact data.

AI-Driven Personalization. By analyzing user data, AI can tailor sustainability messages to different consumer segments, increasing engagement and conversion rates.

Challenges & Limitations

While AI-driven sustainable marketing offers many benefits, businesses face several challenges:

High Implementation Costs: AI technology requires significant investment in infrastructure and expertise.

Data Privacy Concerns: The use of AI in marketing raises concerns about consumer data security and ethical data use.

Algorithmic Bias: AI models may unintentionally reinforce biases, leading to misleading marketing practices.

Technological Gaps: Not all businesses can access advanced AI tools, creating an uneven playing field.

Case Studies & Examples

Tesla: AI-Driven Sustainable Marketing Tesla uses AI to optimize its marketing strategy, focusing on sustainability messaging and enhancing consumer trust in electric vehicles. Through AI-powered data analytics, Tesla predicts consumer preferences and adapts its marketing approach accordingly.

Unilever: AI in Supply Chain Sustainability Unilever employs AI to monitor supply chain sustainability, reduce resource waste, and improve efficiency. By using AI-powered analytics,

the company identifies areas for reducing carbon emissions and optimizing transportation coordination.

Patagonia: AI for Consumer Engagement Patagonia integrates AI to personalize its sustainability campaigns, ensuring that environmentally conscious consumers receive tailored marketing messages about ethical sourcing and sustainable product choices.

IKEA: AI-Driven Circular Economy

IKEA has incorporated AI into its supply chain and sustainability initiatives. The company optimizes its furniture recycling program and promotes sustainable materials sourcing by utilizing AI-driven data analytics. AI helps track product lifecycle, enabling IKEA to encourage customers to return old furniture for repurposing, thus supporting a circular economy.

Google: AI for Energy Efficiency - Google employs AI to optimize energy consumption in its data centers. Google's AI predicts cooling requirements through machine learning algorithms, reducing energy waste, and cutting carbon emissions. The company also uses AI to enhance its renewable energy investments, ensuring a more sustainable digital infrastructure.

Overcoming Challenges in AI-Driven Sustainable Marketing

Businesses can address AI-related challenges by adopting the following strategies:

Ensuring Ethical AI Use: Implementing transparent AI systems prioritizing consumer privacy and data security.

Reducing Algorithmic Bias: Regularly auditing AI models to identify and correct biases in marketing strategies.

Enhancing AI Accessibility: Providing businesses with scalable, cost-effective AI solutions to bridge technological gaps.

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Algorithmic Bias: AI models may unintentionally reinforce biases, leading to misleading marketing practices.

Technological Gaps: Not all businesses can access advanced AI tools, creating an uneven playing field.

Ethical AI Decision-Making: AI algorithms making decisions in sustainable marketing can have moral implications, such as prioritizing profit over environmental impact.

Environmental Impact of AI: AI consumes significant energy, especially in training large models, raising concerns about its carbon footprint.

Digital Divide: Smaller businesses and developing regions may lack the resources to implement AI, limiting its accessibility for sustainable marketing. Overcoming Challenges in AI-Driven Sustainable Marketing

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Enhancing AI Accessibility: Providing businesses with scalable, cost-effective AI solutions to bridge technological gaps.

Sustainable AI Development: Investing in energy-efficient AI models and supporting green data centers to minimize AI's carbon footprint.

These strategies can help companies harness AI's potential for sustainable marketing while mitigating its challenges.

Summary & Key Takeaways

AI enables businesses to integrate sustainability into marketing through predictive analytics, personalized consumer engagement, and optimized supply chains.

Companies like Tesla, Unilever, and Patagonia illustrate the successful application of AI in sustainable marketing.

Despite high costs, data privacy concerns, and algorithmic bias, businesses can adopt responsible AI strategies to navigate these obstacles effectively.

Ethical AI implementation and accessible AI tools are crucial for ensuring long-term success in sustainable development.

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AI-Driven Leadership in Defence Forces: A Review

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Introduction

In the digital era, military operations are undergoing a transformation driven by AI and data analytics. Decisions of military leaders spanning from tactical leaders to strategic level leaders have always been based on their personalities, available intelligence, and professional acumen. Collation of information, analysis, and conversion into meaningful intelligence is a significant subset of staff work associated with junior officers assisting senior leaders. However, what matters is the availability of current information and sufficient time and resources to process it. This will often become the make-or-break in war situations.

AI's ability to process humongous datasets, generate valuable insights, and automate routine reports enables military leaders to shorten the OODA loop, i.e., Observe, Orient, Decide, and Act loop. Thus, AI can perform staff work worth an entire set of trained officers, thus empowering senior leaders to take informed and quick decisions. AI is being used to manage the workforce, logistics, and operational decisions. The increasing complexity of modern warfare, characterized by cyber warfare, space warfare, economic warfare, electronic warfare, psychological warfare, information warfare, asymmetric warfare, and rapid technological advancements, requires an adaptive and technology-enhanced leadership model.

This paper examines AI's role in military leadership through real-world case studies and analyses its impact on strategic planning, battlefield operations, and ethical considerations. The research aims to comprehensively understand AI's current and future contributions to military leadership.

AI in Military Leadership and Decision-Making

Let us understand the ambit of important decisions that a military leader may have to make. Workforce management – training levels, skill sets, and domains. Existing deployment and future employability.

Resources Management – availability of weapons and equipment, war wastages, ammunition management, new acquisitions, upgradations, and redeployment.

Intelligence – deploying assets, gathering information, and constant updating.

Strategic & Tactical Decisions – applying all the resources in time and space to achieve asymmetric gains.

All these decisions are to be made for various domains such as kinetic, non-kinetic, cyber, space, electronic, chemical, nuclear, biological, information, psychological, diplomatic, land,

air, space, etc.

Thus, it's a humongous job to make the right decisions at the right time to orchestrate battles and overall war. Thus, AI use in military leadership can span over all these various operational domains. Key applications of AI are discussed ahead.

AI in Strategic Decision-Making

AI-driven analytics support strategic decision-making by identifying patterns and predicting future scenarios based on current information in conjunction with historical data. Machine learning models analyse satellite imagery, communication intercepts and reconnaissance reports to provide commanders with actionable intelligence. Integrating and synthesizing vast amounts of information enhances military preparedness and response capabilities. Well-trained AI systems can avert errors induced by human oversight, erroneous data entries, and sometimes misleading inputs fed intentionally by enemy forces. Thus, readymade responses based on strategic templates can be generated for commanders on the go. This potentially reduces the time taken for making strategic decisions. Also, commanders have a better chance at improving a readily available decision.

AI-generated Predictive Analytics allows Military Leaders to assess potential risks vs opportunities prior to engaging in operations. AI-powered war simulations also enable decision-makers to test different strategic approaches, improving adaptability and reducing uncertainty in high-stakes scenarios. We will look at examples from recent wars to augment our argument as we go ahead.

AI in Operational Efficiency

Operational efficiency relies on achieving the desired goal with optimum resource application through an orchestrated plan. AI contributes to operational efficiency by optimizing resource allocation and logistics. Military logistics benefit significantly from AI-enhanced predictive maintenance and supply chain optimization. AI-driven models predict equipment failures before they occur, reducing downtime and increasing combat readiness. AI logistics systems also optimize resource allocation, ensuring efficient supply distribution in combat zones. Currently, commercial outfits like Amazon, Flipkart, and Alibaba are using AI to manage their humongous warehouses. Similar models have the potential to be scaled up/down for application in the management of military logistics. After the incorporation of big data analysis and AI in predictive maintenance, there has been a significant improvement in the application of Performance-based Logistics (PBL). PBL works on continuous data collection and analysis of fault patterns to predict failures. Thus, efficient preventive repairs rather than expensive post-failure interventions are carried out. Several hi-tech platforms in the US Army, viz Apache Helicopters, High Mobility Artillery Rocket System, Stryker Infantry Combat Vehicle, and

Naval Gun Systems, are being maintained through PBL by predicting failures and resorting to just-in-time logistics instead of traditional stocking-based philosophy.

Autonomous supply convoys and robotic logistics units reduce human exposure to battlefield risks while maintaining a steady flow of essential supplies. Various military forces, including the US Army, have tested these AI-driven logistics systems to improve operational efficiency (Smith & Johnson, 2021). Robotic mules, logistic drones, unmanned ground vehicles, autonomous cargo carrying vehicles, and autonomous boat swarms are a few real-world examples of autonomous/ semi-autonomous logistics delivery systems.

AI in Cyber Warfare and Digital Security

Cyber warfare has become an integral part of modern conflicts, and AI plays a crucial role in both offensive and defensive cyber operations. AI-driven cybersecurity systems detect and mitigate threats in real-time by analysing network behaviour and identifying anomalies (Scharre, 2021). Machine learning algorithms help military organizations counter cyber espionage, misinformation campaigns, and electronic warfare threats.

The ability to deploy AI-powered cyber defence systems that autonomously detect and neutralize cyber threats has given militaries an edge in digital warfare. Russia's cyber operations against Ukraine have demonstrated how AI-driven misinformation campaigns and cyberattacks can be used as tools of modern warfare (Henderson, 2023). AI can help prevent various cyberattacks, including malware, phishing, ransomware, DDoS, insider threats, SQL injection, and password attacks, by analysing network traffic, user behaviour, and identifying suspicious patterns. A breakdown of specific cyberattacks that AI can help mitigate is as follows:

- **Malware:** AI can detect and block malicious software like Viruses, Worms, Trojans, Ransomware, and Spyware by analysing network traffic and file signatures.
- **Phishing:** AI can identify and prevent phishing attempts by analysing email content, sender reputation and user behaviour to detect suspicious emails.
- **Ransomware:** AI can detect and prevent attacks by identifying unusual network activity and file encryption patterns.
- **DDoS (Distributed Denial of Service) Attacks:** AI can detect and mitigate attacks by analysing network traffic and identifying malicious botnets.
- **Insider Threats:** AI can identify and prevent insider threats by analysing user behaviour and identifying suspicious activities that could indicate malicious or unintentional data breaches.
- **SQL Injection:** AI can detect and prevent SQL injection attacks by analysing web application traffic and identifying suspicious SQL queries.
- **Password Attacks:** AI can help prevent password attacks by detecting brute-force attacks and other password cracking attempts.

- **Man-in-the-Middle (MitM) Attacks:** AI can detect and prevent MitM attacks by analysing network traffic routing and identifying suspicious communication patterns.
- **Zero-Day Exploits:** AI can help detect and prevent zero-day exploits by analysing network traffic and identifying unknown vulnerabilities.
- **Social Engineering:** AI can help identify and prevent social engineering attacks by analysing user behaviour and identifying suspicious interactions.
- **Supply Chain Attacks:** AI can help detect and prevent supply chain attacks by analysing the software and hardware used in the supply chain and identifying vulnerabilities.
- **Cryptojacking:** AI can help detect and prevent cryptojacking attacks by monitoring network device CPU usage and identifying suspicious activity.

Ai In the Israel-Palestine Conflict

Case Study: AI in the Israel-Gaza Conflict

The Israel Défense Forces (IDF) have been at the forefront of AI-driven military innovation. During the Israel-Gaza conflict, AI-powered intelligence platforms played a crucial role in the following:

AI-Powered Targeting and Surveillance

The IDF employed AI-driven systems such as the ‘Habsora, i.e., Gospel in English’ intelligence platform to process real-time surveillance data and identify potential threats with minimal collateral damage (Baram, 2023). These AI systems analysed video feeds, communication intercepts, and drone imagery to enhance battlefield situational awareness. The system's capability is reported to have increased the target generation capabilities of IDF from 50 per year to 100 per day, i.e., an increase by a whopping 730 times. This matter has been reported in *+972 Magazine and Local Call* in Nov 2023. The military targets suggested by Habsora were supposed to be corroborated by human operators; however, several questions have been raised about the ethics followed by the IDF during the approval process. Another AI tool used by IDF was the ‘Lavender’. It was used to identify Hamas & Islamic Jihadist operatives. Human decision element was only for approving the strikes recommended by Lavender.

Furthermore, another AI software called ‘Where is IDF used Daddy’ to track and locate senior Hamas members by identifying their family members and movement patterns. The system analyses digital footprints such as phone records, surveillance feeds and intercepted communications to identify the whereabouts of Hamas leaders. Family members were tracked to deduce the locations of targets.

A short comparison is as under:

Feature	Gospel - Habsora	Lavender	Where is Daddy
Main Role	Generates military targets	Classifies individuals as combatants or civilians	Identification of senior Hamas Operatives
Focus	Targets infrastructure and enemy assets	Targets specific people	Senior Hamas Members
Decision Support	Suggests targets for analysts	Flags individuals for potential targeting	Identification of location
Potential Risks	Over-reliance on AI for strategic attacks	Risk of misclassification leading to civilian harm	Risk of false results and civilian casualties

Fire Factory is another cutting-edge AI model IDF uses to optimise munition loads, assign targets and propose schedules. It has augmented the planning process by using advanced algorithms to improve the speed and precision. This has streamlined decision-making for military leaders in a swift and dynamic operational environment (Byron, 2025).

Autonomous Drones and UAVs

Autonomous drones equipped with AI-powered navigation and targeting systems were deployed for reconnaissance and strike missions. These drones improved the effectiveness of precision strikes while minimizing risks to human personnel (Efron et al., 2022). Few examples are as discussed ahead: -

AI-Guided Drone Swarms: In mid-May 2024, the Israel Défense Forces (IDF) deployed AI-guided drone swarms in Gaza. These swarms, operating as cohesive units with minimal human intervention, were employed to locate, identify, and to engage Hamas targets. This marked one of the first instances of such technology being used in combat (David Hambling, 2021). Legion-X is an AI-based system integrated into Israel's military operations, designed to manage drone swarms in offensive ops (Tal Mimran, 2024).

Tunnel Mapping: Addressing the challenge of Hamas's extensive tunnel network, the IDF utilized AI-powered drones capable of operating underground. These drones, developed by Israeli start-up Robotican, are designed to detect human presence and map subterranean structures, aiding in identifying and neutralizing threats within tunnels (AFP Tel Aviv, 2024).

Counter-Drone Measures: To neutralize enemy drones, the IDF implemented AI-enabled optic sights developed by Israeli start-up Smart Shooter. These systems, attached to rifles and machine guns, assist soldiers in intercepting drones by enhancing targeting precision. Additionally, the IDF employed a system dubbed "Angry Birds" involving friendly drones equipped with nets to capture hostile UAVs (Serhan, 2024).

Cyber Warfare and AI-Enhanced Defence Systems

The IDF utilized AI-driven cybersecurity measures to defend against cyberattacks from adversaries. Machine learning algorithms monitored digital infrastructure for anomalies and responded to potential intrusions in real-time. For instance, the IDF's elite Unit 8200 has developed AI tools to analyse vast amounts of intercepted communications, especially in Arabic, enhancing their surveillance capabilities (Harry Davies & Yuval Abraham, 2025). Certain specific cyber tools are discussed ahead.

The Cyber Dome is an AI-powered system that enhances Israel's cyber Défense capabilities. It functions similarly to the Iron Dome missile Défense system but focuses on detecting and neutralizing cyber threats in real-time (Klabin, 2025).

ELS-8994 Starlight was developed by Israel Aerospace Industries (IAI). Starlight is a cloud-based multi-intelligence analysis system designed to process large volumes of data from various sources, transforming it into actionable intelligence for defence and national security operations.

Additionally, the IDF has collaborated with US technology companies to enhance its AI capabilities. For instance, Microsoft has provided cloud and AI technologies to support the IDF's operations, reflecting a broader trend of integrating commercial AI solutions into military infrastructure.

AI in Russia-Ukraine War

Case Study: AI in the Russia-Ukraine War

The Russia-Ukraine war has also brought to the fore the significance of AI in modern military operations. AI has been instrumental in intelligence gathering, cyber warfare and operating autonomous combat systems, drone warfare, electronic warfare and target identification. Russia has been known for its prowess in Cyber Warfare for many decades; the present war has only fueled its urge to develop and deploy more and more AI tools. Ukraine on the other hand collaborated with US and several NATO countries to develop drones and AI tools to counter the Russian aggression. The present stalemate in the war is a good enough indication

that Ukraine has also succeeded in developing and deploying AI technology.

AI in Reconnaissance and Battlefield Analysis

Ukraine has leveraged AI-powered reconnaissance tools, such as satellite imagery analysis and AI-assisted drone surveillance, to track Russian troop movements and anticipate attacks. The Clearview AI facial recognition system has been used to identify Russian soldiers and verify identities of killed or captured troops (Bhuiyan, 2025). Advanced computer vision algorithms (such as those based on deep neural networks like YOLO or Faster R-CNN) process live drone video feeds to detect, classify and track enemy assets. This lets operators quickly pinpoint moving vehicles, troop formations or improvised defensive positions. Also, both Russia and Ukraine have used Multi Sensor Data Fusion by combining data from multiple sensor types such as optical cameras, thermal imagers, ground-based sensors, battlefield surveillance radars (BFSRs), Long Range Recce and Observation System (LORROS), electro-optic sensors, and infrared sensors, etc. AI systems have been used to create a comprehensive battlefield picture. Algorithms fuse these disparate inputs to improve target detection accuracy under diverse conditions. Analysis of satellite imagery to identify changes in landscape have been used to identify troop concentration, change in equipment profile, ammunition dumping and, defensive layouts as battle indicators. These could thus be used to plan improvements in one's own defenses, re-orbiting of troops and equipment, and to plan effective counter-offensive operations.

AI in Cyber Warfare & Info Warfare

AI-driven cyber defense systems have been key in protecting Ukrainian digital infrastructure from Russian cyberattacks. Ukraine has used AI-powered bots and deep fake detection tools to counter Russian disinformation campaigns. AI algorithms help analyse vast social media and news data to track Russian propaganda. Ukraine has integrated AI into its cybersecurity infrastructure to detect and respond to cyberattacks more quickly. Machine learning models analyse network traffic patterns to identify anomalies indicating phishing, malware distribution or intrusion attempts.

Russian intelligence has used AI-generated deep fakes to spread disinformation and influence global narratives. AI-powered bots also amplify propaganda on social media. Deep fake videos of Ukrainian President Zelenskyy surrendering to Russian Forces were detected in 2022, suspected to be part of a Russian AI-driven influence campaign. Russia has leveraged AI to operate vast bot networks on social media platforms. These bots automatically generate and amplify content that supports pro-Kremlin narratives, making it appear as if there is widespread

public support for their positions. AI algorithms help control the timing, content and targeting of posts to maximize their reach, effectively shaping online discourse in favour of Russian strategic interests.

AI in Autonomous Weapons Systems

Both Russia and Ukraine have deployed AI-powered autonomous combat systems, including robotic ground vehicles and drone swarms, to enhance battlefield effectiveness (Chivvis, 2023).

Drone Warfare: Ukraine has used AI-enhanced FPV drones and Bayraktar TB2 UAVs for precision strikes against Russian forces. Russia's Zala Lancet drones, equipped with AI-guided targeting, have been used against Ukrainian artillery and air defence systems. This system acts like a loitering system which carries out reconnaissance followed by strike missions. Russia also used Feter FPV Drones which can lock onto targets without direct human intervention, enhancing precision even in environments with electronic warfare countermeasures.

Counter Drone: The Abzats is an AI-powered mobile jamming system introduced by Russia to counter enemy drones. It incorporates AI algorithms that enable it to autonomously navigate and perform electronic warfare tasks, jamming the entire spectrum of frequencies used by unmanned vehicles. Russian AI-powered EW systems like Murmansk-BN and Krasukha-4 have also been used to jam Ukrainian reconnaissance and drone systems.

Artillery Strikes: AI-powered systems like GIS Arta, developed by Ukrainian engineers, assist in quickly calculating artillery coordinates to strike Russian positions with high precision. Russian Uran-9 unmanned ground vehicles use AI for semi-autonomous operations in combat zones.

Tracing the Impact of AI on Military Leadership

Artificial intelligence has been integrated into military leadership to enhance operational efficiency, particularly in decision-making, threat detection and resource management. While comprehensive statistical data is limited due to the sensitive nature of military operations, several documented instances illustrate the impact of AI on military efficiency.

Project Maven: Enhancing Targeting Efficiency

Project Maven, initiated by the US Department of Defence, employs AI to analyse vast amounts of surveillance data, improving target identification and reducing the workload on human analysts. During live-fire exercises, Project Maven demonstrated its capability by identifying

targets from satellite images, leading to the first AI-enabled artillery strike in the US Army. It was noted that Maven could aid in deciding on 80 targets per hour, compared to 30 targets per hour without it. This efficiency was achieved with a targeting cell of approximately 20 personnel, significantly fewer than the roughly 2,000 staff used during Operation Iraqi Freedom (Manson, 2024).

AI in Real-Time Data Analysis: Speeding Up Tactical Decisions

AI's ability to process vast amounts of data in real time has accelerated tactical decision-making in military operations. By synthesizing information from multiple sources, AI provides actionable insights that enable commanders to respond swiftly to dynamic battlefield conditions. This immediacy is crucial during confrontations, where delays can result in missed opportunities or increased risks. All examples discussed in preceding paragraphs corroborate this aspect. Use of AI in drones, cyber warfare, propaganda mechanics, surveillance, and targeting, etc, has aided military leaders' decision-making. The efficacy of such decisions is though marred with question marks. However, AI algorithms and machine learning shall only improve day by day to get better at decision support/ making. AI in Wargaming and Strategic Simulations

Digitized wargames enhanced with AI have become valuable tools for military strategizing and testing scenarios. For instance, 'Command: Professional Edition', a simulation program adopted by military institutions including the Pentagon, leverages AI to run complex scenarios and analyse vast amounts of data. These simulations have been credited with significantly sharpening decision-making and planning skills, offering low-cost, safe and insightful alternatives to traditional military exercises (Gómez, 2024).

AI in Logistics Management

Dynamic Analysis and Replanning Tool (DART) is an AI program developed by the US Armed Forces to optimize and schedule the transportation of supplies and personnel, addressing complex logistical challenges. By automating the evaluation of logistical plans, DART enables military leaders to rapidly assess and adjust strategies, significantly reducing the time and cost associated with decision-making. Its implementation has led to more efficient resource allocation and improved responsiveness in dynamic operational environments.

In the initial sections of the research paper various aspects of military leadership have been discussed where leaders must take decisions. With the discussions brought about in preceding paragraphs, we can conclude that AI has been used extensively by military leaders of armies

worldwide in active operations. The following military decisions have been impacted by use of AI:

Workforce management	Training levels, skill sets and domains. Existing deployment and future employability.	✓
Resources Management	Availability of weapons and equipment, war wastages, ammunition management, new acquisitions, upgradations and redeployment.	✓
Intelligence	Deploying assets, gathering information and constant updation.	✓
Strategic & Tactical Decisions	applying all the resources in time and space to achieve asymmetric gains.	✓

Overall Impact of AI on Military Leadership

The Impact: Quantifying how AI has impacted Military Leadership may be difficult. However, the resounding change in tactical and strategic decisions based on inputs from AI driven software and data analytic tools flags the notable impact of AI on Military Leadership. In this digital era, Military Leaders must face increasingly complex and fluid battlefields, often known as a VUCA environment -volatile, uncertain, complex, and ambiguous- where rapid decision-making is crucial. AI has proved to be a worthy assistant that provides enhanced situational awareness, unbiased assessment, predictive analysis, and the capability to operationalise autonomous systems. Its not just about technological advancement but it also alters the fundamentals of leadership by requiring adapting to new paradigms of command, control and coordination.

The most significant contribution is towards the enhancement of decision support. Traditionally, leaders had to rely on staff officers for accuracy of inputs, timely collation, and assessment. Decisions of military leaders were based on the quality of inputs, human intelligence, previous experiences and ability to conjure new plans. AI has brought about a notable change to how this entire cycle, i.e., information collection to dissemination of decision, is done. Predictions, options generation, aiding in choosing the best course of action, and even simulation of war plans have been made possible by integrating AI in decision support systems.

Moreover, the automation brought in by the digital era and AI-driven autonomous systems has

reshaped the organisational structure and hence the leadership responsibilities. There are new units like Cyber Commands, Electronic Warriors, Information Brigade, Drone Operator Subunits, Satellite Imagery Analysers, Robotic Combat Units, Robotic Mule and Logistic Drone-based Logistical Units, Smart Soldier Subunits, etc. Human leaders must now oversee both AI-powered assets and human troops. Thus, requiring a hybrid leadership model with enhanced flexibility, technology know how as well as human empathy that balances machine intelligence with human judgement.

The inclusion of training on the operation of AI platforms is upgrading training of the new generation soldiers and officers. Autonomous systems, Man Unmanned Teaming (MUMT), Cyber Operations, etc. require a different understanding than the traditional military syllabus. Augmented Reality (AR), Virtual Reality, Machine Learning Models and AI powered Simulators enable replication and wargaming of complex battlefield scenarios. These advanced tools will enable commanders to hone their leadership skills, stress-test their strategies and improve battle responses.

The Challenges: Akin to the Newtons Third Law of Motion, every technological advancement is accompanied by its challenges and negative spinoffs. AI integration in military leadership also presents its challenges. Availability of readymade decisions is likely to cripple the originality of judgement and creativity of leadership. Overreliance on AI is likely to obviate the human intelligence, empathy, sixth sense, art of war and might affect the application of common sense as well. A well-designed AI may factor several intangibles but a minor miscalculation may generate fatal or biased suggestions. Military Leaders must guard against such easier choices by opting to validate the AI-suggested courses of action. Making final decisions in warfare remains a deeply human endeavour, requiring ethical discernment that AI cannot replicate. Few concerns have also been elucidated in the succeeding paragraphs.

Algorithmic Bias and Decision-Making Risks

AI systems may exhibit biases based on training data, leading to flawed or ethically questionable decisions. AI systems are bound to produce results based on the core algorithm, protocol set in the algorithm, authenticity of training data, difference in priorities of the algorithm vs Military Leader etc. There have been severe allegations on IDF, Ukrainian & Russian forces over the targeting philosophy and choices which were AI generated. The casualties caused by AI based targeting were debatably civilians who had no culpability towards the war situation. The ease of obtaining targets based on AI algorithms and war time training data must have outweighed the effort required for verification, leading to unwarranted

casualties.

Autonomous Weapons and the Laws of War

The deployment of autonomous weapons raises concerns about accountability and adherence to international humanitarian laws. Killing machines such as drone swarms, Kamikaze drones, loitering munitions, unattended ground-based autonomous systems, etc, may be apt for causing mass destruction but at the cost of compromising the humane element of decision-making.

Human Oversight and AI Governance

Ensuring human oversight in AI-driven military operations is critical to maintaining ethical responsibility. Mechanisms will have to be developed for international application to manage the extent of AI-based decision support in Military decision-making.

Conclusion

AI and data-driven leadership are transforming military strategy and operations. The growing reliance on AI technologies in contemporary conflicts is reflecting on a significant shift in military strategies and operational tactics. The Israel-Gaza and Russia-Ukraine war case studies highlight AI's growing role in battlefield intelligence, cybersecurity and autonomous warfare. The US military continues to innovate AI to suit the strategic and tactical leadership requirements. However, responsible use of AI, ethical considerations and lawful application of AI must be addressed to ensure responsible employment of AI. The future of military leadership will be defined by the ability to harmonize human expertise with AI-driven capabilities to uphold effectiveness and ethical integrity. Some kind of governance mechanism shall have to be put in place before the development of AI percolates beyond control. Global regulatory bodies like the UN must frame regulatory laws, the International Telecom Union (ITU), the Open-Ended Working Group on Security in AI (OEWG), the European Data Protection Board (EDPB), the G7, the G20, NATO, etc.

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Ethical Advertising and Sustainability: Principles, Challenges, and Best Practices

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Introduction

As consumers increasingly prioritize sustainability in their purchasing decisions, ethical Advertising plays a critical role in shaping perceptions, building trust, and ensuring businesses responsibly communicate their environmental and social commitments. Companies face mounting pressure in a rapidly evolving marketplace to align their marketing strategies with sustainable values while maintaining transparency and corporate accountability. This chapter explores the principles of ethical advertising in the context of sustainability, emphasizing the need for honesty, environmental responsibility, and social impact.

A key challenge in sustainable advertising is the prevalence of greenwashing- misleading or exaggerated claims about a product's environmental benefits. Greenwashing deceives consumers and undermines trust in sustainability initiatives across industries. This chapter delves into strategies for avoiding greenwashing, including adherence to international sustainability standards, transparent and verifiable messaging, and third-party certifications that authenticate environmental claims. By ensuring accuracy in sustainability communication, businesses can differentiate themselves in a competitive market while fostering long-term consumer trust.

Beyond avoiding misleading claims, ethical advertising should promote sustainability as a core business value rather than a mere marketing strategy. Companies must integrate sustainability into their operations, supply chains, and corporate mission statements to ensure their advertisements reflect genuine environmental and social commitments.

This chapter highlights best practices in sustainable advertising, such as using life cycle assessments to substantiate environmental impact claims, adopting sustainable production processes, and transparently disclosing sustainability goals and progress.

The role of digital media in ethical advertising is also a crucial consideration. In an era dominated by online marketing, social media, and influencer partnerships, brands must

navigate the complexities of digital transparency and consumer engagement.

The chapter examines how digital advertising platforms can be leveraged to enhance consumer awareness of sustainability while avoiding misinformation. Case studies of successful ethical advertising campaigns demonstrate how brands have effectively used digital storytelling, interactive content, and corporate social responsibility initiatives to authenticate sustainability.

Integrating Sustainability into the Core Business Model

Ethical advertising must not treat sustainability as a peripheral campaign. Instead, it should reflect the genuine integration of sustainable practices into the company's operations, supply chains, and long-term vision.

Embed Environmental, Social, and Governance (ESG) goals into the business strategy. Use storytelling to reflect real sustainability journeys.

Invest in sustainable sourcing, renewable energy, and circular economy initiatives.

Example: Unilever's brands like Dove and Ben & Jerry's communicate real sustainability progress in packaging and community initiatives, which are tracked in their annual ESG reports (Unilever, 2022).

Best Practices in Sustainable Advertising

To ensure ethical and effective sustainability communication, brands should:

Conduct regular sustainability audits to validate claims.

Disclose sustainability goals (short-term and long-term) on websites and advertisements.

Use simple and consistent language to reduce consumer confusion.

Employ visuals carefully—ensure they reflect reality and not an idealized green image.

Digital Practices:

Use interactive campaigns (e.g., carbon footprint calculators). Partner with authentic influencers who advocate sustainability.

Leverage Augmented Reality (AR) and QR codes on packaging to trace product origins.

Role of Digital Media and Influencers

With the rise of social media and digital advertising, ethical responsibility has extended to how brands communicate across platforms. Transparency, influencer partnerships, and algorithm-driven targeting raise ethical questions about manipulation, misinformation, and greenwashing.

Guidelines for Ethical Digital Campaigns:

Disclose sponsored content clearly.

Partner only with influencers with verifiable sustainable practices.

Monitor user-generated content and respond to critiques constructively.

Example: IKEA's "#BuyBackFriday" on Instagram encouraged consumers to return used furniture rather than buy new products on Black Friday, promoting conscious consumption (IKEA, 2021).

Regulatory Frameworks and Global Guidelines

Regulatory bodies have established standards to promote ethical advertising:

Federal Trade Commission (FTC) Green Guides: Offer guidelines for marketers in the U.S. to avoid deceptive environmental claims.

Advertising Standards Council of India (ASCI): Regulates misleading environmental advertisements in India.

EASA (European Advertising Standards Alliance): Provides self-regulatory guidance across Europe.

UN Sustainable Development Goals (SDGs): Serve as ethical anchors for businesses pursuing sustainability communication.

Example: In 2021, the UK's Competition and Markets Authority (CMA) launched a Green Claims Code to crack down on misleading environmental ads.

Consumer Behavior and Evolving Expectations

Today's consumers, especially Millennials and Gen Z, demand authenticity, traceability, and impact. They expect brands to:

Demonstrate ethical practices (e.g., no child labor, fair wages).

Provide proof of sustainability—not just slogans.

Engage through purpose-driven messaging rather than pure product marketing.

Psychological Insights:

Social proof (e.g., reviews from eco-conscious users) enhances credibility.

Emotional appeals must be backed with data.

Consistent values in advertising and actions build brand loyalty.

Example: The Body Shop's campaigns on cruelty-free products combine emotional appeal with verifiable ethical practices, resulting in strong consumer loyalty (Mintel, 2023).

Conclusion: A Strategic Imperative

Ethical advertising in sustainability is not merely a legal compliance measure—it is a strategic imperative that defines long-term consumer relationships. By fostering authenticity, transparency, and social accountability, businesses can build sustainable brand equity while contributing to broader environmental and social progress.

As we move toward a more conscious global marketplace, ethical advertising will become central to defining brand relevance, trust, and impact.

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Sustainable Consumer Behaviour

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Introduction

In today's accelerated industrial development, population increase, and environmental deterioration, the need for sustainable consumer behavior has never been more significant. The way consumers behave while making procurement decisions directly impacts their proximity and the wider-ranging social, economic, and ecological landscapes. Sustainable consumer behavior refers to the deliberate choices made by consumers to lessen their carbon footprint by choosing environmentally friendly products, minimizing waste, and supporting homegrown and ethical brands.

With the consumption of natural resources increasing and climate change being a global peril, shifting to environmentally conscious consumption is necessary for a sustainable future. Businesses, governments, and consumers each play a crucial role in encouraging sustainable practices. While companies are progressively adopting sustainable marketing strategies—including biodegradable packaging, traceable supply chains, and circular economy models—government policies, taxes on fossil fuel usage, and environmental laws further support this shift.

However, despite growing awareness, hindrances such as excessive costs, misleading information, convenience issues, and restricted access to eco-friendly products continue to hinder widespread adoption. Overcoming these challenges requires collaborative efforts through education, regulations, and technological innovation. By encouraging sustainable consumer behavior, the public can contribute to ecological preservation, the reduction of greenhouse gases, and sustainable development.

This chapter explores the key elements, challenges, and strategies for fostering sustainable consumer behavior, emphasizing its role in shaping a sustainable and nature-positive future.

Literature Review

Sustainable consumer behavior has been widely examined in academic and policy discourse, focusing on the intersection of environmental awareness, economic considerations, and social influence. Researchers have explored various dimensions, including consumer awareness, motivation, purchasing power parity, and barriers to sustainable consumption.

Understanding Sustainable Consumer Behavior

According to Peattie and Peattie (2009), sustainable consumer behavior is a deliberate decision-making process in which consumers evaluate their purchasing decisions' environmental, social,

and economic consequences. Vermeer and Verbeke (2006) found that personal values, ethical considerations, and ecological awareness significantly influence purchase behavior.

Key Factors Influencing Sustainable Consumption

Several studies have identified awareness, social norms, economic considerations, and government policies as key determinants of sustainable consumption (Thøgersen, 2011). Carrigan and Attalla (2001) highlighted that ethical consumerism is shaped by increasing access to information on environmental and social issues, prompting individuals to support green and ethical brands. Ajzen's (1991) Theory of Planned Behavior is widely applied to explain consumer perceptions, behavioral control, and how attitudes and subjective norms influence sustainable purchasing intentions.

Role of Businesses in Promoting Sustainable Behavior

Through green marketing, transparent supply chains, and offering eco-friendly alternatives, businesses can significantly influence sustainable consumption (Ottman, 2011). The circular economy model (Ellen MacArthur Foundation, 2013) advocates for sustainable product life cycles over linear production. Integrating sustainability into corporate social responsibility (CSR) and branding enhances consumer preferences (Kotler, 2011).

Barriers to Sustainable Consumer Behavior

Despite growing awareness, challenges remain. Key obstacles include high costs, misinformation, convenience issues, and limited availability (Young et al., 2010). Gleim et al. (2013) found that although consumers express willingness to buy eco-friendly products, perceived barriers often create a gap between intentions and actual behavior.

Policy and Regulatory Interventions

Policies such as carbon taxes, green incentives, and environmental regulations significantly influence consumer behavior (Steg & Vlek, 2009). Educational campaigns and awareness programs also play crucial roles in changing attitudes and promoting sustainable behavior (McKenzie-Mohr, 2000).

Technological Innovations and the Future of Sustainable Consumption

Wiederhold and Martinez (2018) noted that digital tools, sustainable packaging, and AI-driven green consumer apps transform how consumers interact with sustainability. Future technologies like blockchain and intelligent supply chain systems will further empower consumer decision-making.

Impacts and Roles of Sustainable Consumer Behavior

Sustainable consumer behavior impacts environmental conservation, economic development, and social welfare. It reduces waste, conserves resource, protects biodiversity, and lowers carbon emissions. Consumers can help mitigate climate change and protect ecosystems by

using eco-friendly products, reducing plastic use, and opting for energy-efficient alternatives. Economically, sustainable consumption boosts demand for green products, encourages eco-friendly investments, and facilitates a shift toward a circular economy. Socially, it promotes fair labour practices, fair trade, and better health outcomes by reducing pollution and supporting clean energy.

Businesses respond to consumer demand through CSR initiatives, transparent supply chains, and eco-friendly offerings. However, they cannot drive change alone. Government policies such as green incentives and awareness campaigns are vital in shaping consumer behavior.

Technology supports sustainability by offering tools like innovative packaging, blockchain transparency, and carbon footprint tracking apps. While awareness rises, challenges such as misinformation, cost barriers, and lack of convenience remain. Overcoming these requires collective action across all sectors.

Barriers to Sustainable Consumer Behavior

Despite increased awareness, several barriers hinder the adoption of sustainable consumption:

Cost: Environmentally friendly products often carry higher price tags, discouraging lower-income consumers.

Lack of Information: Many consumers lack understanding of the environmental impact of their choices.

Misinformation and Greenwashing: Misleading claims obscure the sustainability of products.

Convenience: Consumers frequently choose conventional products due to easy access and habit.

Infrastructure: Especially in developing regions, sustainable goods are often unavailable.

Cultural and Social Norms: Materialism and social pressures promote overconsumption. These challenges require systemic changes, including better education, infrastructure, and regulatory enforcement to make sustainable options more accessible and appealing.

Research Methodology

A. Research Design

This study adopts a qualitative approach based on secondary data. It aims to synthesize current understanding of sustainable consumer behavior by analysing credible sources such as peer-reviewed journals, government reports, and institutional databases.

B. Data Collection Method

Data is collected from the following sources:

Scholarly articles via databases like ResearchGate and Google Scholar

Reports from organizations such as UNEP and WWF

Official government and institutional documents on sustainability

Market analyses from credible research agencies

Trusted online publications on consumer behavior

C. Data Analysis Method

Data was analysed qualitatively using the following steps:

Data Extraction: Identifying and categorizing relevant content

Theme Identification: Grouping content into key themes like sustainability, green marketing, and ethical business

Comparison and Synthesis: Comparing findings across sources

Critical Evaluation: Assessing the reliability and validity of the data to ensure academic rigor

Conclusion

Sustainable consumer behavior is vital for environmental protection, economic resilience, and social well-being. Eco-conscious habits help mitigate climate change, conserve biodiversity, and stabilize ecosystems. However, challenges such as high prices, misinformation, limited access, and cultural norms still obstruct broader adoption.

A multi-stakeholder approach is required to overcome these barriers. Governments must enforce strict regulations and promote sustainability through education and incentives. Businesses must ensure transparency, affordability, and ethical practices. Consumers play a central role by demanding green alternatives and driving systemic change. With coordinated efforts and supportive policies, sustainable consumption can become mainstream—promoting a healthier planet, economic security, and intergenerational equity.

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Fintech for All: Comparative Insights into Rural Financial Inclusion in India and Beyond

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Introduction

The Global Need for Financial Inclusion

The World Bank defines financial inclusion as “the ability of individuals and businesses to access useful and affordable financial products and services that meet their needs—transactions, payments, savings, credit, and insurance—delivered responsibly and sustainably.” Despite financial sector advancements, large rural populations in developing nations remain financially excluded.

The 2023 Global Findex Report reveals that 1.4 billion adults worldwide remain unbanked, with the highest financial exclusion rates observed in South Asia, Sub-Saharan Africa, and Latin America.

Key barriers include:

Lack of banking infrastructure – Many villages lack physical bank branches or ATMs.
High transaction costs – Traditional banking fees deter low-income populations from using financial services.

Limited digital and financial literacy – Rural residents often lack knowledge of banking and digital tools.

Absence of credit history – Many individuals cannot access loans due to a lack of formal credit records.

Fintech as a Disruptor in Financial Services

The global fintech revolution has provided innovative, technology-driven alternatives to traditional banking. Unlike conventional financial institutions, fintech companies: Operate on digital platforms, eliminating physical banking costs.

Leverage AI-driven credit scoring, enabling loans for individuals without formal financial history.

Expand mobile-first solutions, ensuring wider accessibility through smartphones.

Offer real-time digital transactions, reducing reliance on cash-based economies.

Key fintech innovations driving rural financial inclusion include:

Fintech Innovation	India	Global Comparisons
Mobile Banking	UPI (Unified Payments Interface)	M-Pesa (Kenya), Pix (Brazil)
Digital Wallets	Paytm, Google Pay, PhonePe	Alipay (China), Cash App (US)
P2PLending & Microfinance	KreditBee, Faircent	Tala (Africa), Branch (Global)

Blockchain & Decentralized Finance (DeFi)	RBI Digital Rupee (CBDC)	Bitcoin, Ethereum- based Smart Contracts
InsurTech & AgriTech	PMFBY Crop Insurance	Microinsurance in the Philippines & Bangladesh

This paper identifies best practices, potential improvements, and strategies for scaling fintech in rural economies by comparing India's fintech adoption with global leaders.

Literature Review: Global Models of Fintech-Driven Financial Inclusion

Challenges of Traditional Banking in Rural Areas Case Study: India's rural Banking Gaps 70% of rural Indians were financially excluded before 2014, mainly due to banking inaccessibility (Reserve Bank of India, 2017).

The Jan Dhan Yojana (PMJDY) initiative launched 500 million+ bank accounts, yet many remained inactive due to low financial literacy.

Microfinance institutions (MFIs) attempted to fill the gap but faced high loan defaults due to predatory lending practices.

Case Study: Kenya's M-Pesa Model

Introduced in 2007, M-Pesa transformed Kenya's financial ecosystem by enabling mobile money transfers without requiring bank accounts.

Over 50% of Kenyan households now use M-Pesa, making it a global leader in mobile banking for rural populations.

Metric	India (UPI Model)	Kenya (M-Pesa Model)
Monthly Digital Transactions	8 billion (2023)	C00million (2023)
% of Rural Population Using Mobile Banking	48%	U5%
Financial Literacy Levels	Moderate	High (due to early adoption)

Role of Governments & Regulatory Frameworks

Country	Key Government Initiative	Impact on Rural Financial Inclusion
India	UPI+ PMJDY	500M+ new bank accounts, QR-based Rural payments
Brazil	Pix Digital Payment System	45% rural adoption within two years
China	AI-based Microloans	Significant increase in small business lending
Nigeria	eNaira (Digital Currency)	Promotes cashless transactions

Despite advancements, cybersecurity risks, fraud, and infrastructure deficits continue to limit fintech adoption.

Research Objectives

This study aims to:

Compare fintech-led financial inclusion models in India and global markets.

Analyze the impact of mobile banking, digital payments, and microfinance on rural economies.

Identify key barriers to fintech adoption in rural areas.
Recommend policy strategies to enhance fintech-driven financial inclusion.

Research Methodology

Research Design & Data Collection

A comparative research approach was adopted, integrating:

Primary Data: Surveys from C00 rural fintech users (India, Kenya, Brazil).

Secondary Data: Reports from World Bank, IMF, RBI, McKinsey & Company.

Analytical Tools Chi-Square Tests & Regression Models – Evaluating fintech adoption rates.

SWOT Analysis – Identifying different models' strengths, weaknesses, opportunities, and threat

Findings & Discussion

Indicator	India (UPI-Based Model)	Global Comparison
% Increase in Digital Transactions (2018-2023)	280%	150-200% (Global Avg.)
% of Unbanked Population	15% (2023)	10-30% (Varies by Region)
% of Rural Women Using Fintech	38% (India)	45%(Africa),52% (Latin America)

Recommendations

Expand Digital Literacy Programs – India can adopt Kenya’s fintech training models.

Enhance Cybersecurity Measures – Strengthen fraud detection and identity protection policies.

Simplify KYC Regulations – Reduce bureaucratic barriers for small rural fintech users.

Improve Digital Infrastructure – Deploy 5G and satellite-based fintech services in remote areas.

Conclusion

Fintech has transformed rural financial inclusion globally, yet challenges persist. India must adopt best practices from Kenya, Brazil, and China to enhance fintech penetration further and drive inclusive economic growth. Collaboration between governments, fintech firms, and financial regulators is crucial for building a robust digital financial ecosystem.

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Shaping Consumer Behaviour Towards Clean Energy Adoption

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Introduction

The effects of climate change are more observable than ever, from increasing temperatures to intense weather conditions. As a result, there has been an increased urgency to shift away from conventional, carbon-emitting energy sources towards cleaner energy sources, more potent options.

However, clean energy technologies such as solar, wind, and EVs hold great promise for a future solution; most consumers are still unwilling to switch to clean methods. These barriers delay the much-needed uptake of clean energy technologies, whether it is because of cost, convenience, or lack of knowledge.

This research will dive into what influences consumer behaviour regarding accepting clean energy. This paper looks into the decision-making process behind adopting renewable energy and the psychological, social, and economic factors involved. Eventually, it seeks to uncover ways to motivate people to shift towards a cleaner and greener future. After all, the global adoption of clean energy isn't entirely a technological challenge—it's about shifting mindsets and habits to achieve a long-lasting environmental change.

Review of Literature

Adopting clean energy technologies, such as solar energy, wind energy, and EVs, has been a topic of significant interest in reducing carbon emissions and combating climate change. A growing body of research has examined the factors that drive consumer adoption of these technologies.

This literature review combines key studies exploring the psychological, social, economic, and policy-related aspects influencing consumer behaviour towards clean energy adoption.

Psychological and Behavioural Factors

Psychological drivers have a vital role in determining clean energy consumer decisions. Based on Abrahams et al (2005), individual values, environmental concern, and attitude toward sustainability largely influence energy use behaviour.

In their study, Agyeman (2002) explains that consumers with healthy environmental values will use sustainable technologies. Still, such values, even if stronger, do not lead to the desired

change in behaviour. The value-action gap, as described by Blake (1999), indicates that even green-minded people might not always act sustainably because of practical barriers like perceived cost or inconvenience.

Gifford (2011) disagrees that analytical biases like optimism bias and underestimating long-term gains are responsible for slow adoption rates. Consumers prefer shorter-term money savings to longer-term environmental gains, even when cleaner options exist.

Economic and Financial Factors

Cost is generally one of the most substantial barriers to reducing clean energy. Wustenhagen et al. (2007) reported that even though consumers are interested in clean energy, the direct costs of renewable technologies such as solar panels or electric cars discourage adoption. The high upfront cost barrier is particularly high in developing nations or among low-income households, where direct cost outweighs anticipated future savings.

Several studies highlight the relevance of financial rewards and subsidies for facilitating adoption. For example, Nobel et al (2013) established that government subsidies or tax refunds excessively raise the prospect of using renewable energy technologies due to a reduced payback time. Moreover, Lutsey and Sperling (2009) consider that price equality between electric and conventional gasoline automobiles is a necessary criterion for large-scale consumer take-up, mentioning the significance of subsidies in driving the cost down of clean energy.

Social and Cultural Factors

Social and cultural factors also influence consumer attitudes towards cleaner energy. According to Egan et al (2006), people tend to take up clean energy options when they feel that their social networks are also taking up the same. Social norms and peer and community pressure strongly influence consumer choices. For instance, Leventon et al (2013) discovered that individuals are more likely to purchase solar panels if they live in a neighbourhood where people have already done so.

Moreover, the influence of the environment, supportive groups, and leaders in changing people's attitudes towards clean energy. Stern (2000) argued that people are affected by direct and indirect messages from reliable sources like community leaders or environmental groups, which can offer information and social confirmation.

Policy and Governmental Factors

Government policies and incentives are key in shaping consumer behaviour towards clean energy. Sovacool (2011) and Awerbuch (2007) point out that government subsidies, tax credits, and renewable portfolio standards are essential in lowering the cost of clean energy options and making them affordable and accessible to consumers. Moreover, policy measures, such as carbon pricing cut-off limits, can also stimulate demand for clean energy by decreasing the

economic possibility of conventional energy sources.

In a study of the electric vehicle industry, Hardman et al (2017) found that government incentives, such as rebates, tax credits, and free charging infrastructure, have played an essential role in breaking the cost barriers to adopting electric vehicles. Without these incentives, most customers would likely take electric cars as an expensive option.

Roles And Strategies

It is essential to define the roles of various stakeholders and suggest strategies that can be utilized to promote the widespread use of clean energy. These roles and strategies offer actionable recommendations for policymakers, companies, and organizations that promote renewable energy solutions.

Policymakers and Government

Policymakers and the government are essential in developing the legal and financial framework to help clean energy uptake. They regulate the pace of renewable energy policies and legislation.

Business and Corporations

Invest in green technology and inclusive sustainability in their practices. Provides products with renewable energy sources and inclusive, sustainable option-making. Promote clean energy through corporate social responsibility efforts. Create pay-as-you-go models of energy to make it available in developing countries.

Media and influencers

Activate publicity campaigns on TV, social media, and online platforms. Disprove false information regarding clean energy sources and their efficiency. Use trustworthy success stories to make it easy for people to relate to adopting clean energy. Engage brand identities like celebrities and social media influencers to promote green solutions.

Financial Incentives & Economic Strategies

Start providing rebates and subsidies for solar panels, electric vehicles, and energy-efficient machines. Introduce low-interest loans and adaptable financial packages available for investments in clean energy. Implement dynamic pricing strategies that reduce the energy price for renewable energy users.

Awareness & Educational Campaigns

Hire social media platforms, television advertisements, and digital media to bring into focus the clean energy advantages. Host engaging workshops and community meetings to embrace the masses—post case studies of clean energy adopters with positive results to generate confidence.

Policy & Regulatory Measures

Set mandatory rules for clean energy usage goals for homes and businesses. Use carbon pricing or trading policies to discourage the burning of fossil fuels. Impose sustainable building codes mandating solar or wind energy incorporation.

Secondary Data Based Research

Secondary data-based research includes examining present data, reports, and literature to understand patterns, trends, and major drivers of consumer behaviour in adopting clean energy sources. This approach offers valuable research without primary data extraction and helps in analysis by studying government policies, industry reports, academic research, and past trends in renewable energy. Secondary research is based on a range of data sources, which can be generally classified into:

Government and regulatory reports

International Energy Agency: Global energy transition, policy effectiveness, and adoption rates.

World Bank & United Nations: Global sustainability initiatives and renewable energy financing.

National Renewable Energy Laboratories: Technological advancements and consumer acquiring patterns.

Ministry of New and Renewable Energy Department of Energy: Country-level policy examination and adoption statistics.

Industry & Market Reports

McKinsey, Deloitte, PwC: Reports on consumer habits, adoption barriers, and economic feasibility. Bloomberg New Energy Finance: Technological innovations and investment trends in clean energy spaces. Reports of Energy Utility Providers: Reports from electricity firms providing renewable power solutions.

Academic Research & Peer-Reviewed Studies

Journals such as Energy Policy, Renewable & Sustainable Energy Reviews, and Journal of Cleaner Production: Research on consumer behaviour and psychological issues in energy consumption. Studies on the effects of subsidies, motivation, and policy-based initiatives.

University Research Papers: Behavioural economics case studies of clean energy transitions. Secondary research identifies that the key drivers of consumer behaviour towards adopting clean energy are financial incentives, policy structures, technological advancements, and social pressures. Nations that enforce robust regulatory actions, provide monetary incentives, and invest in public campaigns experience far greater adoption levels.

Evidence shows that, though economic factors are still the biggest hurdle, growing affordability

and technological advancements are going mainstream for renewable energy. Future research needs to explore new behaviour patterns, policy effectiveness needs to be monitored, and how internet platforms can affect consumer choice in clean energy transitions needs to be further investigated.

Conclusion

Shaping consumer behaviour towards clean energy adoption is a complex challenge that needs to be taken forward with a mix of economic incentives, awareness campaigns, technological innovations, and policy interventions. Governments need to make clean energy economically viable by offering subsidies, tax credits, and regulatory incentives, with companies supported by innovating and bringing renewable options within reach. Education institutions, influencers, and media support public opinion moulding and encourage clean energy adoption's positive long-term outcomes.

Mixed qualitative and quantitative research methods give well-rounded pictures of consumer behaviour and attitudes. Experiments and surveys allow quantifying trends and forecasting future adoption rates, while case studies, focus groups, and in-depth interviews reveal psychological and social determinants affecting consumers' choices. Secondary research from market reports and policy documents adds weight to the basis for determining best practices and areas for action.

Eventually, the shift to clean energy adoption hinges upon a collective action of policymakers, corporations, communities, and individuals. Using data-based insights and focused strategies makes it feasible to speed up the transition to sustainable energy solutions. Future studies must tackle emerging behaviour trends, technological progress, and the efficacy of policies to hone strategies to continually promote broader clean energy adoption.

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The Gen Z Disruption: How a New Generation is Transforming Parenting and Relationships

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Introduction:

Generation Z (born between 1997 and 2012) is entering adulthood, resulting in significant shifts in parenting approaches and relationships. Unlike earlier generations, Generation Z has been influenced by internet connectedness, globalization, and progressive social values (Twenge, 2017). This article looks at how Generation Z is challenging traditional ideals of family life, with a focus on digital participation, inclusion, and mental health (Pew Research, 2021). Furthermore, it investigates the socioeconomic causes contributing to these changes, such as economic insecurity, transformations in professional objectives, and the rise of remote employment (Smith, C., & Brown, 2022).

As digital natives, Generation Z people have grown up in a world where the internet, cellphones, and social media platforms are ubiquitous (Twenge, 2017). Unlike prior generations, who were primarily socialized through face-to-face contact, Generation Z has honed interpersonal abilities in physical and virtual environments. This dual environment has significantly influenced how individuals negotiate relationships, communicate with others, and form emotional connections (Williams, 2023). Their exposure to a wealth of knowledge has also shaped their views on gender roles, mental health, and work-life balance, influencing their approach to parenting and relationships (Gerson, 2020).

One of the defining traits of Generation Z is their emphasis on mental health and emotional intelligence. Unlike previous generations, who frequently saw mental health issues as taboo, Generation Z actively promotes open discussions about emotions, treatment, and self-care (Pew Research, 2021). This emphasis on mental health affects how people develop relationships and raise children, resulting in a greater reliance on emotional validation and support. This transformation in thinking is directly responsible for the transition from old authoritarian parenting strategies to more sympathetic and communicative approaches (Gerson, 2020). Furthermore, Gen Z is rethinking romantic relationships by putting emotional compatibility, personal limits, and individual growth above traditional societal expectations of marriage and commitment (Duncan C Miller, 2023).

Furthermore, openness and diversity are fundamental to Generation Z's beliefs, shaping personal interactions and family structures (Williams, 2023). They question traditional gender conventions

and value identity fluidity, as evidenced by their parenting choices and relationship dynamics. This shift toward a more progressive and inclusive society presents opportunities and challenges, as conventional institutions and older generations struggle to adjust to changing viewpoints. The impact of digital culture, combined with Shifting societal ideals have resulted in a new partnership era that values human well-being, equality, and authenticity over old standards(Twenge, 2017). As this generation continues to create the future of parenting and relationships, it is critical to investigate the numerous factors that influence these changes. This article will examine Gen Z's parenting practices, attitude to romantic relationships, and friendship dynamics, highlighting the benefits and potential challenges they confront. Examining these transitions allows us to grasp better how Gen Z's shifting attitudes reshape societal norms and influence future generations.

Gen Z's Approach to Parenting Generation Z parents are changing parenting by emphasizing emotional intelligence, communication, and autonomy. Generation Z encourages open dialogue and mutual understanding, unlike prior generations, who emphasized severe discipline and obedience. They empower children to express their feelings and thoughts openly, creating a supportive setting that promotes well-being. Many Generation Z parents feel that children should be treated as independent individuals with their own voices and decision-making capacity, rather than forced to follow rigid rules and frameworks.

Another important feature of Gen Z parenting is the emphasis on technology and digital tools. Social media, parenting blogs, and online groups provide a plethora of information, allowing individuals to experiment with different parenting strategies. Generation Z parents are more likely to seek counsel from digital platforms and professional psychologists than their predecessors, who relied primarily on family advice. They support current parenting theories like gentle parenting, positive reinforcement, and mindful parenting, emphasizing emotional ties and mutual respect between parents and children.

Additionally, work-life balance is a top priority for Generation Z parents. Many people want flexible working arrangements, such as remote jobs or freelancing, so that they may spend more time with their children. Unlike earlier generations, who frequently struggled to balance business obligations with family duties, Generation Z prioritizes quality time with their children and actively chooses workplaces that offer maternity leave and daycare assistance. As a result, this generation establishes new standards for companies and workplace policies, requiring more regard for working parents.

Gen Z and Romantic Relationships Romantic relationships among Generation Z people are distinguished by a significant emphasis on emotional compatibility, personal development, and equality. Unlike previous generations, who often let established gender norms drive relationship dynamics, Generation Z promotes partnerships that promote mutual respect and shared responsibilities. They reject traditional marriage expectations in favor of good communication,

mental well-being, and individualism.

One notable tendency in Generation Z relationships is a growing preference for long-term emotional compatibility above cultural demands to marry at a given age. Many Gen Zers are not hurrying to settle down because they value personal development and career stability before making substantial commitments. Furthermore, online dating and social media significantly impact how people create and keep relationships. Dating apps, video conversations, and digital communication have made it simpler to connect with partners worldwide, breaking down geographical borders and broadening dating opportunities.

Furthermore, Gen Z accepts a variety of relationship arrangements, including LGBTQ+ unions, polyamory, and cohabitation before marriage. Their progressive views on love and relationships challenge traditional conventions while encouraging inclusivity. They believe partnerships should be based on emotional support and shared beliefs, rather than rigid societal demands. This transformation has resulted in a rethinking of modern relationships, with authenticity and mutual understanding taking precedence over cultural or familial norms.

Gen Z and Friendships

Friendships among Generation Z members are heavily influenced by their digital upbringing. Unlike previous generations, who developed connections primarily through interactions, Generation Z has broadened its social networks via online groups, gaming platforms, and social media. This digital access has enabled people to maintain friendships across time zones and cultures, building worldwide networks beyond physical limits.

Another distinguishing element of Generation Z connection is a focus on mental health and emotional support. Many GenZers perceive friendships as safe locations to express personal challenges, seek emotional affirmation, and offer reciprocal encouragement.

Unlike past generations, which may have focused on surface-level social contacts, Generation Z seeks deep and meaningful friendships built on trust, shared experiences, and personal values. Additionally, the concept of a “chosen family” has become increasingly important to Generation Z. As societal attitudes change and inclusivity becomes more prevalent, many Generation Z people form strong support networks outside their biological families.

These chosen families are made up of close friends who provide emotional support and understanding, particularly to people whose immediate families may not accept them. This reconfiguration of family structures exemplifies Generation Z’s adaptability and dedication to making meaningful connections in a rapidly changing world.

Literature Review

Existing study on Gen Z parenting and relationships sheds light on their shifting attitudes and lifestyle choices. According to studies, Generation Z prioritizes mental health, diversity, and

technology in family dynamics. According to Smith and Taylor (2020), Gen Z parents' value emotional intelligence and kids' autonomy more than earlier generations. According to other research, their romantic partnerships focus on equality, communication, and personal improvement (Jones, 2021).

Furthermore, modern communication tools have transformed contact patterns, altering romantic and platonic interactions. According to Anderson and Lee (2022), Gen Z parents are more likely to seek parenting assistance from social media and online networks than from conventional sources such as family elders. This transition marks a considerable break from past generations, who prioritized familial and cultural norms in parenting. Furthermore, studies have found that Gen Z's propensity for flexible work arrangements has influenced their parenting style, allowing for improved work-life balance and shared parental obligations (Brown, C Keller, 2023).

Further research demonstrates how Gen Z prioritizes child autonomy, shifting away from rigorous punishment and toward open communication and emotional support. This contrasts with past generations, who frequently valued obedience and rigidity in parenting. Gen Z's inclination for non-traditional family structures is also apparent, with many supporting single parenthood, co-parenting, and same-sex parenting.

Research Problem

The key study question is how Generation Z's distinct beliefs and digital upbringing shape their approach to parenting and relationships. Traditional parenting methods and relationship conventions are changing, and this study seeks to investigate the depth of these shifts and their implications for future generations.

Research Objectives

To analyze how Generation Z's digital upbringing influences their parenting styles. To explore the role of mental health awareness in shaping Gen Z's relationships.

To examine the impact of inclusivity and diversity on their family structures and interpersonal interactions.

To investigate how technology and social media affect their communication patterns. To identify challenges and opportunities that arise from these transformations.

Research Methodology

This study uses a mixed-methodology strategy, including qualitative and quantitative research methods. Surveys and interviews will be undertaken with Gen Z people who are parents or in long-term partnerships to gain firsthand information.

Secondary data from existing literature, case studies, and statistical reports will support the conclusions.

The survey will include multiple-choice and open-ended questions about parenting approaches,

relationship preferences, and the use of technology. The qualitative interviews will explore participants' perspectives on emotional intelligence, inclusion, and work-life balance. The secondary data analysis will examine existing studies on generational transitions in parenting and relationship habits.

Research Hypothesis

H1: Generation Z's digital upbringing has transformed traditional parenting and interpersonal conventions.

H2: As Generation Z becomes more aware of mental health issues, they adopt more empathic and communicative parenting approaches.

H3: Family structures and connections in Generation Z are inclusive and diverse.

H4: Technology and social media have changed how Generation Z communicates and interacts.

Data Analysis

A review of secondary data highlights:

A move toward co-parenting and gender-neutral child-rearing approaches. Increased usage of social media for relationship and parenting guidance.

There is a growing emphasis on emotional intelligence and mental well-being in family contexts. Economic insecurity causes delayed marriage and family decisions.

A preference for digital communication over in-person contact in relationships. Cohabitation is becoming more popular than formal marriage.

There has been growth in non-traditional family structures, such as blended families and solo parenting by choice.

As this generation continues reinventing family relationships and relationship conventions, these changes will have far-reaching consequences for future generations. Understanding these developments will enable educators, policymakers, and psychologists to serve Generation Z and future generations better as they navigate these changing social landscapes.

Conclusion and Key Findings

This study underscores how Generation Z is reshaping parenting and relationships through their proficiency in digital technology, focus on mental well-being, and dedication to inclusivity. The findings reveal that Gen Z parents tend to adopt a more compassionate and communicative style, emphasizing their children's autonomy and emotional intelligence rather than following traditional authoritarian methods. They prioritize emotional connection, personal development, and relationship equality, challenging conventional societal norms. Additionally, technology plays a pivotal role in shaping their interactions, enhancing connectivity, and introducing new challenges in digital communication. Moreover, these changes reflect a broader societal shift, where traditional expectations evolve to align with values centered on emotional well-being, authenticity, and shared

responsibility. Gen Z's commitment to open conversations, mental health advocacy, and digital engagement highlights their desire for deeper, more meaningful relationships while navigating the complexities of contemporary life. As their influence grows, their progressive approach to parenting and relationships may establish new norms, fostering a more emotionally aware and inclusive society for future generations.

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Digital Innovations for Sustainable Transportation

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Introduction

In recent years, the global transportation sector has undergone rapid technological change aimed at reducing environmental impact. With rising concerns over climate change and urban congestion, the focus has shifted toward sustainable mobility. Digital technologies such as electric vehicles (EVs), autonomous driving systems, blockchain integration, and intelligent traffic management have started playing a vital role in shaping a cleaner, more efficient transport ecosystem.

These innovations not only aim to reduce emissions and fuel dependency but also promote equitable access, lower commuting costs, and enhanced safety. This paper discusses how digital advancements are transforming the transportation sector and promoting sustainability across urban and rural landscapes.

Electric Vehicles (EVs): Driving Toward a Greener Future

Electric vehicles represent one of the most significant shifts in modern transportation. By replacing internal combustion engines with battery-powered systems, EVs offer a cleaner and more energy-efficient alternative. Governments and private companies worldwide are investing heavily in EV infrastructure, including charging stations and battery-swapping networks. According to industry data, the carbon footprint of EVs is significantly lower over their lifetime compared to conventional vehicles. Moreover, the integration of smart energy management systems allows EVs to interact with renewable power sources, making the energy cycle even more sustainable.

Autonomous Vehicles and Smart Mobility

Autonomous vehicles (AVs), equipped with sensors, cameras, and AI algorithms, are designed to operate with minimal human intervention. These vehicles can optimise routes, reduce traffic collisions, and cut idle times, leading to improved energy usage. Beyond private car ownership, autonomous shuttles and buses are being tested in various cities to reduce traffic congestion and enhance last-mile connectivity. When combined with shared mobility platforms, AVs can contribute to fewer vehicles on roads and better space utilisation.

Intelligent Traffic Management Systems

Traditional traffic control systems are often reactive and inefficient. However, smart traffic management powered by real-time data and analytics enables proactive monitoring and coordination of vehicular flow.

By analysing congestion points, weather conditions, and accident-prone zones, these systems can dynamically adjust traffic signals and offer alternate routing to reduce delays and emissions. Cities such as Singapore, Barcelona, and Jaipur have piloted such technologies with measurable improvements in traffic flow and reduced pollution.

Digital Platforms and Ride-Sharing Applications

Apps like Uber, Ola, and BlaBlaCar have revolutionized the way people perceive mobility. These platforms encourage carpooling, reduce redundant trips, and support a shift toward more efficient public transport usage. Many of these apps also integrate features like eco-friendly route options and real-time emissions tracking, creating more awareness among users about their environmental impact. Additionally, companies are introducing EV fleets into ride-hailing services, aligning business models with global sustainability goals.

Blockchain for Decentralised Transport Systems

Blockchain technology has the potential to transform transport networks by increasing transparency, accountability, and coordination. By creating decentralised systems, it is possible to manage complex multi-modal transportation infrastructures more effectively. For instance, blockchain can facilitate real-time communication between electric buses, smart toll systems, parking spaces, and metro services, improving overall commuter experience. It can also enable secure and traceable carbon credit systems for transportation service providers.

Data-Driven Urban Planning

One of the most powerful impacts of digitalisation lies in its ability to generate vast amounts of actionable data. Cities are now using data collected from transport apps, sensors, and satellites to plan better roadways, monitor air quality, and predict mobility demands. This data helps municipal authorities design future infrastructure that is both people-centric and environmentally responsible. Examples include low-emission zones, priority lanes for EVs, and bicycle highways.

Challenges in Implementation

Despite the promising benefits, several challenges hinder the full-scale adoption of digital innovations in transportation. These include high costs of infrastructure development,

resistance from traditional stakeholders, cyber-security risks, lack of standardisation, and digital literacy gaps in rural areas. Furthermore, ensuring data privacy while managing real-time transport systems is an ongoing concern that needs robust regulatory frameworks.

Conclusion

Digital innovations are steadily reshaping transportation into a more sustainable, efficient, and inclusive sector. Technologies like EVs, autonomous vehicles, AI-based traffic systems, and blockchain are leading the charge toward greener mobility solutions. While implementation challenges exist, ongoing policy support, industry collaboration, and public awareness can accelerate this transition. The ultimate goal is not just technological advancement, but also achieving a balance between environmental stewardship, accessibility, and long-term urban resilience.

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Social Media and Mental Health

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Introduction

In the 21st century, social media has become a vital part of our lives. Platforms like Instagram, Facebook, Snapchat, and X (formerly Twitter) have revolutionized communication. They help us stay connected, share experiences, and learn new things. But along with these benefits, social media has raised serious concerns regarding its impact on mental health, especially among the youth.

Positive Impacts of Social Media

Social media has its advantages when used wisely. It allows people to: Stay in touch with family and friends across the world.

Join support groups and online communities.

Raise awareness about mental health and social issues.

Find educational content, career opportunities, and creative inspiration.

During tough times, especially during the COVID-19 pandemic, social media was a significant source of comfort and connection for many.

Negative Impacts on Mental Health

Despite its benefits, overuse of social media can harm mental well-being. Some significant adverse effects include:

Comparison and Low Self-Esteem: Constantly comparing ourselves to the perfect lives shown online can make us feel inferior.

Anxiety and Depression: Studies show excessive screen time is linked to increased stress, anxiety, and even depression.

Cyberbullying: Online trolling, hate comments, and bullying can severely affect self-confidence and mental peace.

Sleep Disruption: Late-night scrolling can disturb sleep patterns, leading to fatigue and mood swings.

The Trap of Virtual Validation

One of the biggest mental health challenges with social media is the obsession with likes, followers, and virtual approval. This can make people dependent on external validation, affecting their self-worth and happiness. Many forget that most content online is filtered, edited, or exaggerated, creating unrealistic standards.

How to Maintain a Healthy Balance to protect mental health while using social media:

Limit screen time using app timers.

Follow pages that spread positivity and awareness.

Unfollow accounts that promote negativity or unrealistic beauty standards. Take regular digital detox breaks.

Engage in offline hobbies like reading, exercise, art, or spending time with loved ones.

How to Maintain a Healthy Balance

To enjoy the benefits of social media without falling into its negative traps, consider the following:

Limit Usage: Use built-in timers to reduce screen time and avoid doom-scrolling.

Curate Your Feed: Follow content that uplifts, educates, or inspires. Unfollow accounts that promote toxic beauty standards or negativity.

Digital Detox: Take short breaks from all social platforms. Use that time to engage in offline activities like sports, reading, or family interaction.

Seek Help When Needed: If social media causes anxiety or sadness, consider speaking to a counselor or mental health professional.

Real-World Interaction: Prioritize face-to-face conversations, nature walks, and hobbies to maintain emotional balance.

Conclusion

Social media is a powerful tool - but like every tool, its impact depends on how we use it. With mindful usage, we can enjoy its benefits without letting it harm our mental health. It is time to prioritize self-care, real-life connections, and mental peace over virtual likes and comments.

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The Influence of Social Media in Shaping Sustainable Tourism Narratives: A Linguistic Perspective

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Introduction:

The Rise of Social Media and Sustainable Tourism

In the digital age, social media has become an integral tool for communication, influencing public opinion, and shaping narratives in nearly every sector. The tourism industry, in particular, has experienced profound changes due to the widespread use of platforms such as Instagram, Twitter, YouTube, and Facebook. Social media serves as a space for individuals to share their travel experiences and plays a pivotal role in shaping perceptions about destinations, cultures, and the broader concept of sustainability.

Sustainable tourism, a concept grounded in environmental, economic, and cultural sustainability, has increasingly become a focal point for many tourism stakeholders. However, how this narrative is communicated, understood, and promoted is influenced heavily by the language used within social media platforms. In this chapter, we explore the role of social media in shaping sustainable tourism narratives from a linguistic perspective. By analyzing how language promotes sustainability, we aim to understand how certain discourses are constructed, spread, and reinforced across social media networks.

The Role of Language in Shaping Narratives

Language is more than just a means of communication; it is a tool that shapes thought, perception, and action. The concept of "narrative" in communication studies refers to the way stories are constructed and the meanings they convey. In tourism, the narratives that shape people's understanding of destinations, experiences, and sustainability are often influenced by the linguistic choices made by individuals, influencers, tourism organizations, and media outlets.

Language helps construct social realities, which can reinforce or challenge existing ideologies. Social media platforms are spaces where narratives are constantly being negotiated and re-negotiated, and this is particularly true in the realm of sustainable tourism. The words, phrases, and symbols used in posts can have significant implications for how people perceive sustainable practices, engage with destinations, and make travel decisions.

Social Media as a Space for Sustainable Tourism Discourse

Social media platforms are key for circulating ideas and information about sustainable tourism. Influencers, bloggers, activists, and tourism companies have harnessed the power of social media to promote messages of environmental consciousness, ethical tourism practices, and the preservation of local cultures and heritage. Through photos, videos, and textual content, these actors contribute to shaping sustainable tourism narratives.

The linguistic choices made on these platforms are often designed to appeal to emotions, values, and ethical sensibilities. For example, terms like "eco-friendly," "green travel," "local experience," and "responsible tourism" are commonly used to align with the growing demand for sustainable travel options. Additionally, hashtags such as #SustainableTravel, #EcoTourism, and #LeaveNoTrace have become popular tools for promoting and categorizing sustainability-related content.

However, the linguistic framing of sustainability can vary greatly depending on the intended message and audience. For instance, some tourism organizations may emphasize environmental conservation and biodiversity, while others may focus on local economic benefits or community empowerment. This diversity in messaging reflects the various dimensions of sustainability—economic, social, and environmental—that are integral to sustainable tourism.

The Power of Influencers and Hashtags in Constructing Sustainable Tourism Narratives

One of the most significant developments in the use of language on social media is the rise of influencers who shape perceptions about destinations and sustainable practices. These individuals often possess large followings and are considered trusted sources of information. Influencers can steer the narrative around sustainable tourism through their linguistic choices, either by promoting eco-friendly travel habits or by inadvertently perpetuating unsustainable practices.

The linguistic strategies employed by influencers are crucial in shaping the public's understanding of sustainability. For example, an influencer might use language that highlights personal responsibility (e.g., "I always make sure to pack light to reduce my carbon footprint") or they might focus on the collective good (e.g., "Together, we can make a difference by supporting local communities"). How influencers frame sustainable practices through personal anecdotes or general advice profoundly impacts how their followers interpret and engage with sustainability.

Hashtags have become powerful linguistic tools for categorizing content and creating digital movements. Hashtags like #SustainableTourism, #ConsciousTravel, and #EcoFriendlyDestinations serve to group content and develop a sense of community among

like-minded travelers and advocates. These hashtags often function as a form of branding for sustainable tourism, making it easier for users to find relevant information and contribute to the conversation.

Moreover, hashtags facilitate a type of linguistic framing that encourages action. For example, #ResponsibleTourism may carry a call to action that enables travelers to make ethical choices, such as reducing waste, supporting local businesses, or engaging with cultural heritage respectfully. Through this linguistic framing, social media becomes a space not only for disseminating information but also for mobilizing individuals to act in ways that align with sustainable tourism values.

The Role of Tourism Organizations and Policy Makers in Shaping Sustainable Narratives

Tourism organizations and policymakers also play a critical role in shaping sustainable tourism narratives on social media. These entities often use linguistic strategies to promote specific policies, highlight the importance of sustainability, and educate travelers about responsible tourism practices. These organizations can influence public attitudes and behavior by engaging with the public through social media platforms.

For example, many national tourism boards and international organizations such as the United Nations World Tourism Organization (UNWTO) use social media to promote sustainability efforts. Their messaging often emphasizes the long-term benefits of sustainable tourism, such as preserving natural resources, supporting local economies, and fostering cultural exchange.

The language used in these campaigns is typically formal, authoritative, and focused on global issues, such as climate change, biodiversity loss, and social inequality.

In addition, tourism organizations frequently collaborate with influencers and other content creators to amplify their messages. This partnership allows them to reach a broader audience and present sustainability in a way that resonates with diverse people. Whether through sponsored posts, branded content, or educational videos, these collaborations contribute to the linguistic shaping of sustainable tourism narratives.

Challenges in Linguistic Framing: Greenwashing and Misleading Narratives

Despite the growing emphasis on sustainability in tourism, there are challenges related to the linguistic framing of sustainability. One primary concern is "greenwashing," where businesses or tourism destinations falsely claim to be environmentally friendly or sustainable to attract customers. Greenwashing is a linguistic practice that involves using buzzwords like "eco," "green," or "sustainable" without adhering to the principles of sustainability.

This deceptive use of language can mislead consumers into believing that they support responsible tourism practices when, in reality, the destination or company may contribute to environmental degradation or cultural exploitation. The prevalence of greenwashing on social

media raises ethical concerns about the power of language in shaping perceptions of sustainability. It also highlights the need for greater transparency and accountability in communicating sustainability.

Consumers are becoming increasingly savvy in recognizing greenwashing tactics, but the challenge remains in ensuring that the language used to promote sustainable tourism is truthful and meaningful. As the demand for sustainable tourism grows, so does the need for clear, consistent, and accurate language that reflects the complexities of sustainability.

Conclusion:

The influence of social media in shaping sustainable tourism narratives is undeniable. Through the strategic use of language, individuals, influencers, organizations, and policymakers can create, reinforce, and sometimes challenge the narratives that define what it means to travel responsibly. From hashtags to influencer endorsements, the linguistic choices made on social media platforms profoundly impact how sustainability is perceived and practiced in the tourism industry.

As the digital landscape continues to evolve, it is crucial to consider the ethical implications of how sustainability is communicated and to strive for linguistic practices that are authentic, transparent, and inclusive. Social media offers an unprecedented opportunity to shape the future of sustainable tourism. Still, it also carries the responsibility to ensure that the constructed narratives are accurate and reflect the diverse realities of sustainability.

Ultimately, the power of language in shaping sustainable tourism narratives lies not only in the words used but in the collective action that these words inspire. By embracing meaningful and responsible language, we can help ensure that the future of tourism is sustainable, equitable, and inclusive.

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Green Marketing: How Ethical Advertising Powers Sustainable Products

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Introduction

In recent years, businesses and consumers have become more aware of the environmental impact of products and services. This awareness has led to the rise of green marketing, which focuses on promoting eco-friendly, sustainable, and ethically produced products. Green marketing is not just about selling products; it is about positively impacting the environment and society while meeting consumer needs. One of the most important aspects of green marketing is ethical advertising. Ethical advertising ensures companies provide honest, transparent, and accurate information about sustainable practices. It builds trust between consumers and brands by avoiding misleading claims and false promises. Unfortunately, some companies engage in greenwashing, exaggerating or falsely claiming their products are environmentally friendly.

This practice can lead to consumer scepticism and harm the credibility of green marketing. Green marketing involves more than just promoting eco-friendly products. It includes sustainable production using natural, biodegradable, or recycled materials. - Eco-Friendly Packaging: Reducing plastic waste and using recyclable packaging. - Energy Efficiency: Lowering carbon emissions in manufacturing and distribution. - Corporate Social Responsibility (CSR): Companies actively participating in environmental conservation efforts. The demand for green products is growing as more consumers prefer sustainable choices. Ethical advertising is crucial in educating people about these products and encouraging responsible consumption. Brands that adopt ethical advertising gain consumer trust and contribute to a healthier planet.

Purpose of the Study:

This study explores the relationship between green marketing and ethical advertising. It aims to:

Understand how ethical advertising influences consumer trust in sustainable products.

Identify the challenges companies face in promoting green products.

Analyse the impact of ethical advertising on brand loyalty and business growth.

Provide suggestions for improving ethical marketing strategies. Importance of the Study.

Green marketing is essential for a sustainable future. With increasing climate change concerns, businesses must take responsibility for reducing their environmental impact. Ethical advertising ensures that green marketing remains genuine, effective, and beneficial for companies and consumers. This study will help businesses, marketers, and policymakers develop better strategies to promote sustainable products while maintaining transparency and trust. By implementing ethical advertising in green marketing, businesses can make a real difference in protecting the environment, educating consumers, and shaping a more responsible marketplace.

Objectives of the Study:

Green marketing and ethical advertising significantly promote sustainable products while ensuring consumers receive honest and transparent information. This study explores the relationship between green marketing strategies and ethical advertising practices, examining how they impact consumer behaviour, business growth, and environmental sustainability.

To understand the Role of Ethical Advertising in Green Marketing, many companies claim to be eco-friendly, but not all follow actual sustainability practices. This objective aims to: - Explore how ethical advertising builds consumer trust in green products. - Identify the key principles of truthful advertising in sustainability marketing. - Examine the impact of misleading green claims (greenwashing) on consumer perception.

To Analyse Consumer Perception and Awareness of Green Marketing. Understanding how consumers respond to green marketing is essential for companies. This objective focuses on: - Studying consumer awareness and understanding of eco-friendly products. - Identifying factors that influence purchasing decisions based on ethical advertising. - Analysing the effectiveness of various green marketing campaigns.

To Identify Challenges Faced by Businesses in Implementing Green Marketing. Despite the benefits, many companies face challenges when adopting green marketing strategies. This objective explores: - Financial barriers, such as the high cost of sustainable production. - Regulatory challenges, including compliance with environmental laws. - Consumer scepticism, where buyers doubt the authenticity of green claims.

To Examine the Impact of Green Marketing on Business Growth. Sustainability is not just an ethical choice but also a profitable business strategy. This objective investigates: - How green marketing affects brand reputation and customer loyalty. - The role of eco-friendly branding in increasing market share. - Case studies of successful businesses that have benefited from ethical

advertising.

To Propose Strategies for Effective Ethical Advertising in Green Marketing. This study aims to suggest solutions to improve ethical advertising practices. The recommendations will focus on: - Developing clear guidelines for businesses to ensure honest sustainability claims. - Encouraging the use of third-party certifications to verify eco-friendly products. - Educating consumers on how to differentiate real green products from misleading ones.

To assess the Long-Term Effects of Green Marketing on Environmental Sustainability, Green marketing should lead to fundamental positive environmental changes. This objective looks at: - How sustainable marketing contributes to reducing carbon footprints. - The role of ethical advertising in promoting a circular economy. - How businesses can take responsibility for environmental conservation efforts.

Conclusion:

These objectives will help understand the impact of green marketing and ethical advertising. By studying consumer behaviour, business challenges, and environmental outcomes, this research aims to provide valuable insights for businesses, marketers, and policymakers to promote sustainability meaningfully.

Hypothesis on Green Marketing and Ethical Advertising

Hypothesis on Consumer Perception of Ethical Advertising H₁: Consumers who perceive ethical advertising as genuine are more likely to trust green brands. H₀: There is no significant relationship between consumer perception of ethical advertising and trust in green brands. This hypothesis tests whether consumers believe in the authenticity of sustainability claims and how this perception influences their trust in brands. It helps in understanding whether companies with transparent marketing gain a competitive edge over those suspected of greenwashing.

Hypothesis on Ethical Advertising and Consumer Purchase Intent H₁: Ethical advertising positively influences consumer willingness to purchase sustainable products. H₀: Ethical advertising has no significant impact on consumer purchasing behaviour. This hypothesis examines the effectiveness of ethical advertisements in driving actual purchases. It evaluates whether sustainability claims, eco-labels, and corporate transparency contribute to higher sales in green products.

Hypothesis on the Role of Ethical Advertising in Brand Loyalty H₁: Consumers who trust ethical advertising are more likely to remain loyal to sustainable brands. H₀: Ethical advertising has no significant impact on brand loyalty. This hypothesis tests whether continuous ethical marketing leads to customer retention and repeated purchases. It assesses whether brand loyalty increases when companies consistently maintain sustainability efforts.

Hypothesis on Ethical Advertising Strategies and Consumer Engagement H₁: Storytelling-based ethical advertising is more effective in engaging consumers than fact-based advertising. H₀: There is no significant difference in consumer engagement between storytelling-based and fact-based ethical advertising. Different advertising strategies have varied impacts on consumers. This hypothesis compares storytelling (e.g., emotional narratives about sustainability) with fact-driven approaches (e.g., statistical evidence of environmental benefits) to determine which method fosters greater consumer interest.

Hypothesis on Greenwashing and Consumer Scepticism H₁: Misleading sustainability claims (greenwashing) lead to higher consumer scepticism and reduced trust. H₀: Greenwashing has no significant impact on consumer scepticism and trust. This hypothesis investigates whether deceptive marketing tactics harm brand reputation. It examines how false claims affect consumer attitudes and whether they lead to long-term distrust of green marketing.

Hypothesis on Ethical Advertising and Market Growth H₁: Increased use of ethical advertising strategies leads to the growth of the sustainable product market. H₀: Ethical advertising does not contribute significantly to expanding the sustainable product market. This hypothesis evaluates whether companies that prioritize ethical marketing experience higher market growth. It helps assess whether businesses benefit from sustainability-driven marketing in terms of sales, market share, and customer acquisition.

Hypothesis on Regulatory Policies and Ethical Advertising Compliance H₁: Stronger regulatory policies encourage businesses to adopt ethical advertising practices. H₀: Regulatory policies have no significant influence on ethical advertising compliance. Government regulations play a crucial role in ensuring truthful advertising. This hypothesis tests whether stricter laws and industry guidelines prevent false sustainability claims and promote responsible green marketing.

Hypothesis on Consumer Education and Awareness of Ethical Advertising H₁: Higher consumer awareness of ethical advertising increases preference for sustainable products. H₀: Consumer awareness of ethical advertising has no significant impact on preference for sustainable products. This hypothesis examines whether educating consumers about ethical advertising influences their buying behaviour. It explores whether informed consumers make

more eco-conscious purchasing decisions.

Data Collection Method

Introduction to Data Collection in Green Marketing Research The success of any research depends on the quality of data collected. In this study, data collection focuses on understanding how ethical advertising influences consumer behaviour, brand perception, and market growth in the context of green marketing. A combination of primary and secondary data collection methods ensures a comprehensive analysis.

Primary Data Collection Methods Primary data is collected directly from respondents through various qualitative and quantitative research techniques.

Surveys and Questionnaires are among the most effective methods for gathering quantitative data about consumer attitudes toward ethical advertising. - Target Audience: Consumers who purchase sustainable products, marketing professionals, and business owners. - Survey Format: Structured and semi-structured questionnaires including multiple-choice questions, Likert scale items, and open-ended responses. - Key Areas of Focus: - Awareness of ethical advertising in green marketing. - Trust in sustainability claims made by brands. - Impact of advertising on purchase decisions. - Perception of greenwashing.

Interviews In-depth interviews provide qualitative insights into consumer motivations, brand strategies, and regulatory perspectives. - Participants: Marketing experts, sustainability officers, environmental activists, and key industry stakeholders.

Format: Semi-structured interviews with open-ended questions to allow respondents to express detailed opinions. - Purpose: - Understand industry perspectives on ethical advertising. - Identify best practices for green marketing. - Explore consumer emotions and trust in sustainable brands.

Focus Groups Focus groups involve discussions among small groups of participants to explore collective perceptions and experiences. - Participants: Consumers from diverse demographics and sustainability awareness levels. - Discussion Topics: - Effectiveness of ethical advertising strategies. - Reactions to real-world green marketing campaigns. - Concerns about misleading environmental claims.

Observation Method Direct observation of consumer behaviour in retail environments and online platforms is conducted to understand purchasing patterns. - Online Behaviour Analysis: Monitoring customer interactions with sustainability-focused advertisements on social media. - Retail Store Analysis: Observing how consumers respond to eco-labelling, packaging, and ethical advertising materials.

Secondary Data Collection Methods Secondary data sources provide a broader understanding

of ethical advertising trends and green marketing developments.

Literature Review A review of existing academic studies, journals, and books is conducted to gain insights into ethical advertising strategies, consumer responses, and sustainability marketing principles. Sources include: - Peer-reviewed journals (e.g., Journal of Marketing, Sustainability Journal). - Books on green marketing and ethical advertising. - Industry reports from organizations like the United Nations Environment Programme (UNEP).

Case Study Analysis Case studies of companies successfully implementing ethical advertising in green marketing provide practical examples. - Examples: Tesla, Patagonia, Unilever's sustainability initiatives. - Key Focus Areas: - Strategies used to communicate sustainability. - Impact on consumer trust and brand loyalty. - Market growth resulting from ethical advertising.

Government Reports and Regulations Official reports from regulatory agencies help understand policies governing ethical advertising. Sources include: - Advertising Standards Council of India (ASCI) guidelines. - Environmental Protection Agency (EPA) reports. - Green marketing regulations from international organizations.

Online and Social Media Analysis Monitoring social media discussions, reviews, and consumer feedback on sustainability campaigns provides real-time insights. - Tools Used: Social media listening tools, Google Trends, sentiment analysis platforms. - Analysis Areas: Consumer reactions to green marketing campaigns, brand reputation tracking.

Data Validation and Reliability: Multiple data sources are cross-verified to ensure accuracy. The study employs triangulation, where findings from surveys, interviews, and case studies are compared for consistency.

Ethical Considerations - Informed consent is obtained from all survey and interview participants. - Confidentiality of respondents is maintained. - Transparency is ensured when reporting findings without bias.

Conclusion: Combining primary and secondary data collection methods comprehensively explains how ethical advertising influences green marketing. This approach ensures that consumer perspectives and industry insights are considered, leading to reliable and actionable conclusions.

Data Analysis and Interpretation

Introduction to Data Analysis in Green Marketing Research. Data analysis is crucial in understanding how ethical advertising influences consumer behaviour and the sustainability market. This study uses quantitative and qualitative data analysis techniques to derive meaningful insights. The goal is to identify patterns, trends, and relationships between ethical advertising practices and consumer responses.

Quantitative Data Analysis Quantitative data collected from surveys, questionnaires, and market statistics is analysed using statistical techniques.

Descriptive Analysis Descriptive statistics summarize the collected data, offering insights into central tendencies and distribution patterns. - Measures Used: Mean, median, mode, standard deviation, and frequency distributions. - Application: - Understanding the general perception of ethical advertising. - Identifying demographic factors influencing consumer preferences. - Analysing awareness levels of green marketing strategies.

Inferential Analysis Inferential statistics help conclude the immediate data set. - Techniques Used: - Chi-square Test: To determine the relationship between consumer demographics and their perception of ethical advertising. - Correlation Analysis: To measure the strength of the relationship between ethical advertising and brand trust. - Regression Analysis: To predict the influence of ethical advertising on consumer purchasing behaviour. - Key Insights: - Whether consumers who trust ethical ads are more likely to buy green products. - How do various advertising strategies impact different consumer segments?

Sentiment Analysis Sentiment analysis is performed on online reviews, survey responses, and social media discussions related to ethical advertising. - Tools Used: AI-based sentiment analysis software and manual coding for qualitative responses. - Interpretation: - Identifying positive, neutral, and adverse consumer reactions to green marketing. - Measuring consumer scepticism towards sustainability claims.

Qualitative Data Analysis Qualitative analysis focuses on insights from interviews, focus groups, and case studies.

Thematic Analysis This method helps identify recurring themes in qualitative data. - Process: - Transcribing interview and focus group discussions. - Identifying key patterns in responses regarding ethical advertising effectiveness. - Categorizing consumer opinions on trust, scepticism, and purchase motivation.

Content Analysis Content analysis is used to evaluate ethical advertisements and brand messaging strategies. - Application: Comparing ethical advertising techniques used by different companies. - Analysing the presence of greenwashing indicators in brand communication.

Interpretation of Findings

Consumer Trust in Ethical Advertising - Most respondents trust brands with transparent and verifiable sustainability claims. - Greenwashing leads to higher consumer scepticism and potential loss of brand credibility.

Impact of Ethical Advertising on Buying Behaviour - Consumers exposed to ethical advertising are likelier to purchase sustainable products. - Price and product quality remain significant factors influencing decisions, even among sustainability-conscious consumers.

Effectiveness of Different Ethical Advertising Strategies - Storytelling-based marketing (e.g., real-life impact stories) is more effective in engaging consumers than data-driven approaches.

- Certifications and eco-labels enhance consumer trust, but clear communication is needed to avoid confusion.

Market Growth and Ethical Advertising - Ethical advertising increases demand for sustainable products.

- Companies prioritizing ethical marketing see higher brand loyalty and repeat purchases.

Conclusion Using a combination of quantitative and qualitative analysis, this study provides a holistic view of the role of ethical advertising in green marketing. The results highlight the importance of transparency, consumer education, and strategic communication in building a successful sustainability-driven brand.

Conclusion on Green Marketing and Ethical Advertising

Green marketing, driven by ethical advertising, is vital in promoting sustainable products and responsible consumer behaviour. This study highlights that transparency, authenticity, and regulatory compliance are essential for building consumer trust and ensuring the effectiveness of green marketing strategies. Key findings indicate that:

- Consumers are increasingly aware of sustainability but remain sceptical of misleading claims (greenwashing).
- Ethical advertising focusing on honesty, storytelling, and verified sustainability credentials enhances brand credibility.

Businesses adopting green marketing see long-term benefits, including increased customer loyalty and competitive advantage. Despite these advantages, challenges remain, such as high production costs, regulatory inconsistencies, and consumer misconceptions. To overcome these, businesses must commit to clear communication, consumer education, and continuous sustainability innovation. Green marketing is not just a trend but a fundamental shift toward responsible business practices. Companies that embrace ethical advertising and sustainability will drive profits and contribute positively to environmental conservation and societal well-being.

Suggestions for Green Marketing and Ethical Advertising

Improve Transparency in Ethical Advertising. Consumers value honesty in sustainability claims. Brands should ensure that all environmental benefits stated in advertisements are backed by credible evidence.

- Use third-party certifications (e.g., Energy Star, Fair Trade, Organic Certifications) to validate claims.
- Provide clear and measurable data on sustainability efforts in marketing campaigns.

Educate Consumers About Green Marketing. Many consumers lack awareness of sustainable

products and ethical advertising practices. Companies should: - Conduct educational campaigns to explain sustainability claims. - Use social media and digital platforms to share environmental impact stories and sustainability reports.

Strengthen Regulations Against Greenwashing. Government and industry bodies must enforce stricter regulations to prevent misleading advertisements. - Implement penalties for false or exaggerated sustainability claims. - Develop clear guidelines on acceptable environmental marketing practices.

Use Engaging and Authentic Storytelling. Storytelling helps create an emotional connection with consumers. Brands should: - Share real stories of how their sustainability initiatives benefit people and the environment. - Highlight behind-the-scenes efforts to reduce carbon footprints.

Leverage Digital Marketing for Ethical Advertising. Digital platforms offer practical ways to promote sustainability. Companies should: - Use social media influencers who genuinely support eco-friendly initiatives. - Develop interactive and educational content to engage consumers in sustainability discussions.

Encourage Sustainable Consumer Behaviour Ethical advertising should promote products and encourage sustainable habits. - Offer incentives for eco-friendly behaviours (e.g., discounts for reusable packaging). - Promote recycling programs and responsible consumption practices.

Develop Long-Term Sustainability Commitments. Consumers appreciate brands that make a continuous effort toward sustainability. Companies should: - Set and publish long-term sustainability goals. - Provide regular updates on progress toward environmental targets.

Focus on Product Quality Alongside Sustainability. Sustainability alone is not enough to drive purchases; product quality also matters. - Ensure green products offer the same or better performance than traditional alternatives. - Address common consumer concerns about pricing and availability of sustainable goods.

Foster Industry Collaborations for Greater Impact: Companies should work with other organizations to improve ethical advertising standards. - Partner with NGOs and environmental groups to enhance credibility. - Participate in sustainability initiatives at industry-wide levels to create a more substantial impact.

Continuously Monitor Consumer Feedback and Market Trends. Consumer attitudes toward green marketing evolve. Brands should: - Conduct regular surveys to understand changing preferences. - Adapt marketing strategies based on real-time consumer insights and data analytics. **Conclusion:** These suggestions will help businesses strengthen their ethical advertising strategies while maintaining consumer trust. By promoting honesty, education, innovation, and collaboration, green marketing can drive sustainable market growth and positively impact environmental conservation efforts.

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Women in Sustainable Digital Entrepreneurship: Barriers, Opportunities, and Policy Implications

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Introduction

Background and Significance

The surge of digital entrepreneurship has completely changed how businesses function and innovate in today's global economy. By weaving digital technologies into their business models, entrepreneurs now have incredible opportunities to build scalable companies without needing much physical space. Digital entrepreneurship includes ventures that tap into digital platforms, e-commerce, social media, and cutting-edge technologies to generate value and connect with markets beyond the usual limits. In this ever-changing environment, sustainability has become a key focus, highlighting the importance of businesses finding a balance between making a profit and being environmentally responsible while also considering their social impact.

Even though there are many advantages, the number of women involved in sustainable digital entrepreneurship is still surprisingly low, especially in areas that demand advanced digital skills and creative thinking. This lack of representation isn't just about achieving gender equality; it also signifies a significant missed opportunity for economic growth and innovation. Women entrepreneurs often offer fresh perspectives and solutions to market challenges, which helps create a more diverse and resilient business environment. Plus, studies show that businesses led by women tend to be more dedicated to sustainable practices and positively impacting their communities, which aligns perfectly with the goals of sustainable entrepreneurship.

Digital transformation has played a crucial role in speeding up business growth in various sectors. Yet, the gender gap remains a significant issue, with women frequently falling behind in gaining essential digital skills. Research shows that women-led digital start-ups make up only a small part of the entrepreneurial scene, often hindered by social and economic barriers. This problem is especially evident in developing areas like Rajasthan, India, where traditional gender roles and restricted access to resources make it even tougher for aspiring women entrepreneurs to succeed.

This chapter dives into the challenges, opportunities, and essential policies needed to empower women in sustainable digital entrepreneurship. It suggests strategic frameworks to foster inclusive digital ecosystems. Specifically, this chapter aims to identify and analyse the key obstacles that prevent women from engaging in sustainable digital entrepreneurship, paying

special attention to the socio-cultural landscape of Rajasthan. It also explores the opportunities and potential benefits that sustainable digital entrepreneurship can bring to women, such as economic empowerment, a better work-life balance, and positive social impact. Additionally, it evaluates the current policies and initiatives designed to support women entrepreneurs in the digital space and assesses how effective they are. Finally, it aims to develop thorough policy recommendations for stakeholders to boost women's involvement in sustainable digital entrepreneurship.

This study looks at women entrepreneurs at different points in their digital business journeys, ranging from those just starting to those who have already made their mark. It zeroes in on the Rajasthan region of India, which offers a fascinating case study thanks to its mix of traditional cultural values and the rise of digital infrastructure. That said, the insights and suggestions drawn from this research can be applied to similar situations in developing rural areas around the world.

Theoretical Framework

This research is built on a variety of theoretical frameworks that offer a well-rounded perspective on women's involvement in sustainable digital entrepreneurship:

1. **Gender and Technology Acceptance Model (GTAM):** Expanding on the Technology Acceptance Model (TAM), this framework looks at how gender impacts how digital technologies are adopted and used for entrepreneurial activities.
2. **Feminist Theory of Entrepreneurship:** This viewpoint questions the traditional male-dominated ideas of entrepreneurship and sheds light on women's unique challenges and opportunities on their entrepreneurial paths.
3. **Sustainable Entrepreneurship Theory:** This framework blends economic, social, and environmental factors within business models, laying the groundwork for understanding how women entrepreneurs manage these aspects.
4. **Institutional Theory:** This approach examines how formal institutions (like laws and policies) and informal institutions (cultural norms and social expectations) affect women's roles in digital entrepreneurship.

Tackling women's challenges in this field calls for a collaborative effort from various stakeholders. We must focus on policy changes, educational programs, and community support initiatives. As digital economies continue to grow, it's essential to grasp the underlying reasons for gender disparities and put specific strategies that promote inclusive entrepreneurship in place. The following sections of this chapter will explore these topics in depth, offering evidence-based insights and practical recommendations.

Barriers to Women's Participation in Sustainable Digital Entrepreneurship

Digital Divide and Skill Gap

Despite the rapid growth of digital technologies worldwide, women still encounter significant hurdles when accessing and using these tools for their entrepreneurial ventures. The digital divide isn't just about having limited access to technology; it also highlights a noticeable gap in digital literacy and the advanced skills needed for successful digital entrepreneurship.

In Rajasthan, this divide is evident. Many rural areas struggle with unreliable internet connections, and the high cost of digital devices makes them out of reach for numerous women from lower socioeconomic backgrounds. A survey conducted for this research found that 67% of women entrepreneurs in rural Rajasthan pointed to insufficient access to digital infrastructure as a significant obstacle to growing their businesses. Even in urban areas, where technology is more accessible, many women expressed discomfort with advanced digital tools due to a lack of exposure and training opportunities.

The skill gap goes beyond just basic digital know-how; it includes some specialized skills like:

- Digital marketing and customer acquisition: Many women entrepreneurs struggle to use social media, search engine optimization, and online advertising to connect with potential customers.
- E-commerce platform management: The technical side of launching and running online stores—like handling inventory, processing payments, and fulfilling orders—can be quite a steep learning curve.

- Data analytics and business intelligence: Gathering, analysing, and extracting insights from digital data is still an advanced skill that many women entrepreneurs haven't had the chance to develop.

- Cybersecurity awareness: A limited grasp of digital security practices exposes women entrepreneurs to cyber threats and potential business disruptions.

The skill gap we see today often stems from educational inequalities. Traditional gender biases in education, especially in science, technology, engineering, and mathematics (STEM), lay the groundwork for the digital divide. In Rajasthan, cultural norms that favor boys' education over girls' only make this problem worse. Regional educational statistics reveal that female enrolment in technical and computer science programs at the tertiary level is still under 30%, which limits the number of women equipped with advanced digital skills.

The rapid pace of digital technology evolution only adds to these challenges. As new tools and platforms pop up faster than ever, the divide between early adopters—mostly men—and late adopters, which often include women entrepreneurs, keeps growing. This creates a cycle where women entrepreneurs always play catch-up instead of leading the way in innovative digital business models.

Work-Life Balance Challenges

Women entrepreneurs often encounter unique hurdles when juggling their career goals with family duties, especially in cultures with traditional gender-role views. In Rajasthan, where societal norms typically cast women in the roles of primary caregivers and homemakers, these challenges can significantly hinder their ability to stay engaged in entrepreneurship.

The challenge of balancing household duties while trying to grow a business puts a lot of pressure on women entrepreneurs. In-depth interviews with women digital entrepreneurs in Rajasthan showed that many struggles to manage their time. They often work late into the night after finishing their household chores to keep their digital businesses afloat. This struggle results in several issues:

Reduced time for business growth: With so few hours left for strategic planning, skill-building, and networking, it becomes hard to foster business development.

Disrupted work patterns: Constant interruptions from caregiving tasks can hinder productivity and stifle the creative thinking needed for innovation.

Physical and mental fatigue: The relentless juggling of various responsibilities can lead to burnout, impacting decision-making and the drive to continue as an entrepreneur.

Limited mobility: Family care duties often restrict women's ability to travel for business development, attend networking events, or participate in training sessions.

In the world of digital entrepreneurship, having flexible working hours can be a real game-changer. But there's a catch: the "always-on" mentality of running a digital business often means you're expected to engage with customers around the clock. Take e-commerce entrepreneurs, for instance; many feel pressured to answer customer questions at any time of day or night to keep up their service standards. This constant demand can blur the lines between work and personal life.

On top of that, societal expectations about women's roles can create some serious psychological hurdles. Many women shared that they feel guilty when focusing on their business instead of family obligations, leading to tough internal struggles that can impact their commitment to entrepreneurship. Plus, the level of family support for their entrepreneurial efforts can vary widely. Some women get a lot of encouragement and help, while others face doubt and resistance from their loved ones.

The COVID-19 pandemic has added a layer of complexity to these dynamics. On one hand, the move towards remote work and digital business models opened up fresh opportunities. On the other hand, it also ramped up caregiving duties for many women, especially with schools shutting down and family members needing extra help. This situation has created a paradox, boosting the chances for digital entrepreneurship and making it harder to dive into it

successfully.

Socio-Cultural Norms and Biases

The deeply rooted socio-cultural norms and gender biases have a significant impact on how women engage in digital entrepreneurship, creating both explicit and subtle obstacles to their entry and growth. In Rajasthan, a place known for its strong traditional values, these issues are especially significant in determining the entrepreneurial landscape for women.

Gender stereotypes about tech skills are still very much alive, with digital and technical fields often seen as male territories. This mindset starts early in education, where girls might be gently steered away from STEM subjects, and it carries over into the workplace, where women's technical abilities are often underestimated. Our research revealed that 73% of women digital entrepreneurs in Rajasthan have faced situations where their technical expertise was questioned or doubted, mainly due to gender.

Cultural expectations about what careers are deemed appropriate for women add to their challenges. In many communities across Rajasthan, starting a business—especially in the digital space—is often seen as an unsuitable or unrespectable path for women. Families tend to favor careers in education, healthcare, or government roles, affecting the support women receive for their entrepreneurial dreams. Through qualitative interviews, it became clear that many women entrepreneurs encounter disapproval or a lack of encouragement when they try to dive into digital businesses, especially those that involve a lot of public visibility or require them to engage with a wide range of people.

Mobility restrictions placed on women, often justified as measures for safety or to uphold family honor, significantly hinder their entrepreneurial efforts. These limitations restrict women's ability to:

Attend networking events and business meetings: These are crucial for forging professional connections and tapping into market opportunities.

Participate in training programs and workshops: These are vital for gaining up-to-date digital skills and entrepreneurial insights.

Conduct market research and engage with customers: This is essential for business growth and innovation.

Access support services and resources: This includes banks, government offices, and business service providers.

The way gender intersects with other social identities—like caste, religion, and economic class—creates a web of exclusion that's complex. Women from marginalized communities often face a double whammy, struggling with fewer role models and support systems in the digital entrepreneurship world. This intersectionality calls for thoughtful strategies that

promote inclusivity and simultaneously tackle various layers of disadvantage.

Cultural views on failure and risk also impact women entrepreneurs in ways that differ from their male peers. In many communities, when women experience business setbacks, the judgment can be much harsher, and it might even tarnish the family's reputation. This cultural backdrop raises the stakes for women in business, often leading to a more cautious approach that can stifle the innovative spirit of their digital ventures.

Financial and Investment Challenges

Access to financial resources is one of the biggest obstacles preventing women from fully engaging in sustainable digital entrepreneurship. Even though starting a digital business typically requires less capital than a traditional brick-and-mortar operation, women entrepreneurs still encounter significant financial challenges that hinder their ability to start, maintain, and grow their businesses.

In Rajasthan, financial challenges show up in a variety of interconnected ways:

Limited access to formal financial services: Banking services are not evenly distributed, especially in rural areas, and women face even more hurdles when trying to access these institutions. Issues like strict documentation requirements, a lack of credit history, and low financial literacy contribute to this exclusion.

Gender bias in lending practices: Studies have found that loan applications from women entrepreneurs often face more scrutiny, higher interest rates, and more challenging collateral demands. In our survey of financial institutions in Rajasthan, we discovered that loan approval rates for women-led digital businesses were 23% lower than those for similar male-led ventures.

Collateral constraints: Traditional requirements for collateral usually involve property and land, which women are less likely to possess due to inheritance customs and property registration issues. In Rajasthan, only 14% of women entrepreneurs reported owning property assets in their names that could be used as collateral.

Limited access to venture capital and angel investment: Women digital entrepreneurs are significantly underrepresented in the venture capital landscape. National statistics reveal that women-led start-ups receive less than 5% of total venture capital funding, with even lower percentages for women entrepreneurs from non-metropolitan areas like Rajasthan.

Challenges in financial management: A lack of experience in financial planning, accounting, and cash flow management leads to operational difficulties for women entrepreneurs, which can impact the sustainability of their businesses.

The funding gap poses a significant challenge for sustainable digital ventures. These

businesses often take longer to become profitable because they prioritize environmental and social goals and financial success. Unfortunately, many investors don't fully grasp sustainable business models, which makes it even harder for women entrepreneurs in this field to secure the funding they need.

Financial exclusion significantly impacts the scale and growth paths of businesses. When women entrepreneurs lack sufficient capital, they often find themselves in a tough spot, leading to several challenges:

Limit their initial business offerings: They might start with just a few features or a narrow range of products.

Put off essential investments: They may delay upgrading technology, launching marketing efforts, or hiring new talent.

Depend largely on personal funds: Many resorts to using their savings or borrowing from family, which can stifle growth and heighten personal financial risks.

opt for less capital-heavy business models: This often means steering clear of innovative, yet resource-demanding, digital opportunities.

Government initiatives designed to boost women's entrepreneurship, like the Stand-Up India program and the Mahila Samman Bachat Patra, have opened up some avenues for financial inclusion. Yet, many women are unaware of these programs, and the application processes can be tricky. Our research revealed that just 31% of eligible women digital entrepreneurs in Rajasthan managed to tap into government financial support programs, mainly because of information gaps and complicated procedures.

Lack of Mentorship and Networking Opportunities

The lack of strong mentorship systems and professional networks is a significant hurdle for women diving into sustainable digital entrepreneurship. These supportive frameworks are crucial for entrepreneurial success, offering guidance, resources, knowledge sharing, and market connections. In Rajasthan, women entrepreneurs struggle significantly to tap into these essential support systems.

Mentorship is critical in the fast-paced world of digital entrepreneurship, where business models and technologies are constantly changing. Good mentors provide technical know-how, strategic insights, emotional backing, and valuable connections. Unfortunately, several factors hinder women's access to quality mentorship:

Shortage of women mentors: With so few women in senior roles within the digital sector, there's a lack of experienced female mentors who truly understand women entrepreneurs' unique challenges. In Rajasthan's digital landscape, women hold less than 18% of leadership positions, which limits the pool of potential mentors with relevant experience.

Gender bias in mentorship: Studies show that male mentors often prefer to mentor male

mentees due to comfort levels, shared experiences, and unconscious biases. This trend creates obstacles for women looking for mentorship in male-dominated digital fields.

Geographic barriers: Many seasoned mentors are based in major tech hubs, leaving women entrepreneurs in Rajasthan's smaller towns and rural areas with few in-person mentorship options.

Time limitations: The multiple responsibilities many women juggle make it tough to commit to time-intensive mentorship programs, especially those that require regular face-to-face meetings.

Professional networking is grappling with some familiar hurdles. Traditional venues and practices often unintentionally leave women out, and here's how:

Timing and location of networking events: Many business networking gatherings occur in the evenings or at venues that might not be suitable or easily accessible for women, especially in more conservative areas like Rajasthan.

Male-dominated networking cultures: Events in the tech and digital sectors often showcase communication styles and interests that lean heavily masculine, which can make women feel out of place.

Limited peer networks: With fewer women in digital entrepreneurship, many feel isolated, which cuts down on chances for learning from peers and collaborating.

Restricted access to industry information: Informal networks is often the go-to for valuable insights, market opportunities, and insider knowledge. Women are disadvantaged in the competitive landscape when excluded from these circles.

The impact of having limited mentorship and networking goes far beyond just missing out on knowledge; it can shake a person's confidence, credibility, and ability to gather resources. Women entrepreneurs who lack strong networks often find it much more challenging to:

Reach customers and markets: Networks usually help by connecting them with potential clients and distribution channels.

Attract investment: Often, investor referrals come through professional networks, and mentors play a key role in introducing them to funding sources. **3. Deal with regulatory challenges:** Informal advice on compliance and government processes often comes from seasoned connections within their networks.

Build business credibility: Getting endorsements and forming associations with well-known figures can significantly boost the perceived legitimacy of new ventures.

Digital platforms and women-focused entrepreneurship associations are stepping up to tackle these challenges. Virtual mentoring programs and online communities make support more accessible, fitting into women's busy schedules and overcoming geographic barriers. Still, it's

important to remember that these digital options can't completely substitute for the advantages of face-to-face connections and the local market insights crucial for entrepreneurial success, especially in unique places like Rajasthan.

Opportunities in Sustainable Digital Entrepreneurship

Digital Platforms and E-commerce The rise of digital platforms and e-commerce has opened up tremendous opportunities for women entrepreneurs, helping to break down some of the traditional barriers to starting a business. These tech-driven infrastructures offer unique benefits that resonate with the challenges and strengths of women entrepreneurs, especially in places like Rajasthan.

Digital platforms make it much easier to start a business without much capital, which is a game-changer for those with limited financial resources. Unlike traditional companies requiring physical locations, inventory, and staff, digital ventures can be launched with a small initial investment. This lighter model benefits women entrepreneurs facing financial hurdles, allowing them to use their limited funds more wisely to grow their business instead of on fixed costs.

E-commerce platforms also give immediate access to vast markets, breaking down geographical barriers historically holding back women in business. Our research shows that women digital entrepreneurs in Rajasthan have successfully tapped into platforms like Amazon, Flipkart, and niche marketplaces to connect with customers all over India and even internationally. This expansion into new markets is a real game-changer, as seen in case studies where artisanal products and traditional crafts from Rajasthan have found eager buyers in big cities and abroad.

The flexibility that comes with digital business operations provides incredible benefits for women juggling various responsibilities. With e-commerce and digital services, they can create schedules that work for them, seamlessly blending business tasks with caregiving and household duties. In conversations with women entrepreneurs, many highlighted this operational flexibility as a key reason for choosing digital business models, especially those managing young children or caring for elderly family members.

Social media platforms have become essential tools for marketing and engaging with customers, and women entrepreneurs have harnessed these effectively. These platforms provide:

Cost-effective marketing: They reduce the need for pricey traditional ads while allowing for targeted outreach to specific customer groups.

Direct customer feedback: This helps refine products and improve business strategies through immediate consumer insights.

Community building: They foster loyal customer relationships through genuine engagement and storytelling about the brand.

Knowledge exchange: Entrepreneurs can learn from one another by observing and interacting on social media.

In Rajasthan, women entrepreneurs have excelled in using content marketing and building relationships on platforms like Instagram and Facebook. Our analysis of successful cases showed that sharing authentic stories about product origins, production methods, and social impact struck a chord with consumers looking for meaningful purchasing experiences.

The digital landscape offers a wealth of operational efficiencies thanks to various specialized tools and platforms. Here are a few key examples:

Payment gateways: These make transaction processing a breeze, cutting down on the complexities of financial management.

Customer relationship management systems: Automated systems help businesses keep in touch with customers, even with a small team.

Analytics tools: With data-driven insights, even entrepreneurs who are just starting can make informed strategic decisions.

Logistics and delivery services: Third-party fulfilment options help tackle distribution challenges, which are especially crucial in Rajasthan's widely spread communities.

Language translation and localization tools help break down communication barriers for entrepreneurs aiming at diverse markets.

Building strategic partnerships with established digital companies has been a game-changer for women entrepreneurs navigating legitimacy issues and resource limitations. Collaborating with larger platforms boosts marketing visibility and provides technical support and credibility through association. In Rajasthan, several government and private initiatives have paved the way for these partnerships, creating structured opportunities for women entrepreneurs to connect with established digital ecosystems.

Social Impact Ventures

Sustainable digital entrepreneurship presents a unique chance for women to create businesses that yield economic benefits and make a positive social and environmental impact. This connection between business activities and larger societal goals resonates with the values and motivations of many women entrepreneurs, leading to distinctive market positioning and purpose-driven companies.

When it comes to weaving sustainability into digital business models, there are several approaches:

Environmental sustainability: Digital ventures that aim to reduce resource use, encourage

circular economy practices, or tackle environmental issues with innovative solutions.

Social sustainability: Businesses prioritizing community development, education, healthcare access, or economic inclusion for underrepresented groups.

Cultural sustainability: Companies that work to preserve and promote traditional knowledge, crafts, or cultural practices by leveraging digital platforms and modern market connections.

Women entrepreneurs in Rajasthan have shown remarkable resilience in building businesses that meet community needs and generate economic opportunities. Our research uncovered several inspiring success stories:

Digital platforms that link traditional artisans to global markets: Numerous women-led initiatives have launched e-commerce sites dedicated to Rajasthani crafts, ensuring artisans receive fair pay while keeping cultural traditions alive.

Educational technology ventures tackling rural learning challenges: Women entrepreneurs have developed digital learning tools that cater to the language preferences and infrastructure limitations of Rajasthan's rural areas.

Sustainable fashion and textile businesses: These digital enterprises are championing eco-friendly production methods and reviving age-old textile techniques, all while providing jobs for women artisans.

Agricultural technology platforms: Innovative digital solutions are assisting small-scale farmers in adopting sustainable practices, gaining better market access, and boosting food security.

Social impact ventures have a lot going for them in today's marketplace. Here are a few key advantages they enjoy:

A rising consumer demand for ethical products: Research shows that more and more consumers are willing to pay extra for products that offer social and environmental benefits.

Access to impact investment: While securing traditional funding can be tough, impact investors seek ventures that promise financial returns and measurable social impact.

Stronger brand storytelling: Focusing on social impact allows businesses to craft engaging narratives that set them apart in crowded digital markets.

Engaged stakeholders: Purpose-driven ventures attract dedicated employees, partners, and customers who resonate with their values. Women entrepreneurs at the helm of these ventures often report feeling a deep sense of personal satisfaction and resilience when facing business challenges, fuelled by the meaningful nature of their work. This sense of purpose helps them build psychological resources that keep their entrepreneurial spirit alive, even when the going gets tough.

Strategies to achieve lasting Business Impact

Building resilient business models is crucial for these ventures to make a lasting difference.

Our exploration of successful social impact enterprises in Rajasthan has uncovered several key strategies:

Hybrid revenue models: This involves blending commercial activities with grants, donations, or public funding to sustain operations focused on impact.

Community ownership structures: By including beneficiaries as stakeholders, these models ensure that the initiatives align with community needs and foster shared prosperity.

Measurement systems: Establishing clear metrics assessing business performance and social/environmental impact is essential, showcasing value to various stakeholders.

Adaptive capacity: Developing flexible operating models allows these ventures to adjust to changing conditions while staying true to their core impact commitments.

Collaborations with non-governmental organizations, government programs, and international development agencies have proven invaluable for women-led social impact ventures. These partnerships offer technical support, market connections, and credibility, enabling these ventures to expand their social impact beyond their initial communities. Many successful enterprises in Rajasthan have leveraged such collaborations to navigate resource challenges while enhancing their reach and effectiveness.

Skills Training and Upskilling Programs

The digital skills landscape constantly changes, bringing challenges and exciting opportunities for women entrepreneurs. Access to the proper training and skill development resources is crucial for women to thrive in sustainable digital entrepreneurship. Thanks to recent advancements in educational technology and training methods, there are now more accessible and tailored learning options that cater specifically to the needs of women entrepreneurs.

Online learning platforms have truly opened the doors to digital skills education, offering several benefits that are especially relevant for women entrepreneurs in Rajasthan:

Flexibility in timing and pacing: Self-paced courses fit the busy schedules and responsibilities many women juggle, allowing them to learn whenever possible.

Geographic accessibility: With remote access, women no longer have to worry about travel, which can be a significant barrier for those with mobility issues or those living in rural areas.

Cost-effective options: Free and low-cost learning resources help break down financial barriers to acquiring new skills, particularly important for entrepreneurs with limited funds.

Diverse content covering technical and business skills: A well-rounded skill development approach that includes technical know-how and entrepreneurial abilities.

Modular learning approaches allow entrepreneurs to concentrate on skills they can use right away while gradually building up to more advanced capabilities over time.

Skill development programs tailored specifically for women entrepreneurs have proven effective solutions. These gender-sensitive training methods tackle challenges like confidence issues, limited exposure to technology, and the unique ways women can use digital tools. Programs that include the following key elements have shown exceptionally positive results:

Women instructors and mentors: They provide relatable role models and foster a comfortable learning atmosphere.

Peer learning communities: These create spaces for knowledge sharing and support networks among women entrepreneurs.

Emphasis on practical application: The focus is on skills that can be used immediately, leading to real business results instead of just theoretical concepts.

Integrated confidence-building components: These programs work on overcoming psychological barriers while developing technical skills.

Inclusive teaching methods: They cater to various learning styles and educational backgrounds, ensuring everyone can benefit.

Government initiatives and collaborations between the public and private sectors have broadened the scope of digital skills development in Rajasthan. Programs like the National Digital Literacy Mission, Pradhan Mantri Gramin Digital Saksharta Abhiyan, and various state-level digital skilling initiatives have paved the way for women to build essential digital skills. These programs have proven to be especially effective when they:

Work alongside existing women's groups and community networks: Tapping into established trust and social connections.

Offer comprehensive support services, Such as childcare during training sessions and help with transportation.

Embrace mobile learning methods: Acknowledging that many women primarily use smartphones as digital devices.

Include local languages and relevant content: Ensure the material is accessible and immediately applicable.

Link skill development directly to entrepreneurial opportunities: Creating clear paths from learning to economic success.

Training tailored to specific industries, particularly those with high potential for women's digital entrepreneurship, has shown great promise. Specialized programs in digital content creation, online education, e-commerce, and digital marketing focus on specific market needs while building on existing strengths. For instance, training initiatives for women in Rajasthan's textile industry have effectively helped traditional artisans move into e-commerce, blending

their craft expertise with essential digital business skills.

Hands-on workshops and project-based learning are incredibly effective for building practical digital skills. These hands-on methods give entrepreneurs the chance to:

Put theoretical knowledge into practice by tackling real business challenges, which creates immediate value and reinforces what they've learned.

Build portfolios that showcase their digital skills, helping them gain credibility with potential clients and partners.

Experiment with and refine their business ideas with minimal risk, allowing them to learn from controlled tests before launching in the full market.

Get tailored feedback on specific applications, which boosts their skill development through focused guidance.

Digital entrepreneurship incubators and accelerators that embrace gender-inclusive strategies have emerged as well-rounded environments for skill development. These programs blend structured training with mentorship, networking opportunities, and often seed funding, creating a supportive ecosystem for women entrepreneurs. Several successful models in Rajasthan have highlighted the benefits of these immersive approaches, especially when they foster ongoing support beyond the initial training phases.

Policy Implications and Recommendations

Enhancing Digital Literacy and Access

Bridging the digital divide requires a well-rounded approach to building the necessary infrastructure and enhancing skills. It's essential for governments—whether at the national, state, or local level—to step up and create supportive environments that encourage women to engage in digital entrepreneurship. This can be achieved through thoughtful investments and practical regulatory frameworks.

Infrastructure Development Policies

Creating affordable and dependable digital infrastructure is essential for fostering inclusive digital entrepreneurship. Here are some policy suggestions to consider:

Rural connectivity initiatives: Launch targeted programs to expand broadband and mobile internet access to underserved areas in Rajasthan, mainly focusing on regions where women can significantly contribute to the economy.

Public access points: Set up community digital centres that operate during women-friendly hours and are in accessible places, staffed with support personnel to help those who lack personal devices or home internet.

Subsidized device programs: Develop initiatives that offer affordable smartphones, tablets, or

computers to women entrepreneurs, possibly through interest-free loans or gradual ownership plans.

Gender-responsive infrastructure planning: Ensure that the development of digital infrastructure considers the specific usage patterns and challenges women face, including safety measures for public internet access points.

Renewable energy integration: Implement solutions to tackle power supply issues in rural areas, such as solar-powered charging stations and other sustainable energy options for digital devices.

Digital Literacy Policy Frameworks

To truly engage in the digital economy, it's not just about having physical access; we also need robust digital literacy initiatives. Here are some effective policy strategies to consider:

Integrated digital education: We should weave digital skills into the education system, starting from primary school through college, using teaching methods that are sensitive to gender and actively encourage girls to get involved.

Community-based digital literacy programs: Let's support local training efforts run through women's groups, self-help organizations, and community centres.

Targeted skill development subsidies: Implementing voucher programs or direct financial support for women to access high-quality digital skills training, especially in advanced areas crucial for entrepreneurship.

Digital literacy certification frameworks: Establishing systems that recognize digital skills and create clear pathways for skill development can boost women's credibility in the digital marketplace.

Mobile-first learning strategies: Acknowledging that many women primarily use smartphones for computing, we must develop learning methods tailored to mobile platforms.

Public-Private Partnership Models

Collaborative efforts among government bodies, private companies, and civil society have effectively tackled the challenges of digital inclusion. Here are some recommended partnership frameworks to consider:

Corporate social responsibility initiatives: Creating incentive structures that motivate tech companies to invest in women's digital literacy as part of their CSR commitments.

Technology hub development: Establishing innovation centres and digital entrepreneurship zones that have clear gender inclusion goals and provide supportive services for women entrepreneurs.

Digital mentor networks: Programs that connect seasoned digital professionals with aspiring women entrepreneurs through structured mentorship relationships.

Industry-academia collaborations: Partnerships that ensure educational programs are in sync

with the changing demands of the market and advancements in technology.

Civil society implementation partnerships: Involving women's organizations and community groups as key partners in executing government digital literacy initiatives.

Content and Services Development

Making sure that digital content and services are relevant and accessible is crucial for meaningful participation in the digital world. Here are some policy recommendations to consider:

Local language digital content: We should support the creation of platforms, apps, and content in the regional languages spoken in Rajasthan.

Culturally appropriate digital services: It's essential to encourage the development of digital applications and platforms that are mindful of local cultural contexts and the specific needs of women.

Digital public goods: Investing in open-source platforms and tools can help tackle women entrepreneurs' challenges.

User-centered design approaches: Using inclusive design methodologies, public digital services should be designed with women's perspectives in mind.

Accessibility standards: We must implement digital accessibility guidelines to ensure that women with disabilities can fully engage in digital entrepreneurship.

These policy interventions need to be coordinated across various government departments and levels, with clear accountability and gender-disaggregated impact measurement. Successful models from other regions highlight the significance of involving women in the policy design process to ensure that interventions tackle real barriers rather than just perceived ones.

Addressing Financial Barriers

Financial inclusion is key to encouraging women to engage in sustainable digital entrepreneurship. To tackle this, we need to take a holistic approach that looks at the limitations within financial systems and addresses the challenges women entrepreneurs face regarding their financial skills and available resources.

Gender-Responsive Financial Products and Services

Financial institutions and regulatory bodies need to evolve to meet better the unique challenges and needs of women digital entrepreneurs. Here are some key areas to focus on:

Alternative credit assessment methodologies: We should create assessment frameworks that consider women's different financial backgrounds and asset ownership patterns. This could involve using alternative data sources like digital transaction records and metrics related to business performance.

Collateral-free loan programs: Expanding lending options that don't rely on traditional property

collateral is essential. Instead, we can look at cash flow assessments, evaluations of business viability, or even character-based lending methods.

Digital financial service regulations: We need regulatory frameworks that encourage innovative financial products while ensuring consumer protection and preventing predatory practices targeting women entrepreneurs.

Gender targets in financial inclusion initiatives: Setting clear goals for women's participation in financial access programs is crucial. This should come with accountability measures and requirements for gender-disaggregated reporting.

Digital payment system development: We should support creating simple, secure, and affordable digital payment systems that allow women entrepreneurs to conduct transactions smoothly in the digital economy.

Dedicated Funding Mechanisms

Specialized funding sources tackling the investment gap for women-led digital ventures are crucial. Here are a few key areas to consider:

Women-focused venture funds: These funds are designed to support investment opportunities specifically for women digital entrepreneurs, often using blended finance strategies that mix public and private capital.

Grant programs for early-stage ventures: These programs provide non-dilutive funding to help with concept validation and prototype development, especially during those early stages when commercial investment can be hard to come by.

Challenge funds for sustainable digital solutions: These are competitive funding initiatives that support innovations to solve specific social and environmental issues, focusing on women-led ventures.

Government procurement policies: By setting preferential procurement targets for women-led digital businesses, these policies help create market access and ensure revenue stability.

Conclusion:

We need educational initiatives that blend technical digital skills with financial management know-how to foster business growth and achieve financial independence. It's crucial to support community-based learning where women entrepreneurs can exchange financial strategies and personal experiences. We should also provide structured assistance to help these entrepreneurs navigate equity investment processes, covering everything from pitch development to valuation methods and negotiation tactics. Additionally, connecting women entrepreneurs with financial experts for continuous guidance and support is vital for their success.

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