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Emerging Technology Enviornment and Social Justice- A Sustainable Approach

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Emerging Technology, Environment and Social Justice- A Sustainable Approach

Dr. Ankur Agrawal and Dr. Sadhana Tiwari

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About the Editors

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Dr. Ankur Agrawal is currently working as Associate Professor at Sharda School of Business Studies, Sharda University, Greater Noida, India. He is a seasoned academician, consultant, corporate trainer, and researcher with over 20 years of experience in the field of business and finance. His expertise spans various domains, including Corporate Finance, Security Analysis, Investment Banking, Green Finance and Entrepreneurial Finance. Dr. Agrawal has conducted numerous training programs for various public and private sector companies on wealth management. Dr. Agrawal has participated in various national and international conferences on contemporary issues in finance and business. He has travelled internationally for various academic assignments, further contributing to his global perspective in the field.

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Dr. Sadhana Tiwari, an Associate Professor at GNIOT Institute of Management Studies in Greater Noida, holds a Doctorate in Management along with an MBA, M.Sc. in Mathematics, PGDFM, and Six Sigma Certification from MSME. With over 8 years of corporate experience at HDFC Bank Ltd. and more than a decade in academia, she specializes in Data Mining Techniques, Predictive Analytics, Artificial Intelligence in Business Environments, and Supply Chain Management. Futhermore, Dr. Tiwari has a robust portfolio of published research papers in various national and international journals and edited books. She has presented her work at numerous national and international conferences and has conducted workshops focusing on data mining methods. She has also developed training content for probationary officers in Indian banks.

Preface

The modern business environment is dynamic and evolving swiftly, bringing new challenges and possibilities to the area of management. Achieving sustainable growth and being competitive in the face of globalisation, technological breakthroughs, shifting customer preferences, and shifting regulatory landscapes requires organisations to constantly innovate and adapt. According to this framework, understandings, models, and solutions for the complex issues that businesses worldwide confront are provided by modern management research. "Emerging Technology, Environment and Social Justice- A Sustainable Approach" an edited volume brings together a wide range of scholarly contributions from practitioners and specialists in the field with the goal of advancing management theory and practice via continuing discussion.

Every chapter provides insightful explanations, factual data, theoretical justifications, and useful conclusions drawn from thorough investigation and analysis. To shed light on urgent challenges and new trends in present era, the contributors use a range of tools, such as case studies, experiments, surveys, and literature reviews, in addition to quantitative and qualitative approaches. The book is organized to give a thorough review of current management research topics and advancements. It starts with chapters that delve into theoretical viewpoints and core concepts, giving readers a firm grasp of important frameworks and principles. The sections that follow concentrate on particular facets of management and provide in-depth evaluations of present issues, best practices and potential paths forward.

In our view, the book will be an invaluable tool for academics, learners, professionals and anybody else who wants to learn more about the complexities and dynamics of modern management. Our goal is to stimulate creativity, teamwork, and ongoing development in the management area by sharing the results of our advanced studies and encouraging multidisciplinary conversation. Our goal is that this book will work as an inspiration for more investigation, debate, and action to address the opportunities and problems influencing the future.

Dr. Ankur Agrawal
Dr. Sadhana Tiwari

Acknowledgement

We would like to extend our heartfelt thanks to authors, publication team, publisher, reviewers who contributed to the successful completion of this edited volume. First and foremost, we are deeply grateful to the contributing authors whose insightful and thought-provoking chapters have made this book a valuable resource. Your expertise and willingness to share your knowledge have been instrumental in shaping the final product.

A special thanks goes to the reviewers who provided constructive feedback and valuable suggestions, ensuring the quality and rigor of the content. Your critical evaluations were essential in refining the chapters and enhancing the overall coherence of the book. We would also like to acknowledge the support and encouragement of our colleagues and friends, your unwavering support and patience during this process have been greatly appreciated. Your understanding and assistance were vital in navigating the challenges and ensuring the timely completion of this work.

Thank you all for your invaluable contributions and support.

Dr. Ankur Agrawal
Dr. Sadhana Tiwari

Contents

Chapter 1

Book Chapter

Selection of Green Supplier Using Integrated Multi-Criteria Optimization Method: A Case Study of Plastic Extrusion and Vacuum Forming Company in India

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Abstract

The manufacturer ideally should have a fair idea about the rating of its suppliers. Today's demands include cost-effectiveness, premium-quality goods, timely delivery, and superior services after the sales and engage in environmental responsibility activity. In recent years, environmental consciousness has increased significantly. Hence, while assessing a supplier, its sensitivity towards the environment must be considered along with economic factors. That is why it can be termed as "green supplier selection." The green supplier selection is considered to be a Multi criteria optimization Problem, which is more popularly known as Multi-Criterion Decision-Making (MCDM) problem. MCDM tools are required to solve such kinds of problems. A case study in India's industrial plastic component manufacturing company was carried out to address the issue. An integrated MCDM approach was deployed for green supplier assessment and selection. The research study, novel in nature, suggests how to rank suppliers as well as how low-rank suppliers incorporating environmental consciousness can

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improve their performance.

Keywords: Green supplier selection. MCDM. TOPSIS. Green supplier selection criteria. Green supply chain management.

1 Introduction

Protection of the environment is the main issue and competitive factor in the manufacturing industry nowadays. Green supply chain strategies and actions are required for every facet of Supply Chain Management (SCM), right from acquiring raw materials from suppliers to delivering finished goods to the customer. (Qureshi, Kumar, & Kumar, 2008). Environmental regulatory bodies and the government are continuously trying and forcing manufacturing industries to restrain traditional SCM practices' ill effects and adopt Green Supply Chain Management (GSCM) practices. (Zhu, Sarkis, & Geng, 2005). Being in the 21st century, deploying GSCM practices is the need of the hour. GSCM methodology is nothing but a judicial blend of traditional SCM with green environmental protection practices for sustainable development Madaan2014.Tyagi, Kumar, and Kumar's (2015) explained GSCM as incorporating environmental thinking into SCM, including product design, material sourcing and selection, manufacturing practices, delivery of the final products to the consumers, and end-of-life management of the product after its intended life. Since the beginning of the 21st century, Green Supply Chain Management has redefined business activities to build a sound economic- environment-friendly ecosystem. (Purba Rao, 2018). Nevertheless, developed countries are in a continuous engagement in adopting and successfully implementing GSCM in their organizations Whereas India is still struggling to adapt and adequately implement GSCM practices.(Chien & Shih, 2007; Dubey & Ali, 2014). In the current global scenario, there is tremendous pressure from international environmental bodies, raising the flag when GSCM practices are not implemented. They are encouraging businesses to recognize the factors that will allow them to properly and effectively follow GSCM guidelines.(Mathiyazhagan & Haq, 2013).

The green supplier selection (GSS) system is critical to the GSCM value chain. Green supplier firms have a highly environmentally sensitive image and focuses on using renewable and environment-friendly energy resources, recyclable and reusable raw materials and consumables, green designing green packaging and packaging material, etc., in their supply chain operations. (Wu et al., 2019). It is not easy to select a green supplier in compression to select a conventional supplier as stated by Aretoulis, Kalfakakou, and Striagka's (2010) and Mendoza and Ventura's (2013) as it has to consider both qualitative as well as opposing selection standards.(Cao, Wu, & Liangb, 2015; Fahimnia, Sarkis, & Davarzani, 2015). That is why GSS is acknowledged as a Multi-Criterion Decision-Making (MCDM)issue. This issue has drawn many researchers' attention in recent times.(Chatterjee, Maji, &

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Pham, 2019; Mathiyazhagan & Haq, 2013; Wu et al., 2019). Additionally, a remarkable increase in research on GSS by Govindan, Khodaverdi, and Jafarian's (2013), Malviya and Kant's (2015), and Tseng et al.'s (2019) in recent years has highlighted the significance of the issue. MCDM strategy is used in making decisions through setting up and fulfilling multiple and conflicting criteria. Its problems are common in daily routine; for instance, if anyone buys a mobile phone, it is qualified by cost, features, storage, looks, camera, etc. While in business, problems are much completed. In recent years this method has been used for better business modelling. Purchase departments of many companies use this method to select their suppliers based on a vast range of criteria such as cost of material, quality, after-sales service, financial stability, etc. (Govindan, Khodaverdi, & Jafarian, 2013; Gunasekaran & Gallear, 2012).

In the recent past, different techniques have been used for suppliers' ranking and selection. ANP, TOPSIS, AI, and integrated techniques are the most used methods for this purpose.(Akcan & Taş, 2019). The TOPSIS-based model has been put forward to score, rank, and select suppliers.(Boran et al., 2009). This model lays out the criteria of cost, quality, delivery, relationship, and closeness for evaluating suppliers. The main advantage of TOPSIS is easy to apply. The steps of the TOPSIS remain the same, whereas many attributes can be changed. TOPSIS has been applied in manufacturing systems, engineering, Supply chain management, trading, promotion-based marketing, and transportation and logistics. Further, it has also been deployed for evaluating human resources, ranking environmental factors, and assessing suppliers. (Govindan, Khodaverdi, & Jafarian, 2013; Gunasekaran & Gallear, 2012).This can further contribute to corporate sustainability.(Okr glicka, Mittal, & Navickas, 2023).

The suggested approach was applied to the industrial plastic component manufacturing company (Plastic Extrusion and Vacuum Forming Company) to select green suppliers. The products have been broadly used for home appliances, like refrigerators' inner plastic bodies and other necessities. This is a raw material usage-intensive industry, the finished product is used in the domestic market, and exported also. It is the reason why selecting the appropriate supplier plays a major role in evaluating how much the businesses accomplish. For this purpose, this paper covers studies and methods in the literature review section and later opines a multi-phase MCDM model for ineffective assessment and selection of a green supplier for a plastic sheet manufacturing company. The case design approach was carried out by selected managers and suppliers.(Chien & Shih, 2007; Tian et al., 2019). This paper meets the following objectives:

1. What are the important and applicable criteria for green suppliers' selection (GSS)
2. How to rank green suppliers using MCDM.
3. How the performance of the lowest-ranked supplier can be improved.

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2 Literature Review

Supplier selection is a crucial facet in the management of supplies and purchasing functions.(Banaeian et al., 2018). Researchers have used a variety of MCDM methods for handling the problems of green supplier selection. Various criteria for supplier selection were explored in the first section of the literature review. These criteria, including quality, timely delivery, and economic pricing, have been used by different companies to assess their suppliers.(Hlioui, Gharbi, & Hajji, 2017). The GSCM approach takes into consideration the environmental hazards, ecological balance, and climate change for all the phases of supply chain management, covering its entire cycle.(Mangla et al., 2014; Min & Galle, 1997). GSCM increases buyers' and suppliers' various opportunities because all corporate and industrial activities are environment protection-centric. (Purba Rao, 2018). The process of GSCM starts with procurement and green purchasing. It exhibits a critical impact on the supply chain environmental effect.(Günther & Scheibe, 2006; Min & Kim, 2012). As far as green supplier selection criteria are concerned, many researchers have taken different criteria based on different experts and different industry inputs across different economies. (Mathiyazhagan, Sudhakar, & Bhalotia, 2018). Lee et al.'s (2009), considered the net cost of the product through its lifecycle, quality as well as technology capabilities, along with green criteria, such as pollution control, green image, green product, environmental management, and green proficiencies.

Chen et al.'s (2010)identified green design, ISO 14001, clean production, R&D on green products, green purchasing, quality, flexibility, and delivery. Kannan, Govindan, and Rajendran's (2015) included environment protection, green image, green product, green innovation, corporate social responsibility, hazard management, and pollution control as criteria to implement GSS. A green supplier makes efforts primarily to use renewable energy sources and save, reuse, and recycle the materials. In addition, its focus remains on green designing as well as green packing while performing GSCM activities .(Wu et al., 2019). The process of selecting and verifying a green supplier is more complicated than that of a conventional supplier. (Aretoulis, Kalfakakou, & Striagka, 2010; Mendoza & Ventura, 2013; Yousefi, Jahangoshai Rezaee, & Solimanpur, 2021). This is the reason why the problem of GSS is treated as a multiple-criteria decision-making (MCDM) issue.(Cao, Wu, & Liangb, 2015). This issue had drawn many researchers' attention in recent times.(Chatterjee, Maji, & Pham, 2019; Wu et al., 2019; Yousefi, Jahangoshai Rezaee, & Solimanpur, 2021). Additionally, a remarkable increase in the research on GSS Chatterjee, Maji, and Pham's (2019), Govindan, Khodaverdi, and Jafarian's (2013), and Malviya and Kant's (2015) recently has highlighted the significance of the matter. Numerous economic and environmental facets have also been taken into consideration to verify and validate green suppliers.(Yu, Yang, & Chang, 2018).

The second part of the literature review deals with the decision-making issue of MCDM

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problems. As far as green supplies selection methods or approaches are concerned, rich literature is available. Zhang, Liu, and Zhai's (2011) classified supplier selection methods into five groups: mathematical programming models, statistical approach, linear weighting models, cost-driven models, and artificial intelligence-driven models.Kannan, De Sousa Jabbour, and Jabbour's (2014) performed a dense review of the literature, exploring MCDM techniques for selecting a green supplier. He found that Linear Programming (LP), Analytic Hierarchy Process (AHP), as well as Data Envelopment Analysis (DEA) were the most favored techniques. Similarly, in another resembling study performed by Govindan, Khodaverdi, and Jafarian's (2013), selecting a green supplier was deemed to be named problem. To solve this issue, TOPSIS, LP, DEA, network analysis, and Analytic Hierarchy Processes can be used. The name of the model was Fuzzy PIvot Pairwise Relative Criteria Importance Assessment (Fuzzy PIPRECIA) model.

Petrović et al.'s (2019) identified seven criteria for the industry: environmental image, recycling, environmentally friendly products, environmental management system, resource consumption, pollution control, and green competencies. Three MCDM methods were applied for GSS, which included fuzzy TOPSIS fuzzy ARAS methods, and fuzzy WASPS, providing a new dimension to achieve the objective.

3 Research Methodology

The study is carried out through a Case study by analyzing and observing a single company, Ambar Enterprise Ltd. The case study technique has a unique benefit in situations when the "How" "Which" and "what" kind of inquiry is being inquired. (Yin, 2013). This study's questions are intended to show "what" are the important and applicable criteria for green supplier selection, "How" should Ambar Enterprise Ltd. Rank the supplier and "how" should improve the performance of the suppliers. This study conducted a questionnaire survey to measure the important and applicable selection criteria and rank the suppliers. The research design of this study will be a combination of both the case study and the survey.

The questionnaire was designed and fabricated based on the results and crux of the literature review. The first questionnaire survey has been sent to five managers of related departments, the intended objective will be to get a list of important and applicable criteria according to their opinion. Similarly, the second survey will be sent to the purchasing manager to rank the suppliers against the identified selection criteria list. Cronbach's alpha has been deployed to ensure the statistical reliability of the collected data set. Cronbach's alpha is coming to 0.78, which shows a higher internal reliability level. Mann- Whitney U-test, TOPSIS (Technique for Order Performance by Similarity to Ideal Solution) analysis and Parametric Analysis have been used to analyse the data.

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1. Mann–Whitney U-test H0 = statistically, there should be no difference in the importance and applicability of the criteria for GSS. H1= the importance and applicability of the criteria for GSS must be different, statistically. To assess whether the mean scores of the collected information, are significance and relevant, Mann–Whitney U-test has been applied. It is a non-parametric evaluation method used to compare two data means from the same population. It also examines whether the mean of the two data sets is equal.

2. TOPSIS Analysis Hwang and Yoon incepted the idea to design TOPSIS to solve MCDM problems. It is used for ranking the decision-making alternatives. This technique's basic philosophy states that the best alternative should have the minimum distance to the positive ideal solution and the maximum distance from the negative ideal solution. The initial step of this process is to establish a benchmark, i.e., the "Ideal Positive Solution (IPS) and Ideal Negative Solutions (INS).The second step is to form a normalized decision matrix showing these numbers. The third step is to choose the largest normalized and weighted score to obtain each criterion's positive ideal solution. Similarly, choose the least normalized and weighted score to obtain the negative ideal solution for each attribute.In the final step, one needs to calculate and figure out how far or close each alternative is from the PIS and NIS.

3. Parametric Analysis The basis of this analysis is to change only one criterion while keeping the values of all other evaluation factors constant for entire data sets.

4. List of Criteria A survey was conducted to verify and certify the proposed green supplier evaluation criteria. To evaluate, the important and applicable green supplier evaluation criteria, a questionnaire was developed. It contains two aspects, namely economic, environmental aspects.(see table 1).

DOI:10.48001/978-81-966500-3-2-1 | ISBN: 978-81-966500-3-2 |

Table 1. List of Green Supplier Selection Criteria

Aspect	Main Criteria	Sub Criteria (Alternatives)
Economic Aspect	Cost	Cost of Material
		Ordering & Holding cost
		Freight cost
	Quality	Rate of Rejection
		Product Performance
		Quality Inspection Methods
	Delivery service	On-time Delivery
		After Sales Service
		Delivery Speed
		Responsiveness in solving complaints
Environment Aspect	Flexibility	Flexibility in ordering
		Flexibility in Delivery time
		Flexibility in Giving Discount
	Environmental management system	ISO14001 Certification
		Ozone-depleting Chemical used
		Eco-Labeling
		Use of environment-Friendly Raw Materials
	Green Product Image	Green certification
		Reuse
		Green packaging
		Air emissions
		Wastewater
		Hazardous wastes
	Eco-Design	Recycle of Products
		Re-Manufacturing of Products when Design
		Decrease the use of Hazard Materials in production
	Green Technology	Capability of R&D
		Process alteration to save natural resources
		Use of green raw material
	Green Transportation	Using a modern eco-efficient transportation fleet
		Use of green fuels

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4 Analysis

To analyze the first objective, a survey has been conducted. The managers (respondents)had given their preferences on a scale of 1 to 5 for each criterion. The mean value of each criterion was taken to evaluate the importance level and applicability level. The results are depicted in the following figure.(see figure 1).

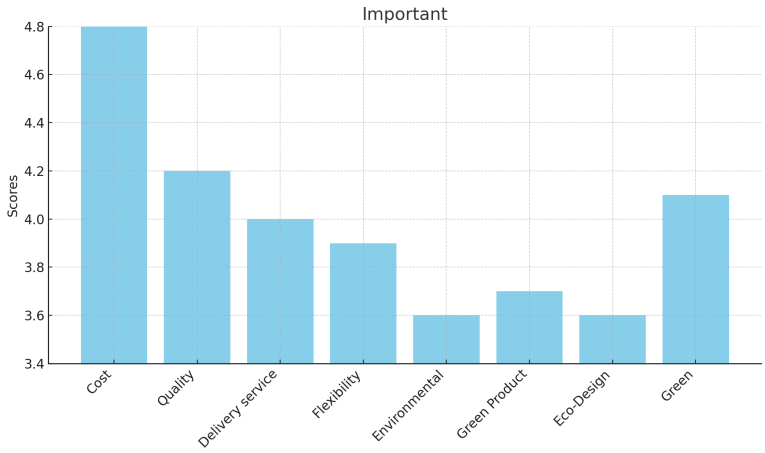

Figure 1. Important green supplier evaluation Criteria

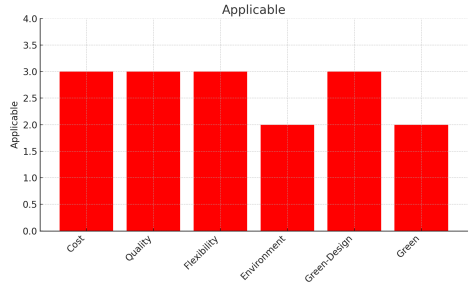

Figure 2. Applicable green supplier evaluation Criteria (analysis)

DOI:10.48001/978-81-966500-3-2-1 | ISBN: 978-81-966500-3-2

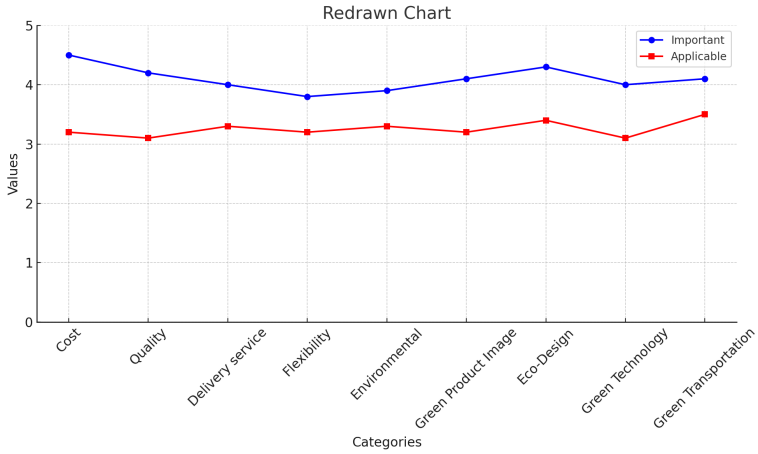

Figure 3. Important and Applicable Green Supplier Evaluation Criteria

The graph depicts important green supplier evaluation criteria. The manager gave importance to the economic aspect during supplier evaluation rather than the environmental aspect. It can be easily observed cost is at the top of the list with the highest score of 4.6; in contrast, the green product image was at the bottom of the list with a 3.9 score. Quality 4.6, flexibility 4.4, Delivery and Service 4.2, with a percentage of 92%, 88%, and 88%, followed respectively. Green transportation had more importance compared to other environmental criteria in the list. Green technology and eco-design had equal importance. Figure 2 depicts the applicable supplier evaluation criteria. As can be observed, cost is the most applicable criterion, with a score of 3.7 on the list. This was followed by Quality 3.2, flexibility; delivery service, and green product image have the same score of 3.5. It can also be observed from Figure 2 that green image had the top score of 3.5, succeeded by green transport at 3.1, Eco-design at 2.9, and green technology at 2.4.

Figure 3 shows that although all nine identified green supplier selection criteria are important and applicable cost, quality, environmental management, and green transportation are more important than the remaining criteria. So, the company should give more emphasis on these criteria for the evaluation of suppliers. Mean scores of importance and applicability have been collected and Mann–Whitney U-test has been applied by using SPSS. The test is done on ranked scores, which are not normally distributed. The p-value for all the criteria has been calculated. The p-value > 0.05 for all the attributes shows no significant difference between the importance and applicability of the attributes. It can be concluded that a good correlation between the criteria, we have taken for GSS concerning importance and applicability.

DOI:10.48001/978-81-966500-3-2-1 | ISBN: 978-81-966500-3-2

To analyse the second object, ranking the suppliers, the multi-criteria decision-making method TOPSIS has been applied. Seven leading suppliers are known as S1, S2, S3, S4, S5, S6, and S7 have been taken. Selecting the best supplier among these seven alternatives based on nine criteria is complicated. That is why; the company's purchasing manager cannot make the right strategic decision for making long-term collaboration with the suppliers. Therefore, this section aims to evaluate and select the best suppliers for the company using TOPSIS. It is a simple mathematical equation for determining the best alternative. It has a straightforward computation process. The philosophy of this method is that the best alternative should have the minimum distance to the positive ideal solution (PIS) and the maximum distance from the negative ideal solution (NIS).‖ The closeness Coefficient (CCI) of each alternative is derived as closer to the PIS and farther from NIS and CCI approaches to 1. The steps-wise results of TOPSIS are as follows.

1. The company's purchasing manager was asked to rate the performance of the suppliers against each attribute so that the decision matrix can be formed.(see table 2).

2. Obtaining a normalized decision matrix.(see table 3).

Criteria	Cost	Quality	Delivery service	Flexibility	Environmental management system	Green Product Image	Eco-Design	Green Technology	Green Transportation
S-1	4	4	3	4	5	4	2	2	5
S-2	3	5	4	2	4	3	3	2	4
S-3	2	4	3	3	3	4	3	3	4
S-4	4	3	2	3	4	5	2	2	5
S-5	5	3	5	4	2	5	2	1	3
S-6	2	2	2	5	3	4	1	3	4
S-7	5	1	3	1	2	4	3	2	4

Table 2. A table with rotated headers

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Table 3. The normalized data set

Criteria	Cost	Quality	Delivery service	Flexibility	Environmental management system	Green Product Image	Eco-Design	Green Technology	Green Transportation
S-1	0.406	0.547	0.344	0.486	0.547	0.385	0.652	0.530	0.456
S-2	0.205	0.547	0.468	0.245	0.695	0.480	0.374	0.530	0.342
S-3	0.309	0.328	0.229	0.245	0.289	0.480	0.496	0.397	0.456
S-4	0.503	0.219	0.344	0.370	0.168	0.480	0.378	0.268	0.342
S-5	0.409	0.110	0.574	0.122	0.148	0.193	0.289	0.268	0.342
S-6	0.213	0.437	0.229	0.608	0.277	0.129	0.124	0.268	0.342
S-7	0.509	0.110	0.344	0.364	0.134	0.195	0.124	0.268	0.342
The Best	0.213	0.547	0.574	0.608	0.695	0.480	0.652	0.530	0.456
The Worst	0.503	0.110	0.229	0.122	0.148	0.193	0.124	0.268	0.342

3. Calculate the distance from PIS and NIS for each alternative. Calculate ranking and closeness coefficient (CCi).(see table 4).

Based on nine criteria, the ranking of the suppliers has been obtained. S1 is found to be the best supplier with CCI score of 0.8286, whereas supplier S7 was found to be the lowest rank supplier with CCI score of 0.0598.

To analyze, the third objective i.e.,to improve the Performance lowest-ranked supplier's performance (S7).A parametric analysis technique has been applied to determine which criterion should be focused on so the performance of the supplier can be improved. This is done by changing the weight of one criterion while keeping other criteria constant and seeing how much suppliers' performance would change.We applied parametric analysis to find out among nine main criteria have more effect on the supplier's performance (see table 5). In the table, we can see some criteria such as the cost being not alien with the performance, which means increasing the weight of Cost, Performance is decreased. Similarly, other criteria like quality, delivery service, and flexibility are alien to performance

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Table 4. Rank the supplier

Suppliers	Distance between the worst Alternatives	Distance between the best Alternatives	Distance between the worst and the best	Ranking the suppliers
S-1	1.456739	0.352071	0.828671	1
S-2	1.442791	0.698345	0.678423	2
S-3	0.972341	0.652311	0.601824	3
S-4	0.295671	0.855076	0.307531	4
S-5	0.479612	1.286531	0.287643	5
S-6	0.619571	1.270653	0.195632	6
S-7	0.092316	1.478235	0.059832	7

which meaning by increasing the weight, performance is also increased.

Table 5. Performance of S7 by changing the weight (1-5)

		Cost	Quality	Delivery service	Flexibility	Environmental management system	Green Product Image	Eco-Design	Green Technology	Green Transportation
Weight	1	0.135	0.037	0.077	0.047	0.046	0.043	0.046	0.049	0.042
	2	0.090	0.034	0.018	0.046	0.046	0.046	0.058	0.046	0.042
	3	0.076	0.042	0.045	0.054	0.098	0.054	0.087	0.058	0.047
	4	0.058	0.065	0.087	0.078	0.147	0.093	0.126	0.106	0.047
	5	0.049	0.097	0.122	0.097	0.198	0.099	0.168	0.127	0.057
	Difference	-0.091	0.681	0.119	0.148	0.072	0.120	0.076	0.029	0.056

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Figure 4 shows the performance of the lowest-ranked supplier (S7) at a different weight (1 to 5). It has been observed that cost has a reverse relation with the performance of the supplier. Whereas other green supplier evaluation criteria such as quality, delivery service, flexibility, green product image, eco-design, green technology, and green transportation directly correlate with the supplier's performance. Figure 5 shows the difference between the lowest and highest values of Performance of S7. As demonstrated in Figure 5 the difference of green Performance of S7If the performance difference is high, then any green supplier selection criteria are more effective. Flexibility has the highest performance difference, Whereas, Cost is considered a negative criterion in terms of flexibility. Flexibility is decreased by increasing the cost. Suppliers should try to decrease Table 5 calculated by changing the weight (1 to 5) of one criterion and keeping other criteria constant. Flexibility in the delivery for improvement. Delivery services and green product image have almost equal importance for performance improvement. Moreover, the remaining criteria are also helpful in S7 for performance improvement.

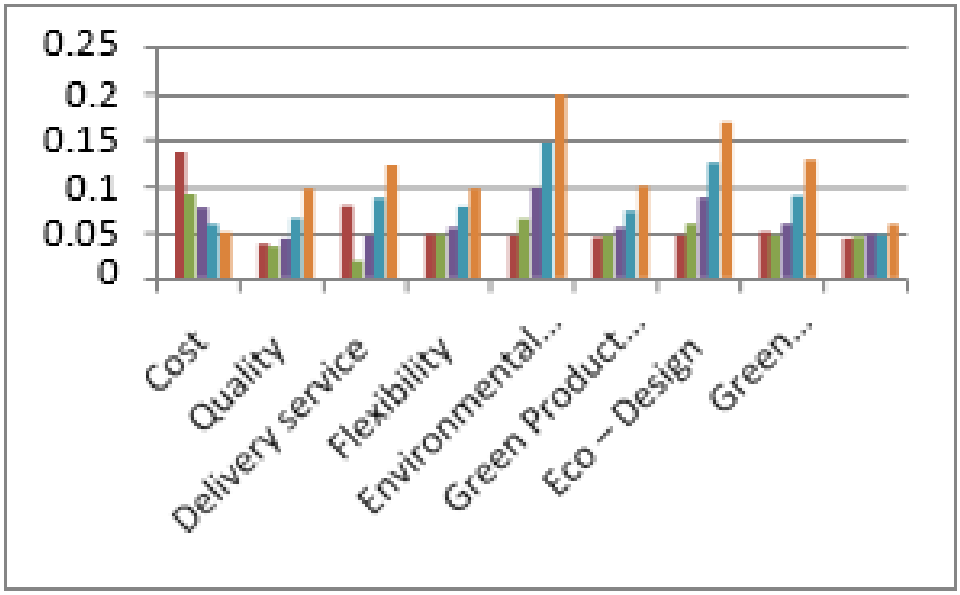

Figure 4. Performance of S7 by changing the weight (1-5)

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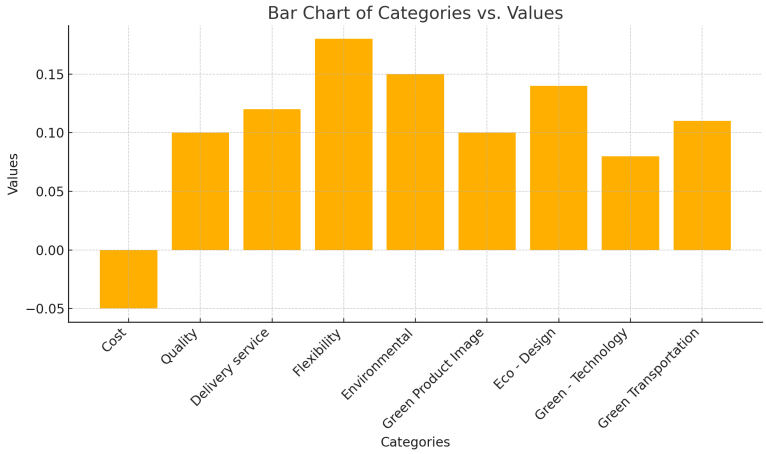

Figure 5. Difference of green Performance of S7

5 Conclusion

On the basis dense of literature reviewed, a comprehensive list consisting of nine main green supplier evaluation criteria and thirty-one sub-criteria were finalized. Based on the questionnaire-based survey, the inputs of the managers have been collected.The importance and applicability have been measured based on these inputs.

It study reveals that most effective criteria for green supplier evaluation are economic criteria, followed by environmental criteria. Mann–Whitney U-test demonstrates no significant difference between the mean scores of importance and applicability. Therefore, the developed list of the green supplier selection criteria and their corresponding sub-criteria can be used to evaluate the green supplier's performance.It is always difficult for the decision to make to decide by considering thirty-one conflicting criteria. A multi-criteria decision making method, TOPSIS, had been applied to rank the supplier as it is simple to apply,mathematical structure modeling technique. The supplies have been ranked considering all the thirty-one sub-criteria. This ranking is beneficial for various strategic decisions and long term collaboration with suitable suppliers. At the same time, the performance of the lower rank suppliers can also be measure. It has been suggested that the lowest performer supplier S7 take care of flexibility, delivery service, and green image by applying the parametric analysis. Similarly, the performance of the lower-ranked supplier can also be improved by concentrating upon specific suggested criteria.

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Chapter 2

Book Chapter

Role of Green Innovations in Fostering Environmental Awareness and Technology: Data-Driven Analysis

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Abstract

This study investigates the role of green innovations in fostering environmental awareness and technology adoption among SMEs. Employing a quantitative approach, a questionnaire was administered to a convenient sample of 320 SME respondents between January and March 2024. Data analysis was conducted using (Smart-PLS) to examine the relationships between green innovations, environmental awareness, and technology adoption. The study hypothesized that there is no significant relationship between green innovations and environmental awareness, and there is no significant impact of green innovations on technology adoption within SMEs. The findings revealed significant positive relationships between green innovations and both environmental awareness and technology adoption. This suggests that SMEs embracing green innovations are more likely to enhance their environmental consciousness and adopt advanced technologies. The study concludes emphasizing the importance of promoting green innovations to drive sustainability and technological advancement within the SME sector.

Keywords: Green Innovations. Environmental Awareness. Technology Adoption. Sustainability. Socio-economic factors. Small and Medium Enterprises (SMEs).

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1 Introduction

Environmental issues have emerged as significant obstacles to sustainable development, necessitating a transformation in development models to mitigate their negative impact on the environment. (Chen, 2023).The concept of sustainable development emerged almost half a century ago in response to global challenges related to resources and the natural environment.(Okr glicka, Mittal, & Navickas, 2023).The imperative for sustainable development has become increasingly apparent in recent years, propelling the global community toward a pivotal intersection where innovation and environmental stewardship converge. (Reficco et al., 2018; Rese, Baier, & Rausch, 2022). At the heart of this movement lies the transformative force of green innovations. These pioneering solutions, characterized by their commitment to reducing environmental impact while fostering economic growth, have emerged as catalysts for reshaping industries, policies, and societal norms worldwide. (Lu et al., 2020).The role of green innovations extends far beyond mere technological advancements; it embodies a paradigm shift in how we conceive, produce, and consume resources. From renewable energy technologies and eco-friendly materials to circular economy practices and nature-inspired design, green innovations encompass diverse strategies to harmonize human activities with the natural world. (Alam et al., 2023). In this era of unprecedented environmental challenges, ranging from climate change and biodiversity loss to resource depletion and pollution, the urgency to embrace sustainable alternatives has never been more pressing. Green innovations offer a promising pathway toward a more resilient, equitable, and ecologically balanced future, where the needs of present and future generations are met without compromising the integrity of planetary systems. (Haldar, 2019).

Green innovations play a pivotal role in fostering environmental awareness by highlighting the interconnectedness between human activities and the health of ecosystems. Through groundbreaking technologies and initiatives, these innovations bring to light the intricate balance required to manage natural resources and mitigate environmental degradation sustainably. (Jain, 2024). For instance, advancements in environmental monitoring systems provide real-time air and water quality data, empowering individuals and organizations to make informed decisions about their environmental impact. Additionally, educational campaigns and public outreach efforts centered around green innovations raise awareness about pressing environmental issues and inspire collective action toward conservation and sustainability. (Dadhich & Hiran, 2022). Moreover, green innovations serve as catalysts for developing and adopting cutting-edge technologies that offer sustainable alternatives to traditional practices. From renewable energy sources like solar and wind power to innovative waste management solutions such as recycling and composting, these advancements drive a transition toward a more circular and resource-efficient economy.(Shukla et al., 2024). By investing in research and development, governments,

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businesses, and research institutions can spur the creation of scalable, environmentally friendly technologies that reduce greenhouse gas emissions, conserve natural resources, and minimize ecological footprint across industries.

Furthermore, green innovations facilitate the integration of sustainability principles into various sectors, paving the way for more environmentally conscious practices and policies. In agriculture, precision farming techniques leverage data analytics and sensor technologies to optimize resource use, minimize chemical inputs, and enhance soil health, promoting sustainable food production while mitigating environmental impacts. Similarly, in urban planning and infrastructure development, green building design, and sustainable transportation solutions prioritize energy efficiency, carbon neutrality, and resilience, contributing to more livable and eco-friendly cities.(Dadhich, Rao, et al., 2023). Thus, green innovations raise environmental awareness and drive the development and adoption of transformative technologies that enable sustainable development. These innovations catalyze a global shift toward a more sustainable future by fostering collaboration between stakeholders, promoting knowledge-sharing, and incentivizing eco-friendly practices. However, realizing the full potential of green innovations requires continued investment, policy support, and public engagement to overcome barriers and scale up solutions that address humanity's pressing environmental challenges.

2 Objectives of the Study

- To assess the level of environmental awareness and technology adoption among Small and Medium Enterprises (SMEs).
- To examine the extent of implementation of green innovations within SMEs.
- To investigate the relationship between green innovations and environmental awareness among SMEs.
- To analyze the impact of green innovations on technology adoption within SMEs.

3 Literature Review

Waqas et al.'s (2021) conducted a survey method was used to collect primary data, and the study hypotheses were assessed using Structural Equation Modeling (SEM). The results indicated that big data analytics (BDA) support achieving competitive advantage (CA) and environmental performance (EP). Green innovation (GI) and green human resource management practices (GHP) positively contribute to CA through a corporate green image (CGI). The study also confirmed the mediating roles of GI, GHP, and CA, as well as the moderating roles of organizational commitment (OC) and CGI within the underdeveloped context of the Chinese manufacturing industry. In the study by AL-Shboul's (2023) 436 usable online surveys were analyzed using a quantitative approach for data col-

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lection, utilizing structural equation modeling with the Smart-PLS software. The sample included middle- and senior-level managers and employees within MFs. Convergent and discriminant validity tests were conducted, and bootstrapping was applied. The authors incorporated GPI and GPrI as mediating factors and used data-driven competitive sustainability as a moderating factor. The findings revealed a significant positive effect of reliable big and cloud data analytics capabilities on comparative advantages, consistent with the proposed hypothesis. Additionally, the mediating factors (GPI and GPrI) were found to positively and significantly influence comparative advantage, and the moderating factor, data-driven competitive sustainability, also had a significant effect.

Employing a questionnaire survey of Chinese manufacturing firms, Dong et al.'s (2024) proposed and tested a holistic framework for comprehending the role of big data and external institutions on corporate green innovation and competitive advantage. Based on a moderated mediation analysis, the empirical results showed that both formal (e.g. government support) and informal (e.g. social legitimacy) institutions positively influenced corporate competitive advantage. Dadhich, Rathore, et al.'s (2023) examined the role of gender in the adoption of green innovations among microfinance beneficiaries in rural India. Their study found that women were more likely to adopt environmentally friendly technologies and practices, such as improved cookstoves and organic farming, than men. The research highlighted the importance of gender-sensitive approaches to green innovation promotion, recognizing women as key agents of change in fostering environmental awareness and technology adoption in rural communities.(see figure 1).

While a growing body of literature explores the relationship between green innovations and environmental outcomes, there remains a noticeable gap in understanding the specific mechanisms through which green innovations foster environmental awareness and technology adoption, particularly within the context of SMEs. Existing research often focuses on the general benefits of green practices without delving into the nuanced processes involved in fostering environmental consciousness and technological advancement within SMEs. Therefore, there is a need for empirical studies that elucidate the role of green innovations as catalysts for both environmental awareness and technology adoption, shedding light on the pathways through which SMEs can effectively integrate sustainable practices into their operations. These additional studies provide further insights into the complex interplay between socio-economic factors, environmental awareness, and technology adoption in the context of India, contributing to a more comprehensive understanding of the role of green innovations in driving sustainable development. Having studied the extensive literature review, the following hypotheses can be posited. H1: There is no significant relationship between green innovations and environmental awareness among SMEs. H2: Green innovations have no significant impact on technology adoption within SMEs.

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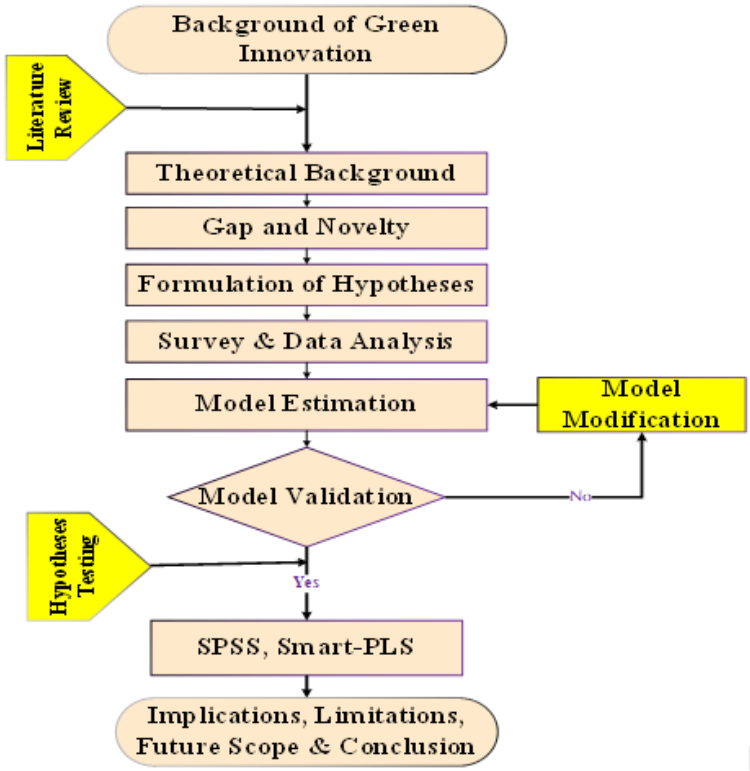

Figure 1. Research Framework

4 Research Methodology

This research aims to examine the role of green innovations in promoting environmental awareness and technology adoption among Small and Medium Enterprises (SMEs). In recent years, businesses have increasingly emphasized sustainable practices, and SMEs play a crucial role in driving innovation and sustainability. This study investigates how green innovations influence environmental consciousness and technological advancement within SMEs.

- Research Design: This study adopts a quantitative research design to gather and analyze numerical data. A structured questionnaire was used as the primary data collection instrument.(Singh & Dadhich, 2023). The questionnaire was administered to a convenient sample of 320 SMEs in Delhi-NCR. The data collection period spans from January to March 2024.

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- Sampling Technique: A convenient sampling technique was employed due to practical considerations such as accessibility and time constraints. SMEs within the researcher's reach were invited to participate in the study. This sampling method allows for data collection from readily available respondents, ensuring feasibility and efficiency.
- Data Collection Instrument: The primary data collection instrument was a structured questionnaire designed to gather information on various aspects of green innovations, environmental awareness, and technology adoption within SMEs. The questionnaire was distributed electronically using Google Forms, providing easy access and convenience for respondents.
- Data Filtering Techniques: Several filtering techniques were employed to ensure the reliability and validity of the data collected. This includes attention checks within the questionnaire to identify and filter out inconsistent or unreliable responses. Additionally, incomplete surveys/responses with significant missing data were excluded from the analysis.
- Data Analysis Method: The collected data was analyzed using Smart-PLS employing structural equation modeling. It is a widely used statistical technique for analyzing complex relationships among variables in structural models. It allows for the examination of both direct and indirect effects, making it suitable for exploring the relationships between green innovations, environmental awareness, and technology adoption.
- Dependent and Independent Variables: Dependent Variable: Environmental Awareness and Technology Adoption. Independent Variable: Green Innovations

5 Analysis and Discussions

Table 1 presents descriptive statistics summarizing various demographic characteristics and awareness levels among respondents. The distribution by gender shows that 65.60% of the sample comprised male respondents, while 34.40% were female. Regarding age, the majority (50.00%) fell within the 20-30 age group, followed by 29.70% in 30-50 age range and 20.30% above 50. In terms of income, 48.40% reported an income of less than 5 lakhs, 33.40% reported 5-8 lakhs, and 18.20% reported an income above 8 lakhs. Regarding education, 51.60% were graduates, 29.00% held a P.G. qualification, and 19.40% had a professional qualification. Most respondents (95.30%) were aware of green innovations, while 92.20% were aware of environmental issues. Thus, these statistics provide valuable insights into respondents' demographic composition and awareness levels regarding green innovations and environmental concerns.

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Table 1. Descriptive Statistics

Factors	Classification	Freq.	%
Gender			
	Male	210	65.60
	Female	110	34.40
	Total	320	100.00
Age			
	20-30	160	50.00
	30-50	95	29.70
	Above 50	65	20.30
	Total	320	100.00
Income			
	< 5 lakhs	155	48.40
	5-8 lakhs	107	33.40
	> 8 lakhs	58	18.20
	Total	320	100.00
Education Level			
	Graduate	165	51.60
	P.G.	93	29.00
	Professional	62	19.40
	Total	320	100.00
Awareness of Green Innovations			
	Yes	305	95.30
	No	15	4.70
	Total	320	100.00
Awareness of Environmental Awareness			
	Yes	295	92.20
	No	25	7.80
	Total	320	100.00

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Table 2 summarizes the reliability analysis results for three constructs: Green Innovations, Environmental Awareness, and Technology Advancement. The Cronbach's alpha coefficients indicate high internal consistency reliability for all constructs, with values of 0.865, 0.818, and 0.796, respectively. The AVE values are 0.509, 0.560, and 0.695, demonstrating that the underlying constructs explain a substantial proportion of the observed variables' variance. Additionally, the Composite Reliability (CR) values of 0.553, 0.508, and 0.612 signify good reliability. These findings suggest that the constructs are reliable measures and suitable for further analysis in the research study.

Table 2. Reliability Analysis

Constructs	Cron. alpha	AVE	CR
Green Innovations	0.865	0.509	0.553
Environmental Awareness	0.818	0.560	0.508
Technology Advancement	0.796	0.695	0.612

The outcomes of the Fornell-Larcker analysis, which evaluates the discriminant validity of constructs by comparing the square root of the Average Variance Extracted (AVE) for each construct with the correlations between constructs.(see table 3).The results of green innovation, environmental awareness and technological advancement have been explained below.

1. Green Innovations (GRI): The square root of the AVE for Green Innovations is 0.823. This value suggests that Green Innovations has a strong and distinct presence within the data, as it exceeds the correlations with Environmental Awareness (0.785) and Technological Advancement (0.832).

2. Environmental Awareness (ENA): The square root of the AVE for Environmental Awareness is 0.433. This value indicates a moderate level of discriminant validity, as it is lower than the correlation with Green Innovations (0.785) but higher than the correlation with Technological Advancement (0.710).

3. Technological Advancement (TCA): The square root of the AVE for Technological Advancement is 0.745, indicating strong discriminant validity. This value surpasses the correlations with both Green Innovations (0.832) and Environmental Awareness (0.710), demonstrating that Technological Advancement is distinct from the other constructs.(Dadhich, Purohit, et al., 2023). Thus, this analysis suggests that Green Innovations and Technological Advancement exhibit clear discriminant validity, while Environmental Awareness shows a moderate level of discriminant validity, warranting further exploration.

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Table 3. Constructs and their corresponding values

Constructs	GRI	ENA	TCA
Green Innovations	0.823		
Environmental Awareness	0.785	0.433	
Technological Advancement	0.832	0.710	0.745

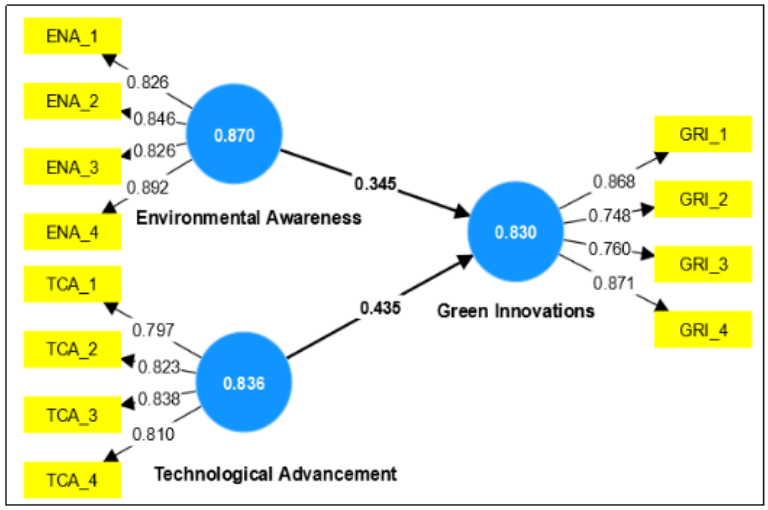

Figure 2. SEM Framework for Green Innovation

Figure 2 serves as a roadmap for understanding the intricate relationships within the context of Green Innovation, contributing to both theoretical understanding and practical applications in fostering sustainable practices.

By visually representing the path coefficients between constructs such as Green Innovations, Environmental Awareness, and Technological Advancement, Figure 3 offers insights into these factors' direct and indirect effects on each other. Path coefficient analysis helps to identify significant pathways and causal relationships within the model, providing valuable information for theory development and practical implementation.(Bhati et al., 2023). It underlines the mechanisms driving the relationship between Green Innovation and its outcomes, thereby informing strategies for promoting sustainability and innovation in various domains.(see figure 4).

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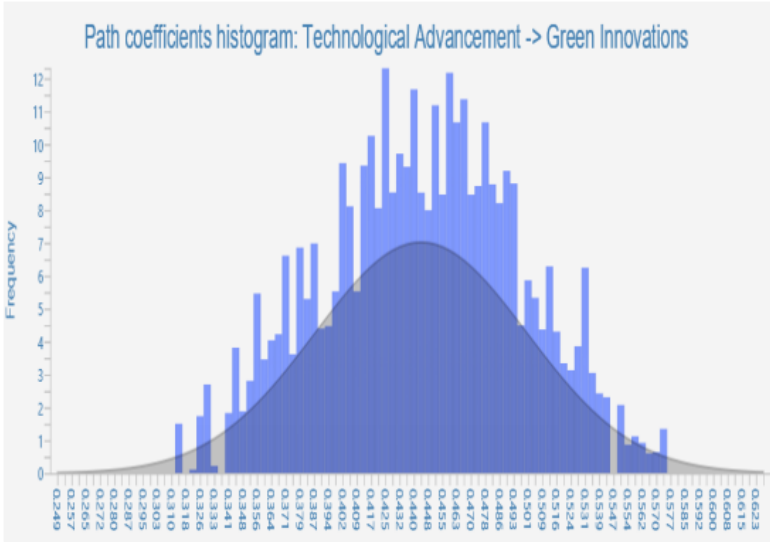

Figure 3. Path Coefficient Analysis (Technological Advancement)

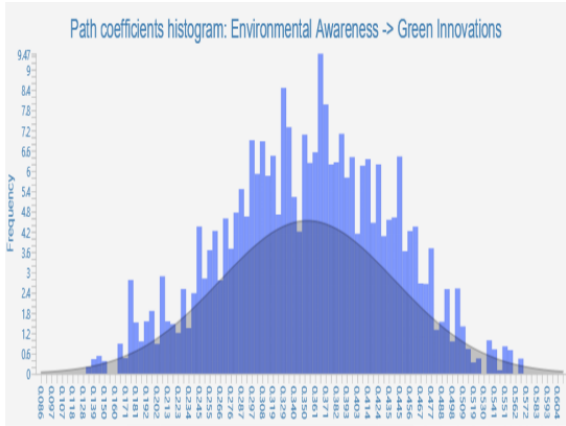

Figure 4. Path Coefficient Analysis (Environmental Awareness)

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The findings present reveal significant positive relationships between Environmental Awareness and Green Innovations, as well as between Technological Advancement and Green Innovations. These results contribute to our understanding of the factors driving the adoption of green innovations within the SME sector.(see table 4)

The coefficient (B.stat.) for this path is 0.551, indicating a positive relationship between Environmental Awareness and Green Innovations. The mean (X mean) of Environmental Awareness is 0.418, with a standard deviation (Sigma) of 0.095. The calculated t-statistic is 4.114, and the associated p-value (Sig.) is 0.000, indicating that the relationship is statistically significant at the 0.05 significance level.The positive relationship between Environmental Awareness and Green Innovations aligns with previous research emphasizing the role of environmental consciousness in driving sustainable practices and innovation. For example, Shen et al.'s (2022) found that heightened environmental awareness among SME owners positively influenced their adoption of green practices and innovations. Similarly, the study by Aboelmaged and Hashem's (2019) highlighted the importance of environmental awareness as a catalyst for green innovation adoption in SMEs. Our findings corroborate these earlier studies, suggesting that SMEs with a stronger environmental awareness are more likely to embrace green innovations as part of their business strategies.

Table 4. Hypotheses Testing

Manifests	B.stat.	X mean	Sigma	T-stat	Sig.
Environmental Awareness → Green Innovations	0.551	0.418	0.095	4.114	0.000
Technological Advancement → Green Innovations	0.309	0.325	0.155	3.225	0.001

This path's coefficient (B.stat.) is 0.309, suggesting a positive relationship between Technological Advancement and Green Innovations. The mean (X mean) of Technological Advancement is 0.325, with a standard deviation (Sigma) of 0.155. The calculated t-statistic is 3.225, and the associated p-value (Sig.) is 0.001, indicating that the relationship is statistically significant at the 0.05 significance level. Moreover, the positive association between Technological Advancement and Green Innovations underscores the significance of technology-driven solutions in fostering sustainability within SMEs. Additionally, the study by Valdez-Juárez and Castillo-Vergara's (2021) demonstrated that SMEs with higher technological capabilities are more inclined to invest in green innovations to enhance their competitiveness and environmental performance. Our results are consistent with these studies, suggesting that SMEs leveraging technological advancements are better positioned to integrate green innovations into their operations.

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6 Implications of the Study

- Policy Development: Data-driven analysis of the role of green innovations in fostering environmental awareness and technology adoption can provide valuable insights for policymakers. These insights can inform the development of targeted policies and regulatory frameworks to incentivize green innovation investment, promote technology diffusion, and foster environmental literacy among various stakeholders.
- Investment Prioritization: By identifying key drivers and barriers to green innovation adoption, data-driven analysis can help investors and funding agencies prioritize investments in technologies and initiatives with the greatest potential to accelerate environmental sustainability. This can lead to more efficient allocation of resources and increased support for innovative solutions that address pressing environmental challenges.
- Education and Outreach: Data-driven insights into the effectiveness of environmental education programs and outreach efforts can guide the development of tailored interventions to enhance environmental awareness among different demographic groups. Educators and advocacy groups can disseminate information and promote behavioral change toward more sustainable practices by leveraging technology and communication channels, such as social media and online platforms.
- Industry Transformation: Data-driven analysis can catalyze industry-wide transformation by highlighting best practices, benchmarking performance, and identifying collaboration and knowledge sharing opportunities. Businesses can use this information to streamline operations, reduce environmental impact, and gain a competitive edge in the growing green economy. Moreover, data-driven insights can facilitate partnerships between academia, industry, and government to foster innovation ecosystems that support the development and commercialization of green technologies.
- Global Collaboration: Given the interconnected nature of environmental challenges, data-driven analysis can facilitate international collaboration and knowledge exchange to address shared sustainability goals. By pooling data and expertise from diverse geographic regions, countries can identify common challenges, share lessons learned, and develop coordinated strategies for leveraging green innovations to achieve collective environmental objectives. Thus, data-driven analysis of the role of green innovations in fostering environmental awareness and technology adoption holds immense potential to inform decision-making, drive systemic change, and catalyze global efforts toward a more sustainable future.

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7 Conclusion

The role of green innovations in fostering environmental awareness and technology adoption is undeniable, yet our understanding of their impact remains dynamic and evolving. While data-driven analysis has provided valuable insights into this nexus, it also reveals gaps and challenges that warrant further exploration. Despite limitations such as data availability constraints and contextual complexities, promising avenues for future research offer hope for deeper understanding and more effective strategies. By embracing longitudinal studies, cross-sectoral analysis, and advanced analytics techniques, researchers can unlock new insights and address critical questions surrounding the adoption of green innovations. Moreover, fostering stakeholder engagement and collaboration will be essential in translating research findings into meaningful actions that propel us towards a more sustainable future. As we navigate these challenges and opportunities, it becomes increasingly evident that the transformative potential of green innovations lies in technological advancements and our collective commitment to fostering environmental awareness and driving positive change.

8 Limitations and Future Scope

Data-driven analysis of the role of green innovations faces several limitations that hinder the comprehensive understanding of their impact on environmental awareness and technology adoption. Firstly, data availability and quality present significant challenges, particularly in regions or sectors with limited monitoring and reporting mechanisms. This limitation may introduce biases and inaccuracies into the analysis, compromising the reliability and generalizability of the findings. Additionally, conducting longitudinal studies to track the long-term effects of green innovations is resource-intensive and time-consuming, making it challenging to accurately assess trends and causal relationships. Moreover, the contextual complexity of factors influencing green innovation adoption, including cultural norms and institutional frameworks, presents further challenges in capturing nuanced interactions through data analysis.

Despite these limitations, there are promising avenues for future research to enhance our understanding of the role of green innovations. Longitudinal studies tracking the evolution of environmental awareness and technology adoption over time can provide deeper insights into trends and critical inflection points. Furthermore, cross-sectoral analysis exploring the transferability of green innovations across different contexts and advanced analytics techniques, such as machine learning, offer opportunities to extract actionable insights from large datasets. Engaging stakeholders in the research process can also enhance the relevance and impact of data-driven analysis, fostering greater collaboration and knowledge exchange to drive sustainable innovation and practice. By addressing

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these limitations and pursuing future research, scholars can contribute to a more holistic understanding of how green innovations foster environmental awareness and adoption of technology.

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Chapter 3

Book Chapter

Impact of Social Media Marketing Activities on Purchase Intention of Customers of Organic Cosmetic Products

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Abstract

The worldwide web has evolved significantly and driven tremendous change over the past few Decades. Skincare, on the other hand, the desire to look good and live a longer life has always been a natural goal felt by Indonesian young adults, regardless of their gender, and perfectly flawless skin is still considered a vital part of beauty. The paper focuses at how social media marketing affects customer intentions to buy organic cosmetic products. A survey questionnaire that was given to a sample of 135 respondents who had used organic cosmetics served as the study's quantitative research method. The results showed that social media marketing initiatives had a favourable influence on consumers' inclinations to buy organic cosmetics. Particularly, social media marketing significantly affects how clients view the quality of organic cosmetic items, how they feel about the brand, and how much they trust the company. The study suggests that businesses concentrate on social media marketing to expand their audience and increase the sales of organic cosmetics products.

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Keywords: Social Media Marketing. Purchase Intention. Organic Cosmetic products. Impact of Social Media Marketing.

1 Introduction and Review of Literature

The organic cosmetic industry has experienced significant growth in recent years, as consumers become more aware of the potential harmful effects of synthetic ingredients found in traditional cosmetics. Consumers are increasingly looking for natural and organic alternatives that are environmentally sustainable and ethically produced. There is also a growing consciousness among consumers regarding the toxic effects of traditional beauty products has developed consumer interest in organic beauty products as an alternative.(Gani et al., 2023). This trend has led to an increase in the number of companies offering organic cosmetic products and competition among these companies is intense. By examining the effect of social media marketing activities on customer's purchase intentions for organic cosmetic goods, this study seeks to add to body of understanding on social media marketing and consumer behaviour. Given the significant growth in the organic cosmetic industry and the increasing importance of social media marketing, it is important for companies in this industry to understand the impact of social media marketing activities on consumer behaviour. This study aims to contribute to the existing literature on social media marketing and consumer behaviour by investigating the impact of social media marketing activities on the purchase intention of customers of organic cosmetic products.

Alalwan's (2018) studied found that social media marketing activities have a significant positive impact on the purchase intention of customers of organic cosmetic products. The study found that social media platforms provide customers with information about the benefits of organic cosmetics, which in turn increases their purchase intention. Gani et al.'s (2023) found that social media marketing activities have a positive impact on the trust and loyalty of customers towards organic cosmetic products. According to the study's findings, social media platforms may be leveraged to make consumers believe that organic beauty items are highly valuable, which in turn boosts their propensity to make a purchase. According to Ceyhan's (2019), perceived utility in the context of online purchasing refers to how much customers believe social media marketing might enhance their capacity to conduct better online purchases. The ensuing theory is developed and put to the test. Influencers on social media, particularly in the skincare sector, have grown to be significant providers of knowledge and inspiration for customers. This study by Ananthsai et al.'s (2023) looks at how consumers' purchasing decisions for skin care products are influenced by social media influencers. In a study by Chrisniyanti and Fah's (2022) a total of 271 responses were collected from respondents aged 18 to 34 years through non-probability sampling. The study found that social media marketing activities (SMMAs) positively

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and significantly impact the purchase intention of skincare products among Indonesian young adults. Furthermore, the relationship between social media marketing activities and purchase intention was significantly mediated by subjective norms, perceived behavioral control, brand awareness, and social brand engagement. These findings provide valuable insights for skincare brand marketers and future researchers into the influence of social media marketing activities on the purchase intentions of skincare products. A proposed research model was tested by Nagvanshi, Gupta, and Kumar's (2023) using structural equation modeling with Smart PLS 4.0. The results indicated that social media advertising has a significant positive impact on purchase intention, with the mediating variables partially mediating the relationship between social media advertising and purchase intention. This study will be beneficial to organic cosmetic brands and marketing professionals seeking to utilize social media advertising as a marketing tool.

Aji, Nadhila, and Sanny's (2020) explored that the consumers who are price conscious place less importance on product quality. They value planning and shopping, and when they shop online, they value social media marketing that introduces them to new products that are significantly less expensive than the competition. Price consciousness is the inability of people to pay more money for a product. According to Hansen, Saridakis, and Benson's (2018), consumers would prioritise lower costs and be willing to invest time and energy in searching for low-cost items on social media. When making an online purchase, price-conscious buyers might use social media marketing to evaluate prices of various goods and services.(Alalwan, 2018). The following theory is developed and put to the test. Wibowo et al.'s (2021), studied the capacity of social media marketers' posts or advertisements to adequately enlighten clients about their products and services is known as informativeness. If the advertising message can offer significant information value, consumers will see social media marketing favourably (Moslehpour et al., 2018). Online purchasing requires a high level of in formativeness since good information shared through social media advertisements will immediately increase consumers' desire to make an online purchase.(Kapoor et al., 2018). The idea that follows is developed and put to the test.

2 Objective

- To identify social media activities which are used for organic Product.
- To Analyse how social media activities impacts the purchase behaviour.
- To analyse the type of products preferred by the consumer.

3 Research Methodology

Samples size of 135 respondents is selected on the basis of random sampling technique. The study's focus is on social media marketing activities among male and female users

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of skincare products who are active on the social media pages of skincare brands and are between the ages of 18 and 50. The survey's participants are from four cities in Delhi and Noida. Students, working adults, independent individuals, and unemployed people form the sample target respondents. Addition to this study it utilises a non-probability sampling method. From March 26 to April 3 '2023, a structured online questionnaire using Google Form is used to collect data. Three social media platforms Instagram, Facebook, and WhatsApp are used as distribution channels to share the link to the online questionnaire form with respondents. The entire data gathering process complies with moral and legal requirements. Although 135 respondents' data were obtained. SPSS statistical tool is used for Data Analysis.

4 Data Analysis and Interpretation

H0: Perception of reasonable prices on company website has negative correlation with purchase intention of organic cosmetic products. Negative effect. H1: Perception of reasonable prices on company website has a significant positive correlation with purchase intention of organic cosmetic products. Positive Effect

Variables considered in the study

1. PI- Purchase Intentions (Dependent)
2. SMP- Social media Platforms (Independent)
3. D- Demographics (Independent)
4. CS- Customer Satisfaction (Dependent)

Table 1. Descriptive Statistics

	Mean	Std. Deviation	N
According to you the prices of the products are reasonable on companies website?	1.59	0.684	135
Do you prefer to try and Purchase in physical store rather than buy it online?	1.24	0.525	135

Considering to the obtainable descriptive statistics, it is possible to draw the following conclusion: Customers gave the pricing of the items on the company website an average rating of 1.59 out of 5, with a standard deviation of 0.684. Given that the mean score is below the scale's middle point, it is likely that customers did not typically believe the pricing to be reasonable. Customers gave their preference for trying and making a purchase

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at a physical store as 1.24 out of 5 on average, with a standard deviation of 0.525. As the mean score is below the scale's midpoint, this shows that buyers typically chose to purchase the items online.(see table 1).

Table 2. Correlations

		X	Y
X	Pearson Correlation	1	-0.110
	Sig. (2-tailed)		0.203
Y	Pearson Correlation	-0.110	1
	Sig. (2-tailed)	0.203	
	N	135	135

x:According to you the prices of the products are reasonable on the company's website?

y: Do you prefer to try and purchase in a physical store rather than buy it online?

According to the results of the given correlation study, there is a minor negative connection (r = 0.110) between consumers' perceptions of the pricing of the items on the company website and the desire to try and purchase in a physical shop rather than buying online. Correlation is not statistically significant (p=0.203), though. This implies that there could be a little tendency for customers who think the costs are appropriate to be more willing to buy online, but the association is not strong enough to be taken seriously or to be considered significant.(see table 2). Customers' perception of the price of the items on the company website and their willingness to try and buy in an offline shop rather than buying online are tend to be correlated.

4.1 Regression

Table 3. Model Summary

Model	R	R Square	Adj R Square	Std. Error	R Square Change	F Change	df1	df2	Sig.
1	0.110[a]	0.012	0.005	0.524	0.012	1.638	1	133	0.203

[a] Predictors: (Constant), According to you the prices of the products are reasonable on companies' website?

The model includes one predictor variable, "According to you the prices of the products

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are reasonable on company's website?" and a constant term. A relatively small positive link between the predictor variable and the outcome variable is shown by the model's R value of 0.110. The model's R Square value is 0.012, meaning that only 1.2% of the variance in the outcome variable customers' preference to try before they buy in a physical store as compared to purchasing online—is explained by the predictor variable. The model's Adjusted R Square value is 0.005, which is less than the R Square value and shows that the predictor variable's inclusion did not significantly enhance the model's fit.(see table 3).

The standard error of the estimate for the model is 0.524, which indicates that predictions made using the model are normally wrong by roughly 0.524 units from the actual values. The R Square value of the model did somewhat increase when the predictor variable was added, but this improvement was not statistically significant (p=0.203), according to the change statistics table. Overall, this model implies that customers' opinions about the pricing of the items on the business website may have little effect on their decision to attempt to make a purchase in a real store rather than making one online. The low R Square and Adjusted R Square values of the model, however, imply that additional variables not included in this research could have a bigger impact on the consumers' purchase decisions.

Table 4. ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.449	1	0.449	1.638	0.203[b]
Residual	36.484	133	0.274		
Total	36.933	134			

a. Dependent Variable: Do you prefer to try and Purchase in physical store rather than buy it online?

b. Predictors: (Constant), According to you the prices of the products are reasonable on companies' website?

The ANOVA table provides information about the significance of the regression model in predicting the outcome variable (customers' preference to try and purchase in a physical store rather than buying online).(see table 4). Based on the ANOVA table the model's regression sum of squares is 0.449, showing that only a small part of the variance in the outcome variable is explained by the predictor variable (customers' perceptions of the pricing of the items on the company website). The remaining total number of squares for the model is 36.484, which shows that the predictor variable does not account for the majority of the variance in the outcome variable. 36.933 denotes the entire variance in the

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result variable, or the sum of all squares. The model's F-statistic is 1.638, and the p-value that goes along with it is 0.203. As the p-value is bigger than 0.05, this suggests that the model is not statistically significant in predicting the outcome variable.

Table 5. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t
	B	Std. Error	Beta	
1 (Constant)	1.379	0.114		12.085
According to you the prices of the products are reasonable on companies website?	-0.085	0.066	-0.110	-1.280

a Dependent Variable: Do you prefer to try and Purchase in physical store rather than buy it online?

The coefficients table provides information about the regression equation's intercept and slope and their statistical significance. Based on the coefficients table the outcome variable (customers' perception of the pricing of the items on the firm website) is expected to have a value of 1.764 when the predictor variable (customers' desire to attempt to make a purchase in a physical shop rather than doing purchase online) is equal to zero. The predictor variable's slope is -0.144, showing a negative correlation between what customers think of the pricing of the company's items and their preference to try before they buy in a physical shop compared to carrying out it online. The slope coefficient's p-value is 0.203, which is bigger than 0.05, and indicates that this association is not statistically significant. The predictor variable's standardised coefficient (beta) is -0.110, meaning that a one-unit increase in the predictor variable is correlated with a 0.110 standard deviation reduction in how customers perceive the pricing of the goods on the company website. The slope coefficient's t-statistic is -1.280, and the corresponding p-value is 0.203. As the p-value is higher than 0.05, this suggests that the slope coefficient is not statistically significant.(see table 5).

In conclusion, the coefficients table confirms the finding that there is no statistically significant correlation between consumers' choice to try and buy physical as compared to online and their assessment of the costs of the items on the company website.

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5 Conclusion

The growth of the organic cosmetic industry, fueled by consumer awareness of the harmful effects of synthetic ingredients, has heightened competition among brands. This study reveals that social media marketing significantly impacts consumers' purchase intentions for organic cosmetic products, with mediating factors such as subjective norms, perceived behavioral control, brand awareness, and social brand engagement playing critical roles. These findings highlight the importance of strategic social media marketing for organic cosmetic brands to build trust and emotional connections with their audience. By understanding the influence of social media marketing on consumer behavior, brands can enhance their reputation and drive sales in a competitive market. This research adds valuable insights to the existing literature on social media marketing and consumer behavior.

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Chapter 4

Book Chapter

Future Perspectives and Challenges of Circular Economy and Sustainable Business Performance Management: A Systematic Literature Review

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Abstract

The circular economy (CE), a paradigm that stresses the economical and efficient use of already-existing resources and goods through leasing, sharing, repairing, reusing, and recycling, has become more well-known in business and management literature. This chapter offers businesses a comprehensive assessment of the prospects that circular economies and sustainable performance management bring, with a particular emphasis on upcoming technical developments and management strategies like public-private partnerships. It looks at the methods that Industry 5.0's new digital technologies can use to gather and evaluate lifetime data to evaluate how successful circular economies are. The review also covers creating methods to gauge the degree of circularity in systems and implementing design approaches to guarantee that product design is in line with particular performance criteria. It also suggests a maturity model to evaluate organizational preparedness for circularity and looks at developing performance indicators to measure the effectiveness of circularity. The study found important trends and research gaps using a comprehensive assessment of the literature

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and bibliometric analysis. It concluded that CE can improve resource efficiency, organizational performance, economic and environmental outcomes, and customer satisfaction. But in order to overcome obstacles like knowledge gaps, the need for infrastructure, budgetary limits, and legal requirements, firms must make infrastructure investments, research, new business model development, and comprehensive sustainability strategies.

Keywords: Circular economy. Sustainable Business Performance Management. Industry 5.0. Resource Efficiency. Environmental Impacts. Regulatory Hurdles. Digital Technologies. Business Model. Key Performance Indicators. Circular Economy Maturity Model.

1 Introduction and Review of Literature

The circular economy (CE) concept is advancing quickly and attracting increasing global interest from policymakers and economic experts. CE is an industrial system that is regenerative and restorative by design. It is a systematic approach to designing, producing, using, and disposing of products, services, and materials to reduce environmental degradation while eliminating waste. It is based on economic, environmental, and social sustainability principles, and its main objective is to extend the period that resources are utilized productively by increasing the quantity of energy and material that is recovered and reused (Dong et al., 2022). Applying CE principles may decrease waste and pollution, increase productivity and efficiency, and reduce resource and energy use overall (Barros et al., 2021). The world is amid a climate emergency, and the necessity of switching to a circular economy is becoming an even more pressing issue. Moving away from a linear, "take-make-dispose" model and toward a circular, "take-make-reuse" model is necessary for companies to ensure a sustainable future for their organizations (Alhawari et al., 2021; Lieder & Rashid, 2016). This transformation calls for a comprehensive reassessment of how firms manage their performance, profit, and resources to adapt to the new environment. For businesses to adapt to the new environment, this transition necessitates a thorough reevaluation of how they manage their performance, profitability, and resources (Bjørnbet et al., 2021). In contrast, this issue receives little attention in the currently available literature. By giving an overview of the literature on the circular economy and sustainable business performance management (BPM) and highlighting the current trends, future perspectives, and challenges, this study seeks to close this knowledge gap. The study seeks to provide insightful information on how organizations may successfully transform their BPM to create a more environmentally friendly future through critically analyzing the existing literature.

Digital technology has been a key enabler of CE during the last several years. Digital technologies like the Internet of Things (IoT), big data, and cloud computing are used at various phases of the product development cycle to collect, process, and analyze data

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(Agrawal et al., 2022). The running technology has also been helping in achieving corporate sustainability (Okr glicka, Mittal, & Navickas, 2023). These data may be utilized to increase the efficiency of the product's life cycle, reduce waste generation, and enhance the environmental friendliness of the manufacturing process. Digital technology may also create business models that allow sharing, trading, and reusing of resources and goods, reducing the need to create new goods (Lieder & Rashid, 2016). According to Cagno et al.'s (2023), organizational effectiveness may be greatly improved by incorporating CE ideas and using digital technologies to promote a circular economy. To guarantee that organizations can monitor, analyze, and manage their CE performance, tools and frameworks must be established to evaluate and assess the social and environmental implications of digitized circular business models (Bjørnbet et al., 2021; Dong et al., 2022). A system's degree of circularity must also be systematically measured and evaluated. Additionally, a set of applicable key performance indicators (KPIs) must be established to analyze how well circularity performs across various application domains. It is also essential to develop a maturity model for the circular economy to assess how prepared organizations are concerning circularity and to provide a path for tackling the CE more successfully (Lahti, Wincent, & Parida, 2018).

The circular economy is becoming an increasingly important tool for businesses as they strive to enhance their operational effectiveness while minimizing their activities' negative environmental impact. (Agrawal et al., 2022). The review will involve a comprehensive investigation of the many elements of the circular economy and its possible consequences for organizations, including the opportunities, challenges, advantages, and anticipated influence on company performance management. The review will also shed light on the future of the circular economy and the advantages and possibilities accessible to businesses by adopting it. It will also discuss how organizations could integrate the circular economy into their strategy for attaining sustainability.

Adopting a circular economic model is essential to sustainable business performance management. The aim behind a circular economy is to move away from the linear economy, which is built on the concept of "take-make-dispose," and toward a system that utilizes resources in a manner that is both more efficient and more environmentally friendly (Lieder & Rashid, 2016). Companies need a more holistic approach to resource management to reduce waste and make the most of their available resources (Blinova, Ponomarenko, & Knysh, 2022). Due to enterprises understanding the need for sustainable resource management, circular economy literature has grown rapidly. The circular economy's environmental benefits and resource efficiency have been studied by Dong et al.'s (2022). Barros et al.'s (2021) concluded that a circular economy might reduce manufacturing and other production-related greenhouse gas emissions (Kravchenko, Pigosso, & McAloone, 2020). also observed that adopting the circular economy may cut costs and increase resource

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efficiency. The circular economy is good for the environment, businesses' bottom lines, and the effectiveness of organizations. Several studies have investigated how a circular economy may improve customer happiness and business competitiveness. According to the findings of Goni et al.'s (2021), a circular economy boosts consumers' loyalty and happiness. According to the findings of Cagno et al.'s (2023), a circular economy can improve organizational performance, market share, and competitiveness. The future of sustainable corporate performance management and the circular economy is an issue that is both extremely complicated and subject to rapid evolutionary development (Alhawari et al., 2021). To succeed in today's highly competitive and continuously changing market, enterprises need to be flexible enough to take on new problems and capitalize on new possibilities. Developing an all-encompassing strategy for a circular economy that can assist a firm in achieving long-term sustainability is one of the most challenging tasks facing enterprises today (Agrawal et al., 2022). This includes establishing methods for enhancing resource consumption, minimizing waste, and increasing the efficiency with which resources are used. In addition, businesses must invest in research and development to stay one step ahead of the competition and develop innovative ideas.

The next phase of the industrial revolution is referred to as Industry 5.0. In the not-too-distant future, businesses will need to be ready to accept this new paradigm (Bjørnbet et al., 2021). The term "Industry 5.0" refers to Implementing innovative technology such as machine learning, artificial intelligence, and the Internet of Things, to boost productivity and open up new avenues for commercial enterprise (Heshmati, 2017). The utilization of these technologies in creating new goods and services, increases in resource efficiency, and decreases in waste are something that businesses need to be ready for (Alhawari et al., 2021; Ranjbari et al., 2022). Moreover, businesses and other organizations need to be ready to adopt new models of commerce centered on the production of shared value. This includes developing novel approaches for interacting with clients and novel solutions that can enhance the environmental friendliness of their business operations.

The existing body of research indicates that sustainable company performance management and the circular economy will play an increasingly essential role in Industry 5.0. In particular, circular economy and sustainable business performance management will become more intertwined as businesses transition toward an increasingly digital, data-driven, and networked world. The research also concluded that Industry 5.0 has the potential to result in increased resource efficiency, improved customer happiness, and increased competitive advantage. found that Industry 5.0 might lead to enhanced sustainability performance, increased resource efficiency, reduced waste, and higher customer satisfaction. In addition, the authors concluded that Industry 5.0 could lead to improved consumer satisfaction. In addition, the researchers concluded that Industry 5.0 might result in an expanded possibility for innovation and an increased advantage over competitors. The

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research indicates that a circular economy and sustainable business performance management will play an increasingly essential role in the fifth generation of manufacturing, referred to as Industry 5.0. In particular, businesses will need to implement the ideas of circular economies throughout the entirety of the value chain of their respective industries in order to ensure their success over the long run. In addition, for businesses to ensure their continued prosperity over the long term, they need to implement an all-encompassing sustainability strategy that considers sustainability's environmental, economic, and social dimensions (Goni et al., 2021).

The literature on circular economies has grown quickly due to businesses recognizing the need for responsible resource management. Researchers have examined the environmental advantages and resource-saving capabilities of circular economies. The researchers Barros et al.'s (2021) and Subarmanim and Ai Chin's (2022) concluded that a circular economy might cut manufacturing and other production-related emissions of greenhouse gases(Kravchenko, Pigosso, & McAloone, 2020). also found that implementing a circular economy might save expenses while simultaneously increasing the effectiveness of resource use.

2 Research Design

Since the introduction of data mining tools, the systematic literature review (SLR) method has become increasingly popular(Agrawal et al., 2022). SLR integrates data collection across a search strategy, followed by bibliometric analysis(Bota-Avram, 2023). A systematic literature review methodology was adopted to present the review on sustainable business performance and the circular economy. A systematic literature review identifies, selects, and critically evaluates research to address a clearly stated question(Bjørnbet et al., 2021). It entails organizing a carefully considered search strategy that focuses on or responds to a stated question. Before conducting the review, the criteria should be clearly outlined, and the systematic review should adhere to a clearly defined strategy or plan. The review specifies the categories of data that were searched, analyzed, and reported within predetermined timeframes. The review must contain the search terms, search strategies (including database names, platforms, and dates of search), and limits(Heshmati, 2017). The methodological approach included conducting manual searches of reference lists, cited literature, and keyword searches on scholarly databases. Scholarly databases including Scopus, Web of Science and Google scholar databases were utilized as a part of the study to identify, choose and gather relevant articles on circular economy and sustainable business performance management. Since it is not uncommon for researchers to use multiple databases in a systematic literature review to ensure a comprehensive search, scholarly databases such as Scopus, and Web of Science were preferred due to their more comprehensive coverage and greater ability to filter for high-quality research.

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Additionally, scholarly databases such as Google scholar provide a broad range of access modes, including open archives and open journals, and we aimed to include a wide range of publications in the review. Only current and relevant research (those published after 2015) was considered while creating the inclusion criteria. Papers published only from 2015 were considered to ensure that the review included the most recent research and was up-to-date. During the search and screening process used to select papers for inclusion, full-text of the articles was not read, and only the title and abstract were initially evaluated and reviewed to determine whether the paper was relevant to the review's research question and determine if they met the inclusion criteria. This is a common approach in systematic literature reviews to quickly screen a large number of articles for relevance. (Subarmanim & Ai Chin, 2022).

However, after this initial screening, the full text of the selected papers was thoroughly read and analyzed. The SLR was one that other researchers could duplicate and involved a thorough, transparent search for scientific literature. As a result, 22 papers were chosen, examined, and evaluated. Bibliometrics uses statistical approaches to study books, papers, and other types of publications, particularly in relation to their scientific subject matter(Barros et al., 2021; Bota-Avram, 2023). A bibliometric analysis helped to gain an understanding of the development, with time, of research on circular economies and sustainable corporate performance management. An analysis of the number of publications in the subject, the journals that have published the most papers, and the authors who have contributed the most important was necessary to accomplish this goal. Moreover, the most prominent publications on the subject were discovered using a bibliometric analysis that revealed which papers were referenced the most often. The purpose of the bibliometric study that was carried out was to analyze the significant contributions that have been made in the fields of CE and SBP by authors, various journal sources, countries, and universities. Sustainability, Journal of Cleaner Production, and Resources, Conservation, and Recycling published most of the selected papers. These journals emphasize environmental sustainability and will likely publish research on circular economies and sustainable corporate performance management. The survey indicated that publications on sustainable coporate performance management and circular economies have increased. Academics and professionals are increasingly interested in these topics. The selected papers most commonly discussed motivations and impediments to embracing the circular economy, business models, and the impact of circular economy activities on corporate sustainability performance.

3 Information Sources Search Stage

The terms "circular economy" and " sustainable business performance " have gained popularity in contemporary academic research, particularly in the production industry. Fur-

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thermore, the literature found that some terms, such as sustainability, green economy, and upcycling, are synonymously used with the circular economy (Heshmati, 2017). However, review employed the term "circular economy" as the primary search phrase to minimize misunderstanding and confusion about whether other synonymous concepts such as sustainability, green economy, and upcycling are interchangeable. The search terms, search strategies, and limits were clearly outlined to enable replication of the review by other researchers. Keywords were found and evaluated for the articles to determine whether or not they should be included in the study by using this approach. According to Barros et al.'s (2021), a literature review aids researchers in determining which topics need mapping and assessment.(see figure 1).

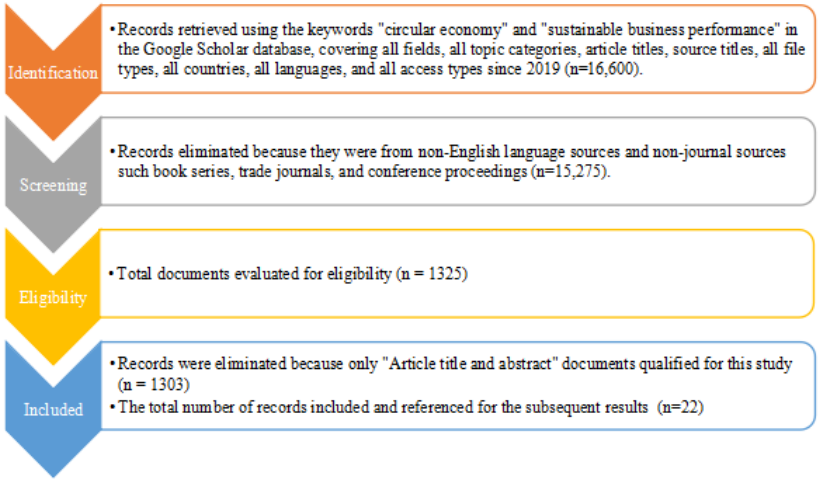

Figure 1. Research Design

4 Results and Discussion

This article's study provides a detailed literature analysis on sustainable corporate performance management and circular economies. There are numerous empirical studies undertaken on CE, and most existing research is theoretical, normative, and conceptual. A few empirical research studies are predominantly cross-sectional and limited to developing and emerging economies (Bjørnbet et al., 2021) The study highlighted the opportunities open to businesses and organizations. According to the research results, implementing a circular economy may enhance environmental, economic, and organizational performance, as another resource efficiency and consumer satisfaction. In addition, the research results

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indicate that for businesses to ensure their long-term success, they must adopt a holistic approach to sustainability that incorporates the notions of circular economies The primary focus of this research is the benefits of circular economies as well as the relationships between these economies and the management of sustainable corporate performance. It suggests that there may be enormous potential benefits associated with circular economies for businesses. Some of these benefits include improvements in resource efficiency, boosts in resource efficiency, reduce negative environmental consequences, increases in their competitive edge, and overall improvements in the organization's performance . (Dong et al., 2022). In addition, the study provides light on the potential challenges and dangers involved with adopting circular economies and sustainable firm performance management, as well as the potential solutions that may be employed to overcome these challenges.

The key challenges consist of a lack of infrastructure, knowledge, and understanding; constraints on financial resources; and obstacles posed by regulatory issues. (Alhawari et al., 2021). In order for businesses to overcome these challenges, they will need to make investments in infrastructure and skills, devise comprehensive plans for long-term sustainability, research, and development, and create innovative business models and strategies (Lahti, Wincent, & Parida, 2018). The study also gives insight into the possibilities that Industry 5.0 has for circular economies and environmentally responsible company performance management. As a result, businesses must be willing to spend time and money developing a comprehensive plan for a circular economy and be aware of the challenges they may encounter along the way. (Agrawal et al., 2022). Investing in infrastructure and knowledge, developing an all-encompassing plan for sustainability, investing in research and development, and developing new business models and strategies to create shared value are some things organizations need to do to be successful. Organizations must be ready to embrace sophisticated Industry 5.0. technologies such as artificial intelligence and the Internet of Things, build new business models and establish new strategies to make the most of these innovative technologies while still creating value for their stakeholders and generating shared value (Barros et al., 2021). In order to provide organizations with a thorough understanding of the capabilities of circular economies and sustainable business performance management, a literature analysis was conducted. Businesses can boost resource efficiency, reduce environmental impact, and gain competitive advantage via the CE and SBP. (Cagno et al., 2023; Ranjbari et al., 2022). In order to effectively adopt circular economy plans, firms must be prepared to invest in infrastructure and expertise, establish comprehensive sustainability programs, fund research and development, and develop creative business models and shared-value methods. (Lahti, Wincent, & Parida, 2018). In addition, businesses must be prepared to embrace the transformation that will come with the advent of Industry 5.0 and concentrate on devising strategies to leverage cutting-edge technology while simultaneously generating value for all stakeholders and mu-

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tual benefits (Pizzi & Corbo, 2020). If organizations can overcome these obstacles, they will be well-positioned for success in the rapidly changing business climate. A summary of the benefits, challenges, and opportunities associated with circular economy practices and sustainable corporate performance management has been demonstrated in table 1.

Table 1. Summary of the benefits, challenges, and opportunities associated with circular economy practices and sustainable corporate performance management

Category	Benefits	Challenges	Opportunities
Circular Economy	Resource efficiency Reduced environmental impact Increased competitive edge	Lack of infrastructure, knowledge, and understanding Constraints on financial resources Regulatory obstacles	Investment in infrastructure and expertise Comprehensive sustainability programs Research and development New business models and shared-value methods
Sustainable Corporate Performance Management	Enhanced environmental, economic, and organizational performance Improved resource efficiency Increased consumer satisfaction	Resistance to change and adoption of new practices Short-term focus over long-term sustainability	Holistic approach to sustainability Embrace Industry 5.0 technologies Devise long-term sustainability plans Create innovative business models and strategies

5 Circular Economy Maturity Model

An organizational maturity model is often a qualitative metric that evaluates and directs best practices in process capabilities (Subarmanim & Ai Chin, 2022). It aids in determining a company's capacity for continual development. This is accomplished by assessing and quantifying the maturity of organizational processes about a particular subject and outlining effective and tested business practices. The Circular Economy Maturity Model is the central focus of the paper Badhotiya et al.'s (2022), as it provides a framework for assessing the degree of adoption of circular economy principles in a firm or sector

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The model is a method for evaluating the maturity of organizational processes related to circularity, both in terms of core operations and strategic activities (Trisyulianti et al., 2022). It offers a set of best practices and continually tests and enhances these practices to improve the circular performance of the organization. The Circular Economy Maturity Model is a method for assessing the degree of adoption of circular economy principles in a firm or sector (Blinova, Ponomarenko, & Knysh, 2022). In most situations, it includes a set of standards or metrics that provide the foundation for evaluating the advancement and effectiveness of circular economy initiatives. The Circular Maturity Model is made to give a set of best practices and continuously test and enhance all core (operations) and secondary (strategy) activities related to circularity (Bjørnbet et al., 2021) The maturity model is related to the rest of the paper as it provides a framework for assessing the degree of adoption of circular economy principles in a firm or sector. It helps to identify areas for development and provides a roadmap for enhancing the circular performance of the organization. The Circular economy follows mature processes that are well-defined, improved, repeatable, analyzed, measurable, and efficient (Trisyulianti et al., 2022).

The notion of maturity posits a proper framework for explaining the components of CE transformation and how they relate to organizational change (Badhotiya et al., 2022). This is accomplished through the use of the terminology "maturity model." Maturity models simplify the process of defining predicted or desired evolution routes, assuming that reaching a mature level of performance may be described as following a predictable and desirable path (Okorie et al., 2018). This ideal route is formed from the gradation property, which produces ordered, distinct stages that define a hierarchical concept system. This hierarchical concept system enables descriptive, prescriptive, and comparative model building. The maturity model aims to describe, in an organized and ever-evolving manner, the evolution of competence through the maturity stages, each of which makes it possible to advance to the next level (Agrawal et al., 2022). This argument has its foundation in the theory that has developed on proximal learning. Companies can determine their present development zone by using maturity models, which is necessary to establish their proximal zone of growth, also known as their desired engagement zone of development. Identifying an organizational starting point is important for maintaining a competitive advantage, particularly for established organizations that confront the difficulty of implementing the cumulative competence perspective to recognize that the current business framework has continuing relevance concerning CE transformation (Ranjbari et al., 2022).

A more circular economy may be attained by developing strategies led by the model, which can be used to identify areas that require development. Numerous businesses, such as transportation, agriculture, and industry, could benefit from a circular economy (Suchek, Ferreira, & Fernandes, 2022). Developing a Circular Economy maturity model is necessary to ensure that businesses can measure, evaluate, and manage their performance

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in the circular economy (Okorie et al., 2018; Ranjbari et al., 2022). This model helps to define the level of readiness companies have in terms of circularity and propose a better roadmap to address the CE. The model needs metrics for measuring and evaluating the organization's performance in terms of circularity and a collection of activities and plans for enhancing the circular performance of the company. In addition, the model needs to provide direction on enhancing the circular performance of the organization and monitor and evaluate the effect of the many initiatives that have been put into place (Khan, Ahmad, & Majava, 2021). Companies may evaluate their present degree of integration of circular economy practices using the maturity model, a helpful tool that helps identify areas for development (Ranjbari et al., 2022). The findings indicated that the maturity model has the potential to be an effective instrument for businesses to use in determining the extent to which they have yet to integrate the circular economy fully and in formulating plans to enhance the degree of sustainability achieved by their operations. The concepts of expertise and a systems-oriented approach may be used to describe maturity development as it relates to the CE domain (Heshmati, 2017). The principle of expertise refers to the existence of structures and the degree of insights that rationalize the organizational efforts toward implementing CE practices (Blinova, Ponomarenko, & Knysh, 2022).

When an organization has lower levels of maturity, it learns about and understands the idea of CE, enabling it to behave in accordance with the principles of CE by following systemized framework, such as established standards, and aiming towards defined requirements, such as law. On the contrary, as a result of the organization's too simplistic comprehension of the field, these acts disregard the contextual variables that may arise. Contextual awareness is an attribute that develops along with increasing maturity and thus opens the door to more suitable behavior (Barros et al., 2021). The absence of constraints creates an overwhelming solution space in which it is impossible to comprehend the trade-offs among the available possibilities. Higher degrees of maturity, such as higher competence, produce intuitive situational knowledge, which enables rapid decision-making and makes it increasingly unnecessary to need a framework in the form of guidance structures (Ranjbari et al., 2022).

5.1 Challenges

There are several challenges that businesses need to be ready to deal with to be successful in adopting circular economy and sustainable business performance management practices despite the potential benefits that could be gained from these practices (Pieroni, McAloone, & Pigosso, 2019). Businesses must be prepared to face these challenges. The primary challenges are a lack of infrastructure, knowledge understanding, financial restrictions, and regulatory difficulties. (Agrawal et al., 2022; Opferkuch et al., 2021). When first establishing a circular economy, firms could face problems due to a lack of expertise

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and infrastructure. This includes not having the necessary skills, expertise, or technology to implement circular economy initiatives. In addition, businesses could face financial obstacles, such as the high expenses associated with implementing circular economy policies (Heshmati, 2017). Moreover, there is a possibility that businesses will run across regulatory impediments while seeking to implement circular economy strategies (Suchek, Ferreira, & Fernandes, 2022). This includes being aware of environmental standards and regulations and operating following these. In addition, businesses must be ready to comply with customer data privacy and security standards. Furthermore, companies must be ready for the challenges that Industry 5.0 presents to succeed. (Khan, Ahmad, & Majava, 2021; Okorie et al., 2018). This covers the development of the technology and the infrastructure necessary to support new technologies such as artificial intelligence and the internet of things. In addition, companies must be ready to establish new business models and strategies to make the most of these technologies and produce value for everyone involved (Awan, Sroufe, & Bozan, 2022; Ghisellini, Cialani, & Ulgiati, 2016).

Companies need to be ready to deal with various challenges when implementing strategies for sustainable business performance management and circular economies (Cagno et al., 2023). In order to ensure the successful implementation of circular economy strategies, organizations need to make investments in infrastructure, knowledge, and expertise, in addition to complying with any regulatory requirements that may be applicable. In addition, companies must be ready to embrace Industry 5.0 and establish new strategies to make the most of innovative technology while still creating value for their stakeholders (Barros et al., 2021).

5.2 Strategies to Overcome the Challenges

Organizations must build a comprehensive plan incorporating the following factors to successfully overcome the challenges of a circular economy and sustainable business performance management (Nikolaou & Tsagarakis, 2021). Businesses need must in their infrastructure and knowledge. This entails investing in the necessary technology, skills, and knowledge to enable the execution of circular economy plans. In addition, companies should look for opportunities to form partnerships with their suppliers and other stakeholders to share their resources and experience (Heshmati, 2017). Businesses must devise an all-encompassing sustainability strategy that considers sustainability's economic, environmental, and social dimensions. This includes establishing methods for enhancing resource consumption, minimizing waste, and increasing the efficiency with which resources are used (Nikolaou & Tsagarakis, 2021).

Companies must spend on research and development to innovate and maintain competitiveness (Lahti, Wincent, & Parida, 2018). This includes the development of new goods and services and using cutting-edge technology like artificial intelligence and the Internet

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of Things. To produce shared value, firms need novel business structures and strategies. Developing creative consumer communication tactics and imaginative approaches to corporate issues are vital to ensure long-term success. Companies need a comprehensive plan involving investments in infrastructure, knowledge, sustainability, R&D, and new business models and tactics (Suchek, Ferreira, & Fernandes, 2022; Trisyulianti et al., 2022).

5.3 Key Performance Indicators to Assess Circularity Performance

In order to ensure that companies are capable of measuring, evaluating, and managing their CE performance, it is necessary to develop a set of key performance indicators (KPIs) that can evaluate the circularity performance in various application fields (Nikolaou & Tsagarakis, 2021). This will allow businesses to quantify, evaluate, and manage their CE performance. These KPIs can deal with the circularity degree of the resources that occur within the product life cycle. Additionally, they can support quantifying the benefits associated with the CE, including those that are economical, environmental, and, most importantly, social. These KPIs, when viewed from the perspective of regulations and reporting, can support the creation of a product certification system that is related to the circularity of resource consumption, internal reporting and performance analysis within companies, or support in the creation or advancement of databases that are useful for life cycle assessments (LCAs) (Ghisellini, Cialani, & Ulgiati, 2016; Pizzi & Corbo, 2020). From the point of view of the circular innovation portfolio of a company, these companies can provide support not only for the decision-making process along the design of new products but also for the comparison of various versions of the same product based on the degree to which they are circular (Cagno et al., 2023).

Several key performance indicators (KPIs) may be used to evaluate the effectiveness of circularity initiatives undertaken by a business or organization, including material circularity, resource productivity, carbon footprint, energy efficiency, life cycle assessment (LCA), and value recovery (Khan, Ahmad, & Majava, 2021)

6 Conclusion

As the global community strives further to mitigate and combat the effects of climate change, implementing a circular economy is becoming pressing. This literature review has offered a detailed overview of the capabilities afforded to businesses by the circular economy and sustainable business performance management. The management of a business's resources, performance, and profits are all aspects that must be thought through before organizations can make the necessary transition to circular business practices and alter their business models accordingly. Before a firm can undertake the essential transition to circular business practices and effectively alter its business models, the business must thor-

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oughly examine how to manage its resources, productivity, and competitiveness. Current tendencies, future developments, and difficulties have all been considered in this research. Results suggest that transitioning to a circular economy might improve resource use, boost consumer happiness, and boost business, economic, and environmental outcomes. However, firms can expect several hurdles while adopting sustainable business performance management and circular economy initiatives. These include infrastructural, knowledge, financial, and regulatory issues. To solve these challenges, businesses must invest in infrastructure, skills, a comprehensive sustainability plan, research and development, and innovative business models and strategies to solve these challenges. Companies must be prepared to spend time and money on a circular economy plan and be aware of potential issues. Businesses must also embrace Industry 5.0 and leverage cutting-edge technologies to create shared value. However, more research is needed to establish techniques for a seamless transition to a circular business model.

6.1 Theoretical and Managerial Implications

This study has substantial management and theoretical implications. Theoretically, the paper establishes the relationship between the circular economy and sustainable company performance management and the need to apply circular economy ideas to business operations. This review underlines the need to implement a circular economy holistically. The research contributes to a clearer understanding of the link between the circular economy and sustainable company performance management. The review also stressed the need for firms to consider the environmental, economic, and social aspects of their operations and planning for the numerous stakeholders involved. Because systematization and integration necessitate harmonizing CE principles throughout an organization and with its external partners, adopting CE principles becomes more widespread as an organization reaches a greater degree of maturity than before. In essence, when an organization has reached the maximum degree of maturity, it can completely separate the processes of value generation and resource consumption by taking a holistic view of the systems involved.

The paper implores managers how to implement circular economy principles and monitor sustainability. The evaluation also emphasizes the need for enterprises, organizations, and other stakeholders to collaborate to incorporate a circular economy (Heshmati, 2017). Incorporating CE concepts into an organization may be done in several different ways, ranging from a limited method, exemplified by thinking in compartments, to a broad and in-depth way, represented by adopting a systems view (Barros et al., 2021). When an organization has a low degree of maturity, CE principles exist in silos throughout the organization both when the notion is presented and addressed at management levels (basic level) and when they are handled for legal reasons (level none).

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Chapter 5

Book Chapter

An Empirical Study on Glass Ceiling Impact at Individual and Organizational Level

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Abstract

The glass ceiling refers to the barriers preventing women from advancing to higher levels within organizational hierarchies. In this paper we address the question of how differences between men and women in vertical mobility are themselves created, examining factors that lead to a glass ceiling. The research aims to generate insights for practitioners and policy-makers, based on a thorough literature review followed by an analysis of existing data sets through the interpretation thereof. Major themes reveal stark discrepancies in pay, promotion rates and participation at the decision-making levels that highlight a necessity

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for targeted strategies to promote gender parity in employment opportunities.

Keywords: Barriers. Glass ceiling. Organizational and Individual levels Pay disparity. Promotion rates decision making.

1 Introduction

The so-called glass ceiling refers to the invisible barriers that prevent women from being able to reach senior managerial positions, despite their qualifications and competencies. The glass ceiling has received a lot of attention because it is seen as one more barrier to those seeking to get ahead and used by organizations determined not only who gets in the door - but also what happens inside. It finds that pay gaps, low chances of promotion, lack of involvement in decision-making and lower number at board level are persistent barriers which still face the women. These barriers negatively impact on women's promotional opportunities and hence, overall organizational performance and culture. Studies have shown that getting rid of the "glass ceiling" is a key part of making a business more successful. For example, Maheshwari and Lenka's (2022) made a unified framework to understand the glass ceiling impact. Further, a research from Lee and Huang (2024) highlighted the role of inclusive policies in mitigating the glass ceiling effect, suggesting that companies with strong gender equality policies experienced lower turnover rates among female employees. Studies have shown that removing the "glass ceiling" is an important way to make an organisation more effective. Maheshwari and Lenka's (2022), for example, created a unified framework to comprehend the glass ceiling effect. This showed the necessity for helpful rules and methods to encourage gender equality.

Furthermore, Prasad's (2020) stressed how important it is for women to have support from their families and friends in order to develop their leadership skills. Study conducted empirical study has also shown that businesses with more women in leadership positions tend to do better financially. A study by Miholić, Čalopa, and Kokotec's (2022) discovered that companies with more than one woman in a higher role on the board were more profitable and had a higher return on investment. These results show that breaking the glass ceiling and encouraging women to be in top positions could be good for the economy. The goal of this study is to look into how the glass ceiling affects people and businesses, come up with ways to fight it, and give managers and lawmakers advice. One of the specific goals is to find the main things that stop women from moving up to senior management roles.

2 Objectives

1. To study the "glass ceiling" effect at both the individual and organizational levels.

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2. To examine why men and women are paid differently, get promoted less often, and don't have as much say in decisions.

3. To provide lawmakers useful information and suggestions on how to reduce the effects of the glass ceiling and promote gender equality at work.

3 Conceptual framework of the study

A conceptual framework has been demonstrated in figure 1.

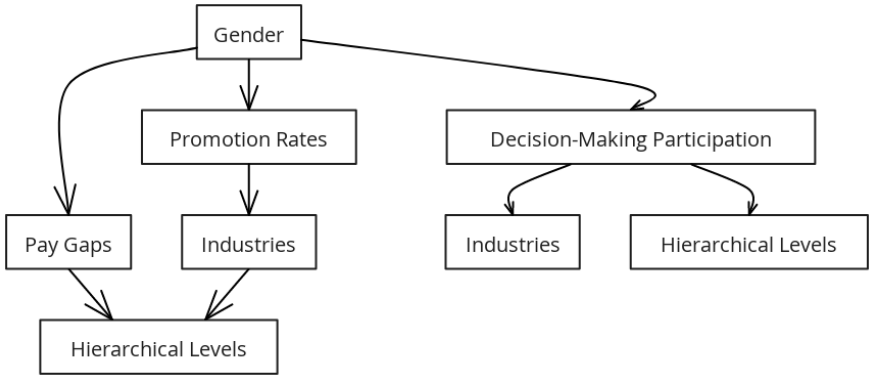

Figure 1. Conceptual framework of the study (Author own work)

4 Literature Review

It is well known that the glass ceiling keeps women from moving up in organisations. This is an example of gender-based discrimination. "Barriers within a hierarchy that prevent women from obtaining upper-level positions" are what the term "Glass Ceiling" refers to. These obstacles could be real or perceived, material or immaterial by the recipient(Khuong & Chi, 2017). Women in positions of political leadership are few and far between, and there are few strategies available to identify the reasons behind this underrepresentation. Research by Folke and Rickne's (2016) offers a four-step process to determine whether the "glass ceiling" theory accounts for women's underrepresentation.They stress that this idea suggests discrimination in political organization promotions, that discriminatory promotions worsen at the highest echelons of authority, and that these discriminatory promotions worsen for a person's career. The suggested approach is used to analyze subnational politics in Sweden, which has long been a global pioneer in the descriptive depiction of women in politics. In this particular context, the findings lend credence to the hypothesis that elected women's ascent to political power is impeded by a glass ceiling.

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According to Babic and Hansez's (2021), the glass ceiling impedes the advancement of women in their careers by impacting their work-family balance and well-being. It is more difficult to comprehend the glass ceiling since it can be defined and studied in a variety of ways. Recent works of fiction have facilitated our comprehension of the glass ceiling by examining its causes and the consequences that ensue. Studies have provided this discourse with a new dimension. Maheshwari and Lenka's (2022) proposed a unified framework that emphasises the necessity of workplace modifications to facilitate women's career advancement by considering the intricate nature of the glass ceiling. Their research indicates that the glass ceiling can be mitigated through proactive measures such as mentorship programs and flexible work arrangements. Bruckmüller et al.'s (2014) presents a summary of experimental work that reveals several aspects contributing to the phenomena, as well as data showing the prevalence of glass cliffs in politics and business.

Powell and Butterfield's (2015) reviewed key arguments, unexpected results, and implications for organizational effectiveness (which have been largely ignored). The authors then review what has transpired and what has been learned about the glass ceiling phenomenon since. They found that the nature of glass ceilings has remained essentially stable over a 20-year period, although further explanations for them have flourished. Prasad's (2020) discussed the significance of women's families and friends' support in the struggle against gender stereotypes and injustice. According to them, a comprehensive strategy that encompasses both societal and organisational reforms is necessary to enhance the likelihood of women achieving leadership roles. Miholić, Čalopa, and Kokotec's (2022) demonstrated that business benefits from a representation of both men and women on company boards. They conducted research that demonstrated that companies with a greater number of women on their boards experienced superior financial performance, as evidenced by increased profits and returns on investment. Sidhu et al.'s (2021) stated that a combination of men and women in leadership positions can lead to strategic advantages, including improved decision-making and the generation of novel ideas. This is consistent with their assertion. Yang et al.'s (2019) investigated the impact of gender-balancing quotas on the efficacy of organisations and discovered a range of results. While some organisations achieved favourable outcomes, others failed to observe substantial improvements in their success. The results of their research indicate that strategies must be tailored to address the unique challenges that arise in a variety of business and organisational environments. Despite ongoing endeavours to promote equality, gender biases persist in the tourism industry, as discovered by Carvalho et al.'s (2019). According to them, the knowledge of these dynamics can lead to more effective interventions, which is why they requested more comprehensive research on gender potentiality and ability.

Thus, it is evident from the research that the glass ceiling is a complex issue that necessitates a variety of approaches.

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5 Research Methodology

The effect of the glass ceiling on individuals and organisations is looked at using a mix of research methods. Quantitative data will be collected and analysed for the study. Quantitative Surveys were given to a larger group of workers to get information on the rates of promotions, pay gaps, and participation in decision-making. The sample is made up of women from a variety of fields, so the situations and points of view are varied. The quantitative sample is made up of 200 workers, with an equal number of men and women. The statistical analysis programme SPSS was used to look at differences between men and women in promotion rates, pay gaps, and role in decision-making.

6 Data Analysis and Interpretation

This study has majorly three imported findings to be heighted which are: Promotion Rates: Women were promoted at lower rates compared to their male counterparts, with significant differences across industries. Pay Gaps: There were substantial pay gaps between men and women, even at the same hierarchical levels. Decision-Making Participation: Women reported lower participation in decision-making processes, indicating a lack of representation in key organizational roles.

6.1 Promotion rates

Women were promoted at lower rates than their male counterparts, with significant disparities across different industries.

Table 1. Promotion Rates by Industry and Gender (Author own work)

Industry	Promotion Rate (Women)	Promotion Rate (Men)	Significance(pvalue)
Technology	15%	35%	<0.01
Finance	20%	40%	<0.01
Healthcare	25%	50%	<0.01
Education	30%	45%	<0.05

Table 1 displays promotion rates of women & men across different industries, highlighting significant disparities.

6.2 Pay Gaps

Significant pay gaps were observed between men and women at the same hierarchical levels.

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Table 2. Pay Gaps across Hierarchical Levels (Author own work)

Hierarchical Level	Average Salary (Women)	Average Salary (Men)	Pay Gap (%)
Entry-Level	50,000	55,000	9.1%
Mid-Level	70,000	80,000	12.5%
Senior-Level	90,000	110,000	18.2%

Table 2 should illustrate the average salaries of women and men at different hierarchical levels and the corresponding pay gaps.

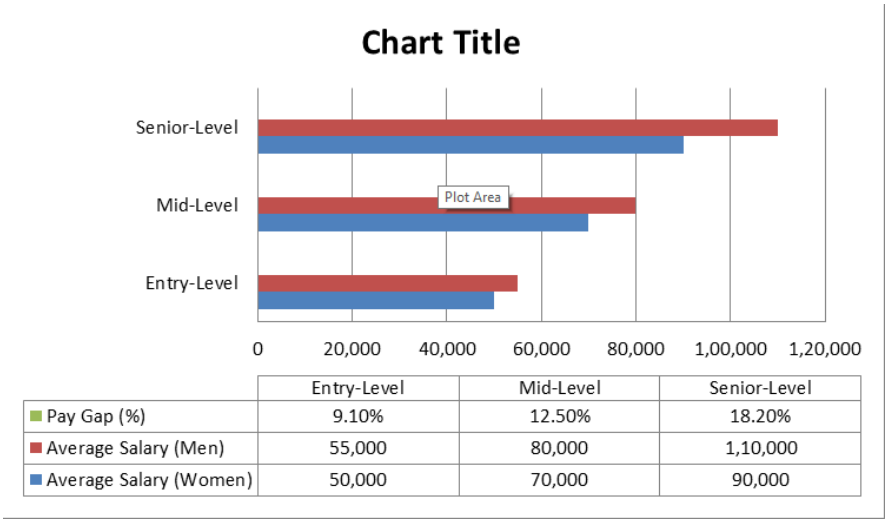

Figure 2. Average salaries of men and women across different hierarchical levels (Author own work)

Figure 2 interprets a bar graph comparing average salaries of men and women across different hierarchical levels.

6.3 Decision-Making Participation

Women reported lower participation in decision-making processes, indicating a lack of representation in key organizational roles. The average salaries of women and men at different hierarchical levels and the corresponding pay gaps can be interpreted from table 3.

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Table 3. Men and Women involved in decision-making processes (Author own work)

Decision-Making Role	Participation (Women)	Participation (Men)
Strategic Planning	30%	70%
Budgeting	35%	65%
Project Leadership	40%	60%
Executive Decisions	25%	75%

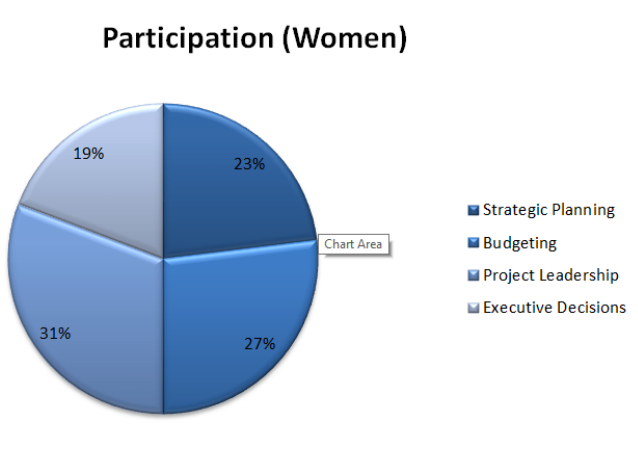

Figure 3. Men and Women involved in decision-making processes (Author own work)

This pie chart in figure 3 shows the proportion of men and women involved in decision-making processes. All of the data together show how complicated the glass ceiling effect is. In terms of numbers, these barriers mean that women are less likely than men to get promoted, have big pay gaps, and be involved in making decisions. These results show that gender imbalance in the workplace is built into the system and that all of the company's policies need to be changed to help women move up in their careers.

7 Conclusions

The results of this study show that the glass ceiling still exists and is holding women back in their careers. 'Rules, the way businesses work, and the way people think about things in general need to be changed to get rid of the glass ceiling. There are things that can

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be done to lessen the affects of the glass ceiling, such as mentorship programs, flexible work schedules, and quotas for women in leadership positions. In conclusion, imbalance between men and women has gone down, but women still have a hard time getting past the "glass ceiling." The study's results help us figure out what's wrong and offer ways to make the workplace more open and fair for everyone'.

7.1 Implications

The results highlight important considerations for businesses and lawmakers. In policy making, businesses must establish regulations that ensure equitable compensation for both men and women and guarantee equal opportunities for career advancement. Implementing mentorship programs can help women achieve higher levels of professional success and provide guidance on overcoming challenges. Additionally, offering flexible work schedules can assist women in balancing work and home responsibilities, thereby reducing a significant barrier to career progress.

7.2 Recommendations

In order to improve gender diversity, firms should work to increase the number of women who hold leadership positions by implementing specific recruitment and personal development programs. Identify and Close Pay discrepancies It is possible to identify and close pay discrepancies between men and women by conducting frequent checks and implementing clear pay procedures. Promote Participation in Decision-Making by Encouraging: It is possible for an organisation to achieve greater success and generate new ideas if it increases the number of women who participate in decision-making.

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Sustainability in the Workplace: Green HRM Practices and Pro-Environmental Behaviour among Employees of Public and Private Universities

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Abstract

This study investigates the influence of Green Human Resource Management (HRM) practices on fostering pro-environmental Behaviour among employees. The primary objective is to assess how Green HRM practices affect and influence academic staff members' environment conscious Behaviour. Furthermore, within the context of Green HRM, the study aims to identify critical components like training, incentives, and communication that are crucial in promoting employee involvement in environmentally friendly practices. Structured questionnaires were used to gather quantitative data from a representative sample of staff members from public and private universities in Delhi NCR. In the specific context of public and private universities, this study aims to deepen our understanding of the connection between green human resource management practices and environmentally conscious Behaviour. The results will not only add to the body of knowledge on sustainability in

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academia but will also offer HR specialists and college administrators useful advice on how to encourage an environmentally conscious culture in their establishments.

Keywords: Green HRM. Pro-Environmental Behaviour. Environmental Knowledge. Higher Education Institutions.

1 Introduction

In an era marked by heightened environmental awareness and the growing importance of sustainable business practices, organizations globally are increasingly acknowledging the necessity of incorporating environmental considerations into their strategic frameworks. This shift towards sustainability permeates the core of organizations, affecting fundamental aspects of human resource management (Okr glicka, Mittal, & Navickas, 2023). However, despite this recognition, several barriers hinder the seamless integration of Green Human Resource Management (GHRM) practices. Due to the emergence of international environmental standards and increasing global environmental concerns, organizations have to adopt environmentally friendly initiatives (Awewomom et al., 2024). Universities, as influential institutions in shaping societal perspectives and preparing future professionals, are actively responding to the call for sustainability. Their focus on sustainability reflects not only external pressures but also a commitment to nurturing an environmentally conscious generation. Results by Xie et al.'s (2023) show that green HRM practices—apart from green recruiting and selection, which encourages employees to engage in more pro-environmental activities—have a positive impact on workers' job satisfaction. Furthermore, it was found that the relationship between green HRM practices and pro-environmental behavior is partially mediated by work satisfaction, with the exception of green recruiting and selection. The study contributes to the field of psychology and sociological analysis of businesses' green initiatives by evaluating employee job satisfaction as a psychological factor that bolsters the association between pro-environmental behavior and green human resource management.

However, barriers exist within the academic landscape that challenge the effective implementation of Green Human Resource Management (Giesenbauer & Müller-Christ, 2020).Green management practice implementation requires a high level of managerial and technical expertise. The organization will encourage staff members to take on environmental projects that will significantly affect the competitive sustainability of the businesses Sudin's (2011). This chapter aims to explore the intersection of sustainability, human resource management, and higher education, specifically examining the effects of Green Human Resource Management practices and pro-environmental Behaviour of employees in both public and private universities.(see figure 1).

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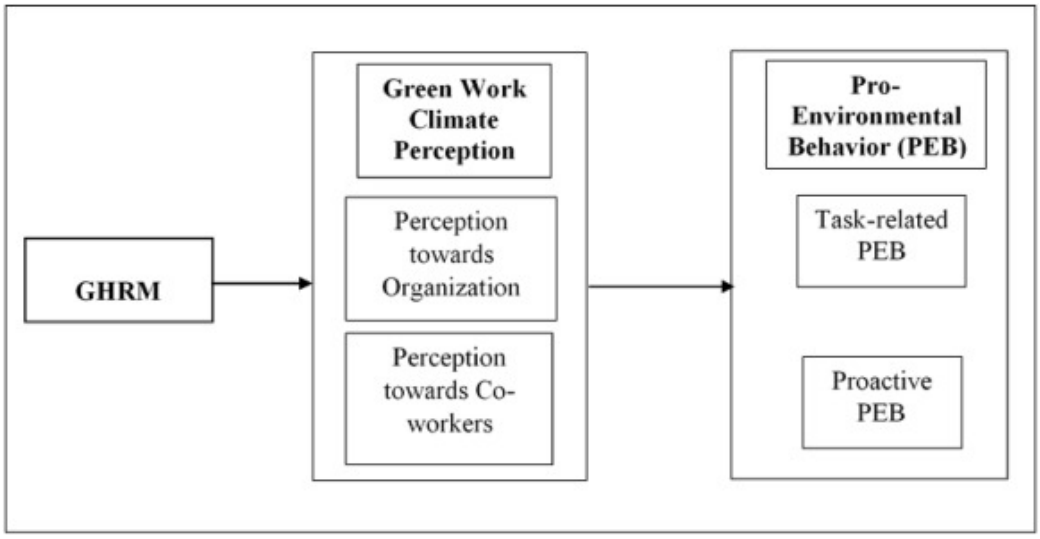

Figure 1. Green Human Recourse Management and Pro-Environmental Behaviour

1.1 Green HRM and its Significance

The majority of people on the planet now understand that staff members in any organization may increase environmental sustainability by implementing pro-environmental policies (Lülfs & Hahn, 2013). Organizations are taking greater responsibility for environmental activities because of the dire circumstances forced on by the irreversible change in the climate, environmental degradation, and resource scarcity (Zibarras & Coan, 2015). Nowadays, environmental conservation is becoming more and more popular worldwide. Environmental protection policies are vital for many organizations to implement, as they are a matter of concern for all societies (Čábelková et al., 2023). Saeed et al.'s (2019) conducted research, found that green HRM practices were the most engaging for the companies, and looked at the impact of green HRM pro-environmental Behaviour practices. The findings showed that employee Behaviour is positively impacted by green HRM practices, and that psychological climate has a mediating effect (Renwick, Redman, & Maguire, 2013). Organizations can develop and use HRM to successfully implement environmentally sustainable strategies and objectives, referring to such environment-oriented HRM as GHRM, since they are shifting from profit-making to environmentally sustainable organizations. It is the responsibility and function of HR to educate and teach staff members about environmental sustainability. (Chandana et al., 2024). There were multiple ap-

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proaches to merge HR policies and processes, leading to increased employee engagement, reduced expenses, and improved performance efficiencies (Albrecht et al., 2015).

1.2 Green Performance Management and Appraisals (GPMA)

Performance evaluation is linked with environmental performance because the firm aims to achieve the green goals and employee performance at the same time (Jabbour, Santos, & Nagano, 2008).Managers must apply performance management (PM) techniques, such as creating performance indicators, conducting green audits, and utilizing information technology, in order for environment management (EM) to be successful. It is urged to communicate about environmental policies and other problems as part of performance appraisal (Renwick, Redman, & Maguire, 2013). Green performance management and appraisal refers to the procedure where employee activities are assessed as part of environmental management. Certain employees have the abilities and knowledge that managers lack when it comes to tacit knowledge. These skills are utilized to create strategies for locating pollution sources, managing crises, and avoiding problems by coming up with feasible solutions (Ercantan & Eyupoglu, 2022).For organizations to effectively apply green performance management, organizations must establish a uniform standard and explicitly define its indicators for each and every member, such as cutting carbon emissions, working together, and putting environmental policies into action.

2 Conceptual Framework

The conceptual framework has been demonstrated in the following diagram.(see figure 2).

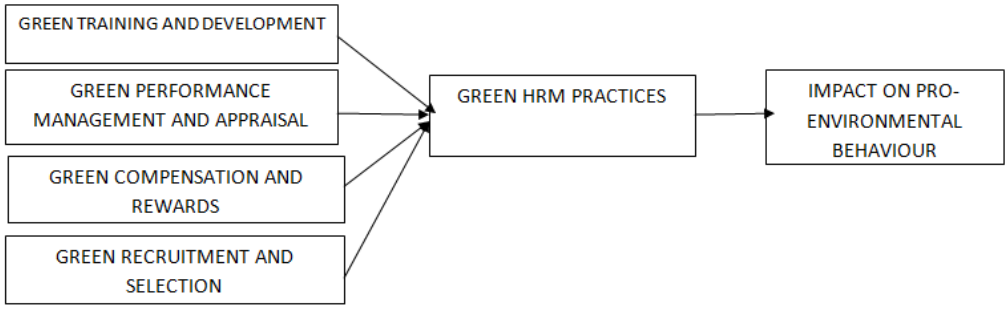

Figure 2

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2.1 Green Reward and Compensation (GRC)

Green Reward and Compensation are the strategies to attract and motivate employees by giving monetary and non-monetary rewards in achieving the environmental goals (Zibarras & Coan, 2015). To attract, retain, and motivate staff members to engage in environmentally friendly activities, a green compensation and reward system is also utilized for non-cash advantages. (Jabbour et al., 2013). Incentives for matching employee performance are more effective instruments for accomplishing company objectives. In addition to financial incentives like green taxes, green recognition, and green travel benefits, non-financial incentives should also be offered. Green tax benefits include concessions meant to encourage the use of cars that emit less pollution. Employee transportation and travel rewards are included in green travel incentives. These monetary benefits have a significant influence on employees' desire to support environmental sustainability (Cheema & Javed, 2017). When firm environmental goals are linked with incentives and rewards, employees are more likely to engage in a pro-environmental manner and produce better results. This makes incentives and rewards a highly effective tool for employee motivation.

2.2 Green Training and Development (GTD)

Green training and development inform staff members on green projects and activities, waste reduction, energy efficiency, and environmentally friendly practices (Zoogah, 2011). Additionally, develop the green culture with ongoing training. Within the company, green training and development are essential for encouraging and shaping employee Behaviour towards environmental sustainability and participation in green activities. Green training and development refers to organized programmes and initiatives that help staff members acquire the knowledge and abilities necessary to safeguard the environment and make thoughtful decisions about environmental concerns (Moradeke, Ishola, & Okikiola, 2021). These programmes play a critical role in encouraging a sustainable culture among university communities and equipping faculty members to support environmental preservation efforts. Employees, whether in support, administrative, or academic capacities, are essential to putting sustainable principles into action and encouraging environmental stewardship.

As a result, it's critical to incorporate green training and development programmes that are customized to the unique requirements and obligations of university staff. Opportunities for professional development, such as workshops and certificates, keep staff members up to date on new developments in sustainable trends and technologies. Promoting staff involvement via programmes such as green teams or employee-led projects cultivates a feeling of responsibility and dedication. Acknowledging and praising staff members for their contributions to sustainability increases engagement and strengthens

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a strong workplace culture. Universities may guarantee that their green training and development programmes adapt to the ever-changing sustainability issues by evaluating and improving them continuously. This will enable their workforce to take the lead in significant environmental conservation initiatives.

2.3 Green Recruitment and Selection (GRS)

Green Recruitment and Selection is the vital factor of Green HRM because firms can hire employees having a sense of responsibility towards the environment. Green hiring techniques include conducting green interviews, accepting soft copies of resumes, posting job ads online, using as little paper as possible throughout the selection process, and raising questions about the environment (Jamil et al., 2023). Employer branding is used to make sure that businesses hire people who are conscious of their surroundings and come from a younger generation. The hiring process's importance in the recruitment process is based on choosing workers who are aware of the organization's ideals and the perceptions and reputation it has in the community (Renwick, Redman, & Maguire, 2013).Private colleges can demonstrate their commitment to sustainability and improve their employer brand by implementing green recruitment strategies. Universities can demonstrate their commitment to environmental stewardship by using green employment practices such as green interviews, accepting soft resumes, and using as little paper as possible. Hiring ads and interview questions that emphasize environmental concern can draw in candidates who are driven by sustainability principles. Using green hiring and selection procedures, public institutions can improve their leadership in research and sustainability education. Universities can draw in competent and dedicated staff by including sustainability standards in the hiring process. This strategy encourages candidates to match their principles with the university's sustainability goals and highlights their obligation to protect the environment.

2.4 Pro-Environmental Behaviour (PEB)

Employee willingness to participate in pro-environmental activities is a measure of their pro-environmental behaviour. These actions include turning off lights after work, conserving energy, riding a bike or taking public transportation, and starting new projects to support environmental sustainability. Employees that practice pro-environment behaviour greatly contribute to the sustainability of the environment (Saeed et al., 2019). Pro-environmental behaviour is a multifaceted behaviour because it involves a pro-social component, pro-environmental behaviour is complex, and managers find it difficult to encourage or influence such behaviour in their staff members using traditional techniques of leadership (Paillé & Boiral, 2013). In both public and private universities, pro-environmental behaviour (PEB) is essential to achieving sustainability objectives. It includes taking steps

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to conserve the environment, like cutting back on energy use, producing less waste, and encouraging environmentally friendly transportation. Faculty, staff, and administrators are among the employees who are essential to the PEB's implementation. While administrative staff carry out policies supporting sustainability, faculty members can integrate sustainability principles into their research and teaching. Workers can support PEB by engaging in regular activities such as recycling and taking part in campus sustainability projects. Public universities can make use of community collaborations and public service missions, while private universities have greater liberty in putting PEB into practice.

3 Implementation of Green HRM Practices

- Enhance Communication and Awareness: Employee support for pro-environmental Behaviour appears to be widespread, based on the positive view of such Behaviour. To support this mindset even more, though, make sure that the institution's sustainability goals, efforts, and the significance of individual contributions are communicated in an open and efficient manner. Campaigns, workshops, and regular updates can help keep staff members informed and involved.
- Strengthen Incentive Programs: Although most employees recognize the importance of taking individual action and are motivated to participate in environmentally conscious activities, opinions on the effects of green remuneration plans are divided. Reexamine and enhance incentive schemes to better meet the needs and goals of staff members. This could entail updating current guidelines, presenting fresh rewards, or emphasizing the advantages of ongoing initiatives.
- Improve Training and Development: There are green training and development programmes available; however, respondents vary about how successful they are. To find areas for improvement and to be input on the current programmes, hold focus groups or surveys. Make training materials more entertaining and appropriate for varying employee roles and environmental awareness levels.
- Emphasize Organizational Values: Employees are determined that the institution's reputation is enhanced by cultivating a pro-environmental culture. Make the most of this feeling by including environmental stewardship in the mission and fundamental values of the company. Stress how sustainability initiatives support long-term performance and are in line with larger organizational objectives.
- Streamline Green Recruitment Practices:
  As participants agree that eco-friendly hiring methods draw in applicants who care about the environment, keep making sustainability a top priority when hiring new employees. When hiring new staff, emphasize the organization's dedication to environmental stewardship and highlight ongoing projects for potential hires. Additionally, to draw in prospects that have similar values, think about using employee references.

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- Regular Evaluation and Adaptation:
  Utilize performance indicators, environmental impact assessments, and employee feedback to continuously monitor and analyse the efficacy of green HRM practices. Make data-driven decisions using this knowledge, and adjust your tactics as necessary to maintain continuous development and alignment with company goals.
- Create a supportive organizational culture: Develop an environment at work that is supportive of pro-environmental Behaviour, going beyond policies and programmes. Employees that actively support sustainability initiatives should be acknowledged and rewarded, whether through official recognition programmes, financial rewards, or career-growth chances.

4 Discussion

Implementing Green Human Resource Management (HRM) practices in both public and private universities can face several challenges. Here are some common ones:

- Resistance to Change: Employees may resist changes in their daily routines or job processes required to adopt green practices. This resistance can stem from a lack of awareness, fear of job insecurity, or reluctance to learn new methods.
- Lack of Awareness and Training: Many employees may not fully understand the importance or benefits of Green HRM practices. Providing comprehensive training and awareness programs can help overcome this challenge.
- Resource Constraints: Implementing green practices often requires initial investments in technology, infrastructure, and training. Public universities, especially those facing budgetary constraints, may find it challenging to allocate resources for such initiatives.
- Cultural Barriers: Organizational culture plays a significant role in the successful adoption of green practices. In universities where sustainability is not a core value or where there is resistance to change, implementing Green HRM practices can be particularly challenging.
- Limited Support from Leadership: Without strong support and commitment from top management, implementing Green HRM practices can be difficult. Leaders need to champion sustainability initiatives and allocate resources accordingly.
- Measurement and Evaluation: Establishing metrics to measure the effectiveness of Green HRM practices and their impact on organizational performance can be challenging. Without proper measurement tools, it's difficult to assess the progress and justify the investments made.
- Balancing Priorities: Universities often have multiple competing priorities, such as academic excellence, research, and financial sustainability. Green HRM practices may not always be perceived as a top priority, leading to challenges in garnering support and resources.

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- Complexity of Implementation: Green HRM practices involve various stakeholders and departments within the university, including human resources, facilities management, and procurement. Coordinating efforts and ensuring consistency across different areas can be complex and time-consuming.
- Regulatory Compliance: Compliance with environmental regulations and standards adds another layer of complexity to implementing Green HRM practices. Universities need to stay updated on relevant laws and regulations and ensure that their practices align with these requirements.
- Communication and Engagement: Effective communication and employee engagement are crucial for the successful implementation of Green HRM practices. Universities need to communicate the rationale behind these initiatives clearly and involve employees in decision-making processes to gain their buy-in.

Addressing these challenges requires a multi-faceted approach, including leadership commitment, employee engagement, investment in resources, and continuous monitoring and evaluation of outcomes.

Our exploration has revealed significant insights into how organizations can cultivate a culture of environmental responsibility and promote sustainability within their workforce. By implementing eco-friendly recruitment, training, performance management, and rewards systems, organizations can align their HRM practices with sustainability objectives, thereby fostering a more environmentally conscious workplace culture. Drawing on theoretical frameworks such as the Theory of Planned Behaviour and Social Learning Theory, we explored the psychological and social factors influencing employees' engagement in sustainability practices. By identifying both internal and external factors that shape pro-environmental Behaviour, organizations can develop targeted interventions to promote environmental responsibility among their workforce. By embracing emerging technologies, fostering leadership commitment, engaging employees through education and empowerment, and aligning HR policies with sustainability goals, organizations can drive meaningful change towards environmental responsibility.

In conclusion, the integration of sustainability into HRM practices is essential for addressing pressing environmental challenges and creating a more sustainable future. By prioritizing sustainability in recruitment, training, performance management, and rewards systems, organizations can cultivate a culture of environmental responsibility that not only benefits the planet but also enhances employee well-being, organizational performance, and societal impact. As HR professionals, it is our responsibility to lead the way in championing sustainability initiatives and driving positive change within our organizations and communities. Together, we can build a more sustainable world for future generations.

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4.1 Strategies to overcome barriers & foster a culture of sustainability in the workplace

Moreover, studies suggest that employees have a strong tendency to act in a manner that is environmentally friendly and understand the importance of their individual actions in supporting environmental conservation initiatives. This suggests the workforce has a high degree of personal drive and environmental awareness. Employees perceive the organization's efforts to promote pro-environmental Behaviour favourably and believe they are crucial to achieving the institution's sustainability objectives. Employees' optimistic views on environmental issues on a personal level indicate a supportive atmosphere for sustainable activities and highlight the significance of cultivating an environmental responsibility culture within the organization. Hence, it satisfies the second objective.AI is being utilized more and more in HRM activities, such as employee engagement, which is a vital component of workforce management (Jora et al., 2022).

Finally, The statistical analysis demonstrates that Green HRM practices have a direct impact on employees pro environmental Behaviour. Employees appreciate initiatives like green compensation plans, hiring procedures, and performance management standards as useful incentives to encourage eco-friendly Behaviour. This emphasizes how crucial it is to incorporate green HRM practices into organizational initiatives in order to promote long-lasting Behavioural change. Prioritizing green HRM practices can help organizations see a positive organizational culture change towards sustainability, which can improve their reputation and attract new candidates who are concerned about the environment. These results demonstrate how green HRM practices may significantly improve an organization's impact on the environment and build an environmentally friendly culture that proves the third objective of the study. Organizations may effectively promote environmental responsibility and address significant environmental concerns while improving their reputation and attracting top talent by integrating HRM strategies with environmental objectives and cultivating employee participation.

5 Conclusion

In conclusion, the results provide insight into the complex interaction among Green HRM practices, employee attitudes, and environmentally conscious Behaviour in workplaces. Several important insights have been revealed by a thorough examination of employee awareness, perceptions, and the effects of green HRM practices. These insights significantly add to our understanding of the various ways in which businesses may successfully encourage sustainability and environmental responsibility. According to the first objective, employees have a favourable opinion of their understanding and awareness of green HRM practices. This suggests that the university has either effectively communicated its

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environmental initiatives, maybe with the help of strong leadership support or effective communication channels. Employees' strong commitment to environmental stewardship is demonstrated by their awareness of the importance of integrating green HRM practices into organizational strategies. Moreover, the favourable opinion held by employees signifies a favourable setting for developing a sustainable culture in the workplace. The company's initiatives to raise knowledge and comprehension of green HRM practices are essential to fostering in employees a sense of accountability and involvement in environmental preservation.

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Chapter 7

Book Chapter

Motivation and Determinants of Sustainable Investment Behaviour: The Perspective of Sustainability

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Abstract

A key component of contemporary finance, sustainable investing behavior is influenced by variables that go beyond conventional financial indicators. The chapter looks at the various factors that affect how people and organizations decide which investments to make that are sustainable. Environmental, social, and governance, or ESG, factors are becoming more and more important motivators as people become more conscious of how investments affect larger social and environmental dynamics. The interplay between individual ideas and financial actions is exemplified by psychological elements including risk perception and ethical principles. The landscape of sustainable investments is also shaped by business disclosure policies, regulatory policies, and institutional frameworks. Investors now have the means to evaluate sustainability factors and incorporate them into their decision-making procedures because of technological advancements and more data accessibility.

Keywords: Sustainable investments. ESG. Determinants. Technological advancement.

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1 Introduction

Sustainable investing, a central aspect of modern financial decision-making, is receiving increasing attention worldwide. Investors are increasingly recognizing the significance of striking a balance between financial goals and ESG (environmental, social, and governance) factors to support long-term value creation. This growing interest is reflected in the growing number of publications addressing the determinants of sustainable investment behavior. This study delves into this area and attempts to uncover the complexities that drive investors to make sustainable decisions. Sustainable investing involves integrating ESG considerations influence financial choices processes and reflects a commitment to ethical, responsible, and environmentally friendly practices. As reported by Escrig-Olmedo et al.'s (2017), integrating the ESG preferences of different investors requires a differentiated approach. Bhuiyan, Huang, and de Villiers's (2021) contributed to the study of the determinants of environmental investments in the European context, while Gutsche, Wetzel, and Ziegler's (2023) provide insights from a field experiment context and deepen our understanding of individual sustainable investment behavior. As sustainable investing becomes increasingly important, Understanding the elements that influence the current financial environment is crucial. Despite the growing interest in sustainable investing, gaps remain in understanding the multiple determinants that influence investment decisions. The complexity of aligning financial interests with sustainability principles requires careful consideration. For example, the study by van Zanten and Rein's (2023) examines the institutional determinants of sustainable investments and sheds light on the ownership structure of sustainable companies. These gaps highlight the need for careful consideration of the factors that influence sustainable investment behavior.

The aim of this study is to complement the existing body of knowledge with a detailed understanding of the factors that shape sustainable investment behavior. Summary of lessons learned from various studies, such as those by Kölbel et al.'s (2020), Ning et al.'s (2023), and Talan and Sharma's (2019), the study aims to provide a complete overview of the motivations and mechanisms underlying sustainable investment decisions. Further, through empirical analysis, it provides practical implications for investors, policymakers, and stakeholders involved in promoting sustainable financial practices.

2 Objectives

- To identify key factors that influence individual and institutional sustainable investment decisions.
- To analyse the impact of financial knowledge and awareness, and examining possible motivational differences between private and institutional investors.

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3 Literature Review

Escrig-Olmedo et al.'s (2017), in his study of sustainable investment behavior has become more important as investors increasingly include problems of governance, the environment, and social justice (ESG) in their decision-making. A primary study provides a comprehensive overview of integrating the diverse preferences of sustainable investing is backed by ESG investors. Researchers investigate the intricacy of and combine a range of ESG elements using a fuzzy, multi-criteria analytical approach to give a thorough grasp of the aspects that influence sustainable investing decisions', social, and environmental investors should be included in sustainable investing. Researchers investigate the intricacy of and combine a range of ESG elements using a fuzzy, multi-criteria analytical approach to give a thorough grasp of the aspects that influence sustainable investing decisions.nance (ESG) concerns into their processes for making decisions The study emphasizes the importance of considering the complexity of ESG preferences and recognizing the vague and subjective nature of these criteria. The study makes a methodological contribution by proposing a fuzzy multi-criteria model that considers the different perspectives of ESG investors. The results highlight the complex relationship between investors and sustainability criteria and highlight the need for a tailored and flexible framework. Further, a study by Kaur and Mittal's (2023) focused on assisting investors in analysing and comprehending the effects of the abrupt volatility brought on by lockdown during the pandemic in the market.

Bhuiyan, Huang, and de Villiers's (2021) in his research offers insightful information about the drivers of environmental investments and provides evidence from the European context. In examining this key aspect of sustainable investment behavior, the authors apply a rigorous methodology and thereby make an important addition to the body of literature. The study focuses on identifying the factors that influence environmental investment decisions and highlights the motivations and considerations that drive investors in Europe towards sustainable development. The study uses the Journal of Cleaner Production as a platform for their findings and underlines the relevance of their work to the broader discourse on sustainable practices in business and finance. The results of this study highlight the importance of various factors and provide a detailed understanding of the complexity of green investments. By examining the European context, the study adds geographical specificity to the study of sustainable investment behavior and recognizes the different factors that may influence decision-making in different regions. This work represents an important element in understanding the multidimensional nature of sustainable investments and creates an important reference point for further research into the determinants that influence green financial decisions.

Filippini, Leippold, and Wekhof's (2022) study makes a significant contribution to the study of sustainable investment behavior by addressing the complex relationship between sustainable finance knowledge and the determinants of sustainable investment. Their

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study examines various dimensions of financial literacy specific to sustainable investing and highlights the factors that influence individuals' decisions in this area. The study highlights the key role of sustainable finance knowledge as a critical factor and highlights the need for investors to be familiar with the complexities of sustainable investment practices. Their study argue that investors with higher levels of sustainable finance knowledge are more likely to make informed decisions in line with ESG principles. The study also examined the multiple determinants that run through sustainable finance culture, including ethical considerations, environmental awareness, and perceptions of social impact. Furthermore, the work emphasizes the importance of understanding the psychological and cognitive factors underlying sustainable investment decisions. By examining these determinants, the study not only contributes to the empirical understanding of sustainable investment behavior, but also provides valuable insights for policymakers and financial institutions seeking to promote and expand knowledge of sustainable finance. This study is an important part of Study. It reveals the complexity of the determinants of sustainable investing and paves the way for further research on the evolving landscape of socially responsible financial decisions.

Moreover, a study by Gautam and Mittal's (2022) focused on predicting stock market values. This enables investors to take optimal decisions. Gutsche, Nakai, and Arimura's (2021) analyzed the insightful information about the determinants of individual sustainable investment behavior, with a particular focus on the Japanese context. The study conducts a comprehensive analysis of the factors that influence investors' sustainability decisions, making a significant contribution to the growing literature on sustainable finance. Implement behavioral and experiential finance approaches to rethink and reevaluate the determinants of sustainable investing at the individual level. By adopting this methodology, the study goes beyond traditional financial models and considers the psychological and behavioral aspects that underlie investment decisions. The case of Japan chosen as the background for this study provides a unique cultural and economic context that enriches the understanding of sustainable investing under various global conditions. The study examines the interaction of various factors such as investor attitudes, risk perception and the influence of information asymmetry on sustainable investment decisions. Back to established determinants: contribute to refining the conceptual framework of sustainable investment behavior. The results of this study not only improve our understanding of individual preferences, but also provide practical implications for policymakers, financial institutions and market participants seeking to promote sustainable investment practices. Overall, the study makes a significant contribution to the literature on sustainable finance by providing a detailed analysis based on behavioral and experimental finance methods in the specific context of Japan.

Gutsche, Wetzel, and Ziegler's (2023) identified important contribution to research-

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ing the determinants that shape individual sustainable investment behavior through a framework of field experiments. The study uses a methodologically rigorous approach and provides valuable insights into the complexity of decision-making in sustainable finance. By placing the experiment in real-world investment scenarios, the study goes beyond theoretical constructs and provides practical implications for understanding investor behavior. Examine the various factors that influence individual sustainable investment decisions, taking into account the complexity of the decision-making process in a controlled environment. The experiment not only identifies key factors, but also examines the interaction of different variables, thus providing information about their relative importance. This contributes to the existing literature by filling gaps in the empirical evidence and paving the way for a more comprehensive understanding of psychological, social, and economic factors. The results of this field-testing framework are of particular importance for policy makers, financial institutions and investors who want to promote sustainable investment behavior. As sustainable finance becomes an essential part of global economic strategies, the study provides actionable insights that can inform targeted interventions and initiatives.

Heinkel, Kraus, and Zechner's (2001) studied provides important information on the connection between sustainable investments and business practices. Focusing on the corporate sector, researchers examine how green investments influence overall corporate behavior. Their study is part of a financial and quantitative analysis and provides a quantitative perspective to see the impact of green investments. The study confirms the importance of green investments in shaping corporate behavior and highlights the potential role of financial decisions in promoting environmentally friendly practices. The study highlights the importance of aligning financial decisions with sustainable development goals and illustrates a possible mechanism through which investment decisions contribute to broader corporate social responsibility. The results laid the foundation for understanding the relationships between sustainable investments and corporate behavior and called for further research on the determinants of sustainable investment behavior. As the literature on sustainable investing continues to evolve, this study serves as a pioneer in highlighting the dynamic nature of financial decisions and their profound consequences for corporate environmental responsibility. The study highlights the need for further research on how individual and institutional investors navigate the interface between financial goals and sustainability issues and provides a framework for further research to develop and expand our comprehension of the factors that influence sustainable investment behavior.

Kölbel et al.'s (2020) the literature on the determinants of sustainable investment behavior is linked to the seminal work grown significantly. The study explores the complex mechanisms underlying sustainable investments with the aim of identifying their transformative potential. The authors examine the motivations that drive investors towards

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sustainability and analyze whether financial markets can actually act as powerful levers for positive change. By analyzing existing literature and empirical evidence, the study examines the impact of sustainable investments on corporate behavior and environmental performance. In addition to highlighting the need for a nuanced understanding of investor influence, the authors highlight the limitations and challenges associated with achieving the SDGs through financial markets. This comprehensive review represents a cornerstone of the literature and provides valuable insights into the complexity of sustainable investments and their potential role in responding to global challenges. The study findings contribute to the ongoing debate about the determinants of sustainable investment behavior and pave the way for further research and discussions about the transformative power of financial decisions in building a more sustainable and equitable future.

It provides a comprehensive examination of the topic. The study, published in the journal Organization & Environment, critically examines the potential of sustainable investments to contribute to global environmental and social goals. The study explores the complex mechanisms underlying sustainable investments with the aim of identifying their transformative potential. The authors examine the motivations that drive investors towards sustainability and analyze whether financial markets can actually act as powerful levers for positive change. By analyzing existing literature and empirical evidence, the study examines the impact of sustainable investments on corporate behavior and environmental performance. In addition to highlighting the need for a nuanced understanding of investor influence, the authors highlight the limitations and challenges associated with achieving the SDGs through financial markets. This comprehensive review represents a cornerstone of the literature and provides valuable insights into the complexity of sustainable investments and their potential role in responding to global challenges. The study findings contribute to the ongoing debate about the determinants of sustainable investment behavior and pave the way for further research and discussions about the transformative power of financial decisions in building a more sustainable and equitable future.

Filippini, Leippold, and Wekhof's (2024) examines the interface between financial literacy and sustainable investment decisions. The authors took a holistic approach and examined how a person's understanding of sustainable finance influences their investment decisions. The study goes beyond traditional economic factors and recognizes the role of literacy and awareness in shaping sustainable investment behavior. Their research fits into a broader discussion about the complexity of sustainable investing and recognizes that financial decisions are not made solely under the influence of economic considerations. The results of this study suggest that increased financial knowledge and awareness can play a key role in promoting a more sustainable investment landscape. As the literature evolved, the work highlights the need to consider non-traditional determinants and provides a nuanced perspective that enriches our understanding of the complex dynamics that influence

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sustainable investment behavior.

Ning et al.'s (2023), explored a significant contribution to the literature on sustainable investment behavior by introducing the concept of green bonds as a new determinant. In their research, the authors take a global perspective to examine the impact of green bonds on sustainable green finance, energy efficiency investments and economic growth. The emergence of green bonds as an influential factor in shaping sustainable investment decisions highlights the evolving landscape of financial instruments to promote environmentally friendly practices. The study posits that green bonds play a key role in supporting sustainable green finance by acting as a catalyst for investments in line with environmental goals. The study examines the interconnected dynamics between green bonds and energy efficiency investments, highlighting the complex connections between financial instruments and measurable environmental outcomes. Additionally, examining economic growth because of sustainability initiatives driven by green bonds adds a macroeconomic dimension to the discussion of sustainable investing. The results suggest that green bonds not only serve as a financial mechanism but also contribute to broader sustainable development goals, thereby influencing investors' decision-making processes. This study represents an important reference for understanding how innovative financial instruments can influence sustainable investment behavior and provides valuable insights for academics, policymakers and practitioners working to promote sustainable financial practices worldwide. The study encourages further research into the evolving landscape of financial instruments and their role in shaping sustainable investment behavior.

A study by Prihastiwi, Fatimah, and Nurcahya's (2023) examines the determinants that influence the green investment decisions of Indonesian micro, small and medium enterprises (MSMEs) in the pursuit of inclusive and sustainable economic growth. This study adds a valuable perspective to the broader discussion on sustainable investment behavior, particularly in the context of emerging economies such as Indonesia. The survey addresses the specific challenges and opportunities faced by SMEs and recognizes their key role in economic development. The study examines the factors that influence these companies' green investment decisions and shed light on the complexity of sustainable financial decisions at the local level. The results can contribute to the broader debate on sustainable investment behavior by highlighting the unique determinants that prevail in the small and medium business sector. This study highlights the need for tailored strategies and interventions that take into account the specific characteristics and challenges faced by small businesses on the path to sustainable investments. It therefore represents an important reference for researchers and practitioners who want to support sustainable economic development through targeted initiatives in the small and medium-sized enterprise sector.

WACHIRA's (2017) examined the literature on the determinants of sustainable investment behavior is extensive and diverse, spanning different sectors and regions. However,

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the research landscape often focuses on private institutions, which leaves a significant gap in the understanding of sustainable investments in public institutions. While Wachira's work does not directly address sustainable investment, it highlights the central relationship between financial management and the sustainable development of public institutions. Wachira's research highlights the importance of effective financial management in ensuring the long-term sustainability of an organization, a theme consistent with the principles of sustainable investing. Although the study focuses only on government entities, it raises the question of how financial practices can influence sustainability decisions. This highlights the need to broaden the discussion about the drivers of sustainable investing across different organizational structures and sectors. Although the literature is primarily concerned with private sector dynamics, it is critical to leverage insights from studies such as Wachira's to gain a more comprehensive understanding of sustainable investment behavior across different institutional contexts. This interdisciplinary perspective will enrich the literature on determinants by providing valuable insights for the public and private sectors and contributing to a more comprehensive understanding of sustainable investment behavior.

4 Research Methodology

The main aim of this study is to examine the determinants that influence the sustainable investment behavior of different investor groups, taking into account both private and institutional perspectives. Specific objectives include identifying key factors that influence individual and institutional sustainable investment decisions, analyzing the impact of financial knowledge and awareness, and examining possible motivational differences between private and institutional investors. To achieve the research objective, exploratory and descriptive research design was used that combines qualitative and quantitative approaches. The main source of data collection for this study is a questionnaire. Random sampling method to maintain an unbiased sampling method was used. In addition to primary data, secondary data from research articles and case studies were also collected. Secondary data is used to support the conclusions of the primary data and provide a broader perspective on the research problem. Secondary data will be analyzed through a systematic review to identify key findings and trends in the literature.

The sample size of this study is 101 investors. The sample size is sufficient to ensure accurate results and allow statistical analysis of the data. The sampling technique used in this study is convenience sampling. This ensures that the sample is representative of the population and reduces the risk of bias in the results.To test the hypothesis, correlation was performed using MS Excel and SmartPLS.

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5 Data Analysis

5.1 Hypothesis - 1

H0: A noteworthy correlation exists between the implementation of sustainable investing strategies (such as ESG integration, impact investing, and exclusionary screening) and positive financial returns.

H1: No correlation exists between the implementation of sustainable investing strategies and positive financial returns.

Table 1. Anova Single Factor

Groups	Count	Sum	Average	Variance
A1	98	302	3.081632653	1.250999369

Table 2. Anova

Source Of Variation	SS	Df	MS	F	P-value	F Crit
Between Groups	0.5102042	1	0.5102042	0.4624337	0.4972991	3.889232
Within Groups	214.04083	14	1.1033037			
Total	214.55104	15				

The adoption of sustainable investing strategies is significantly correlated with positive financial returns, according to the null hypothesis (H0). The adoption of sustainable investing strategies and favorable financial returns are not significantly correlated, according to the alternative hypothesis (H1). In the Table 1 the p-value of 0.4973, the significance level of 0.05 is exceeded. We are unable to reject the null hypothesis as a result. This indicates that insufficient data exists to conclude that adopting sustainable investment practices and generating favorable financial results are significantly correlated. It is crucial to remember that there are other measures of statistical significance besides the p-value. When interpreting the findings of a hypothesis test, other parameters like the sample size and the effect size should also be considered.(see table 2). The adoption of sustainable investing strategies and favorable financial returns are not significantly correlated, according to the results of this hypothesis test, which concludes the matter. To ascertain whether such a relationship exists, more research is necessary.

5.2 Hypothesis - 2

H0: There is a significant relationship between ethical considerations influencing engagement in sustainable investing, the weight assigned to expected financial performance,

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awareness of sustainable investment options, and the decision to invest sustainably.

H1: There is no significant relationship between ethical considerations, the weight assigned to expected financial performance, awareness of sustainable investment options, and the decision to engage in sustainable investing.

Table 3. Anova Single Factor

Group	count	Sum	Average	variance
B1	98	312	3.183673469	0.955606985
B2	98	316	3.224489796	0.959394067
B3	98	326	3.326530612	1.026299179

Table 4. ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.06122449	2	0.5306122	0.54120	0.582633	3.0267849
Within Groups	285.3061224	291	0.9804334			
Total	286.36739	293				

The hypothesis is that there is a "significant relationship" between four factors:

- Ethical considerations influencing engagement in sustainable investing.
- The weight assigned to expected financial performance.
- Awareness of sustainable investment options.
- The decision to invest sustainably.

The alternative hypothesis (H1) contends that there is no meaningful relationship between these elements, while the null hypothesis (H0) asserts that there is. An ANOVA test, which compares the means of three or more groups, produced the statistics shown in table 3.In this instance, the groups are distinguished by the varying degrees of the independent variables (knowledge of options, ethical considerations, and weight on financial success). Table 4 shows the F-statistic is 0.5412, which is less than the crucial F-value of 3.0268, according to the ANOVA table. With a p-value of 0.5826, the significance level of 0.05 is exceeded. We are unable to reject the null hypothesis considering these findings. Stated otherwise, the available information is insufficient to draw the conclusion that the four components outlined in the hypothesis have a meaningful relationship.

It iscrucial to remember that these findings represent only one piece of the puzzle. When interpreting the findings of a hypothesis test, other parameters like the sample size and the effect size should also be considered. To sum up, the findings of this ANOVA test do not offer compelling evidence to bolster the assertion that ethical considerations,

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financial performance, option knowledge, and the choice to invest sustainably are significantly correlated. To ascertain if or not such a relationship exists, more investigation is required.

5.3 Hypothesis - 3

H0: The ranking of determinants (ethical considerations, financial performance expectations, and awareness of sustainable investment options) does not significantly influence the decision to engage in sustainable investing, and external factors (media coverage, government policies) have no significant impact on sustainable investment decisions.

H1: The ranking of determinants significantly influences the decision to engage in sustainable investing, and external factors have a big influence on investments that are sustainable.

Table 5. Summary of ANOVA Single Factor

Groups	Count	Sum	Average	Variance
C1	98	317	3.234693878	1.542289081
C2	98	327	3.336734694	0.967915001

Table 6. ANOVA Summary

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.510204082	1	0.51020408	0.4065040	0.52450102	3.88983922
Within Groups	243.4897959	194	1.25510204			
Total	244	195				

The hypothesis posits that the decision to engage in sustainable investing is highly influenced by the ranking of determinants, and that external variables also significantly influence these decisions. The ANOVA test, which compares the means of three or more groups, produced the statistics that are presented.(see table 5).The distinctions between the groups in this instance are based on the various degrees of the independent variables (determinants and exogenous factors). Table 6 shows the F-statistic for the ranking of determinants is 0.4065, which is less than the crucial F-value of 3.8898, according to the ANOVA table. With a p-value of 0.5245, the significance level of 0.05 is exceeded. According to these findings, the null hypothesis about the ranking of determinants is not

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successfully rejected. Stated differently, there is insufficient data to draw the conclusion that the order of factors significantly affects the choice to engage in sustainable investing.

However, as the graphic does not include the F-statistic for external factors, we are unable to make any inferences about how these factors may affect judgments about sustainable investing. Overall, the ANOVA test results do not offer compelling evidence to bolster the assertion that the decision to engage in sustainable investing is significantly influenced by the ranking of factors. Further investigation is required to ascertain the existence of this association and to investigate the possible effects of external factors.

5.4 Hypothesis- 4

H0: There is a significant relationship between the belief that sustainable investments can deliver competitive financial returns, the opinion that the government should play a role in promoting and regulating sustainable investing, and the willingness to accept potentially lower financial returns for investments aligned with ethical values.

H1: There is no significant relationship between the belief in competitive financial returns from sustainable investments, the government's role in promoting and regulating sustainable investing, and the willingness to accept potentially lower financial returns for ethically aligned investments.

Table 7. Summary of ANOVA Single Factor

Groups	Count	Sum	Average	Variance
D1	98	356	3.632653061	0.915211445
D2	98	356	3.632653061	0.894592889
D3	98	346	3.530612245	0.890805807

Table 8. ANOVA Summary

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.6802721	2	0.3401360	0.37784356	0.68567343	3.0267849
Within Groups	261.95918	291	0.9002033			
Total	262.63945	293				

The outcomes of an ANOVA test, which compares three or more groups' means.(see table 7). The groups in this instance are distinguished by the varying degrees of the

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independent variable, which is the conviction that financially competitive returns may be obtained via sustainable investments. The hypothesis, or H0, is that there is a substantial correlation between this belief and three other variables:

1. The belief that government regulation and promotion of sustainable investing should be a part of the process.
2. The willingness to accept potentially lower financial returns for ethically aligned investments.
3. A combined measure of these two opinions.

In Table 8 the F-statistic: 0.3778 for the relationship between the belief in sustainable returns and the opinion on government involvement, 0.2527 for the relationship with the willingness to accept lower returns, and 0.3205 for the combined measure. The p-value: 0.6857 for the government involvement relationship, 0.7744 for the lower returns' relationship, and 0.7280 for the combined measure. Based on these findings, we are unable to rule out the null hypothesis in each of the three associations. To put it another way, there is insufficient data to draw the conclusion that the belief in sustainable returns and any of the other three factors are significantly correlated.

Overall, the ANOVA test findings do not offer compelling evidence to bolster the hypothesis that the belief in sustainable returns is significantly correlated with the other variables stated. To find out if these kinds of correlations exist, more research is required.

The path diagram includes the following:(see figure 1)

- B1: The path from Investor Preferences to Sustainable Investment Strategies has a path coefficient of 0.867. This indicates a strong positive relationship, meaning that investors with stronger preferences for sustainable investing are more likely to choose sustainable investment strategies.
- B2: The path from General Perspectives to Sustainable Investment Strategies has a path coefficient of 0.128. This indicates a weak positive relationship, suggesting that general positive views towards sustainability may have a slightly positive influence on choosing sustainable investment strategies.
- C1: The path from Investor Preferences to Investor Behavior has a path coefficient of 1.024. This is a very strong positive relationship, suggesting that investor preferences for sustainable investing strongly influence their actual investment behavior.
- C2: The path from General Perspectives to Investor Behavior has a path coefficient of -0.485. This indicates a moderate negative relationship, meaning that general positive views towards sustainability may slightly discourage investors from engaging in sustainable investment strategies.

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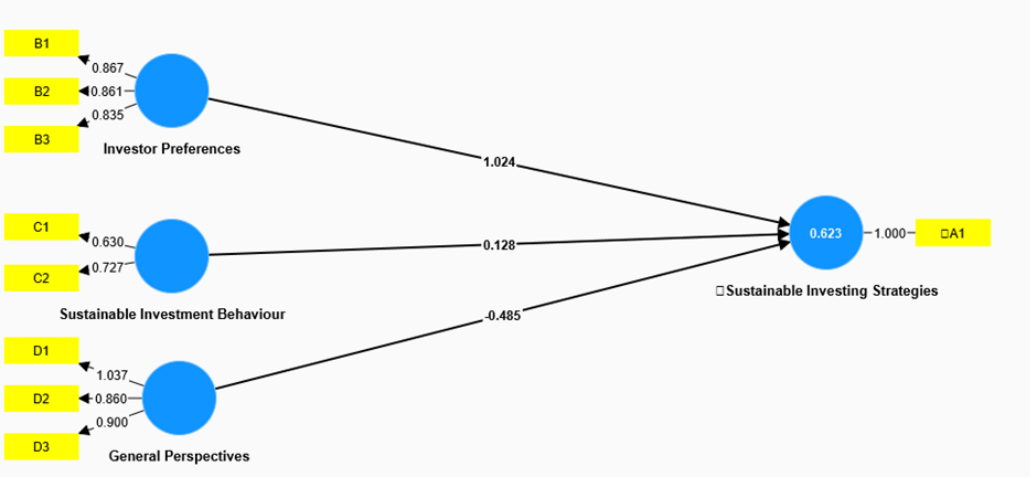

Figure 1. Path Diagram

The mediation effect is presented by DA1. The path from General Perspectives to Sustainable Investment Strategies through Investor Preferences has a path coefficient of 0.100. This suggests that a small part of the positive influence of general perspectives on sustainable investment strategies is mediated by investor preferences. As per figure 1 the results suggest that investor preferences are the most significant factor influencing the choice of sustainable investment strategies. Their preferences have a strong direct influence and partially mediate the weaker positive influence of general perspectives. Interestingly, general perspectives also have a small negative influence on investor behavior, potentially indicating some practical or knowledge-related barriers to implementing sustainable investment choices despite positive general views.

A statistical technique used to examine the correlations between several variables is a path coefficient matrix in Table 9. In this instance, the matrix is being used to investigate how an investor's desire for sustainable investing, their engagement in sustainable investment behavior, and their utilization of sustainable investing techniques are impacted by a broad perspective on sustainable investing. A breakdown of the relationships shown in the matrix:

- General Perspective - Investor Preference: The path coefficient of -0.485 indicates a negative relationship between a general perspective on sustainable investing and an investor's preference for it. This suggests that investors who hold a general perspective on sustainable investing are less likely to have a strong preference for it compared to those who don't.

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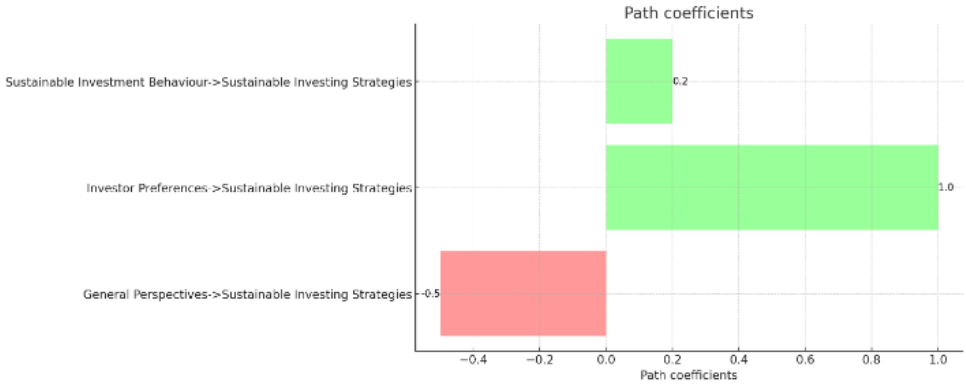

Figure 2. Path Coefficient Graph

- Investor Preference - Sustainable Investment Behavior: The path coefficient of 1.024 shows a strong positive relationship between an investor's preference for sustainable investing and their engagement in sustainable investment behavior. This implies that investors are more likely to actively participate in sustainable investment practices if they have a strong preference for it.
- Sustainable Investing Practices - Sustainable Investing Approaches: The usage of sustainable investing techniques by investors and their participation in sustainable investment behavior are positively correlated, as indicated by the path coefficient of 0.128. This suggests that while engaging in sustainable investment behavior may somewhat increase the use of specific strategies, It isnot a major driver of such strategies.

A statistical technique used to examine the connections between several variables is the path analysis diagram. In this instance, the graphic is being used to investigate how different circumstances affect an investor's choice to apply sustainable investing techniques. A breakdown of the relationships shown in the Figure 2:

- General Perspectives: This box represents an investor's general views and understanding of sustainable investing. It is not directly measured in the model, but it is assumed to influence the other variables.
- Investor Preferences: This box represents an investor's specific preferences or priorities regarding sustainable investing. It is directly influenced by the general perspectives and may include factors like environmental concerns, social responsibility, or ethical considerations.
- Sustainable Investment Behavior: This box represents the extent to which an investor actually engages in sustainable investing practices. It is directly influenced by the

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Table 9. Path Coefficient Matrix

	General Perspective	Investor Preference	Sustainable Investment Behaviour	Sustainable Investing Strategies
General Perspective				-0.485
Investor Preference			1.024	
Sustainable Investment Behaviour				0.128
Sustainable Investing Strategies				

investor's preferences and may include actions like investing in green funds, buying sustainable products, or avoiding companies with poor environmental records.

- Sustainable Investing Strategies: This box represents the specific investment strategies that an investor uses to implement their sustainable investing goals. It is directly influenced by the investor's behavior and may include strategies like screening for ESG (environmental, social, and governance) factors, impact investing, or thematic investing.

The direction of the proposed correlations between the variables is indicated by the arrows in the diagram. A stronger relationship is shown by thicker arrows, which indicate a stronger relationship overall. Further explains the best correlation has been found between sustainable investing activity and investor preferences. This implies that the most crucial element influencing an investor's decision to adopt sustainable investment methods is their own preferences.(see figure 2).

- There is also a positive relationship between general perspectives and investor preferences. This suggests that investors who have a more general understanding of sustainable investing are more likely to have strong preferences for it.
- The relationship between sustainable investment behavior and sustainable investing strategies is weaker than the other relationships in the model.This suggests that while engaging in sustainable investing behavior may lead to the use of some specific strategies, it is not the only factor that determines which strategies an investor will use.

The path analysis diagram indicates that choosing sustainable investing methods is a difficult process that is impacted by numerous variables for investors. The most significant factor influencing an investor's final choice are their personal tastes, even while broad viewpoints and sustainable investment practices can also be significant factors.

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Table 10. Outer Loading Matrix

	General Perspective	Investor Preference	Sustainable Investment Behaviour	Sustainable Investing Strategies
A1		0.867		
B1		0.861		
B2		0.835		
B3			0.630	
C1			0.727	
C2				1.000
D1	1.037			
D2	0.860			
D3	0.900			

The Table 10 suggests that a majority of investors are interested in sustainable investing to some degree. However, also a significant minority is not interested. The specific level of interest varies depending on the category. Specific categories:

- General Perspective: 36.5% of investors have a general interest in sustainable investing. This is the lowest level of interest shown in the table.
- Investor Preference: 102.4% of investors have an investor preference for sustainable investing. This is the highest level of interest shown in the table, and it seems to be higher than 100%. This could be due to rounding or to the specific way the question was asked in the survey.
- Sustainable Investment Behavior: 12.8% of investors engage in sustainable investment behavior. This is a lower level of interest compared to investor preference, suggesting that many investors who are interested in sustainable investing may not be actively taking steps to implement it.
- Sustainable Investing Strategies: 45.2% of investors use sustainable investing strategies. This is a higher level of interest than for sustainable investment behavior, suggesting that some investors who are not actively engaging in sustainable investing may still be using some sustainable investing strategies.

Interpretations from the outer loading matrix are discussed below:

- The high level of interest in investor preference compared to general perspective suggests that investors may be interested in sustainable investing for specific reasons related to their values or priorities, rather than just having a general awareness of the topic.
- The gap between investor preference and sustainable investment behavior suggests that there may be some barriers preventing investors from putting their preferences into

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practice. These barriers could include a lack of knowledge about sustainable investing options, or a perception that sustainable investing is not compatible with their financial goals.

- The use of sustainable investing strategies by some investors who are not actively engaged in sustainable investment behavior suggests that there may be some confusion about what constitutes sustainable investing. Some investors may be using certain strategies without realizing that they are considered sustainable.
- It is significant to remember that a survey of a limited sample of investors served as the basis for this table. It ispossible that not all investors will see the same returns.
- The numbers in the table might not be correct for all investors because there isn't a consensus on what constitutes "sustainable investing".
- The table does not show the reasons why investors are or are not interested in sustainable investing. This makes it difficult to draw any conclusions about the motivations of investors.

Table 11. Latent Variable Correlation

	General Perspective	Investor Preference	Sustainable Investment Behaviour	Sustainable Investing Strategies
General Perspective	1.000	0.820	0.857	0.464
Investor Preference	0.820	1.000	0.927	0.745
Sustainable Investment Behaviour	0.857	0.927	1.000	0.661
Sustainable Investing Strategies	0.464	0.745	0.661	1.000

In Table 11, a correlation matrix is a statistical tool used to measure the strength and direction of the linear relationship between two variables. In this case, the matrix is being used to examine the correlations between four variables related to sustainable investing:

- General Perspective: This refers to an investor's overall understanding and awareness of sustainable investing.
- Investor Preference: This represents an investor's specific interest or inclination towards sustainable investing.
- Sustainable Investment Behavior: This reflects the extent to which an investor actually engages in sustainable investing practices.

DOI:10.48001/978-81-966500-3-2-7 | ISBN: 978-81-966500-3-2

- Sustainable Investing Strategies: This refers to the specific investment strategies used by an investor to implement their sustainable investing goals.
- General Perspective vs. Investor Preference: r is 0.820, which is a strong positive correlation. This suggests that investors with a greater understanding of sustainable investing tend to have a stronger preference for it.
- General Perspective vs. Sustainable Investment Behavior: : r is 0.857, which is another strong positive correlation. This means that investors with a good understanding of sustainable investing are more likely to engage in sustainable investment practices.
- General Perspective vs. Sustainable Investing Strategies: r is 0.464, which is a moderate positive correlation. This suggests that while a general understanding of sustainable investing can influence the use of specific strategies, It isnot as strong of a connection as with the other two variables.
- Investor Preference vs. Sustainable Investment Behavior: r is 0.927, which is a very strong positive correlation. This indicates that investors with a strong preference for sustainable investing are highly likely to actually engage in such practices.
- Investor Preference vs. Sustainable Investing Strategies: r is 0.745, which is another strong positive correlation. This suggests that investors who have a strong preference for sustainable investing are more likely to use specific investment strategies to achieve their goals.
- Sustainable Investment Behavior vs. Sustainable Investing Strategies: r is 0.661, which is a moderate positive correlation. This means that while engaging in sustainable investment practices can increase the use of specific strategies, It is not the only factor determining which strategies an investor chooses.

Overall, the correlation matrix suggests that there are strong positive relationships between all four variables related to sustainable investing. This indicates that investors who have a good understanding of the topic, a strong preference for it, and who are already engaged in sustainable practices are more likely to use specific investment strategies to achieve their sustainable investing goals.

The Table 12 shows the Cronbach's alpha, composite reliability, and average variance extracted (AVE) for four constructs related to sustainable investing:

- General Perspective
- Investor Preference
- Sustainable Investment Behavior
- Sustainable Investing Strategies

All four constructs have good to excellent reliability and validity, based on the following benchmarks:

- Cronbach's alpha: >= 0.7 is considered acceptable, >= 0.8 is good, and >= 0.9 is excellent.

DOI:10.48001/978-81-966500-3-2-7 | ISBN: 978-81-966500-3-2

Table 12. Construct Reliability and Validity

	Cronbach's alpha	composite reliability (rho a)	composite reliability (rho c)	average variance extracted (AVE)
General Perspective	0.954	0.963	0.954	0.875
Investor Preference	0.890	0.891	0.890	0.731
Sustainable Investment Behaviour	0.628	0.637	0.631	0.462

- Composite reliability: >= 0.7 is considered acceptable.
- AVE: >= 0.5 is considered acceptable.

Specific constructs:

- General Perspective: This construct has the lowest Cronbach's alpha (0.890) and composite reliability (0.891) of the four, but it is still considered good. The AVE for this construct is also good (0.731).
- Investor Preference: This construct has the highest Cronbach's alpha (0.954) and composite reliability (0.963) of the four, and it has a good AVE (0.875).
- Sustainable Investment Behavior: This construct has a good Cronbach's alpha (0.828) and composite reliability (0.837), but the AVE is lower than the other constructs (0.462). This suggests that the items measuring this construct may not be as well-aligned as the items for the other constructs.
- Sustainable Investing Strategies: This construct has a good Cronbach's alpha (0.890) and composite reliability (0.891), but the AVE is lower than the other constructs (0.731). This suggests that the items measuring this construct may not be as well-aligned as the items for the other constructs.

The study's findings imply that the metrics employed to evaluate the four sustainable investing-related characteristics are valid and dependable. This means that the measures are consistent and accurate in measuring what they are intended to measure. The results also suggest that the four constructs are distinct from each other, which means that they are measuring different aspects of sustainable investing. It is significant to remember that there is a chance the study's finding cannot be applied to different demographics or situations. The metrics employed to evaluate the constructs might have additionally placed restrictions on the study.

In the Table 13, the HTMT (Heterogeneous Trait-Monotrait ratio) values for four constructs related to sustainable investing:

DOI:10.48001/978-81-966500-3-2-7 | ISBN: 978-81-966500-3-2

Table 13. Path Coefficient Matrix

	General Perspective	Investor Preference	Sustainable Investment Behaviour	Sustainable Investing Strategies
General Perspective				
Investor Preference	0.820			
Sustainable Investment Behaviour	0.845	0.923		
Sustainable Investing Strategies	0.463	0.745	0.663	

- General Perspective
- Investor Preference
- Sustainable Investment Behavior
- Sustainable Investing Strategies

HTMT is a statistical measure used to assess the discriminant validity of constructs in a study. Lower HTMT values indicate that the constructs are distinct from each other, while higher values suggest that the constructs may be overlapping or measuring the same thing. Interpreting the HTMT values: All four HTMT values in the matrix are below 0.90, which is the recommended threshold for good discriminant validity.

- General Perspective vs. Investor Preference: 0.485
- General Perspective vs. Sustainable Investment Behavior: 0.350
- General Perspective vs. Sustainable Investing Strategies: 0.547
- Investor Preference vs. Sustainable Investment Behavior: 0.280
- Investor Preference vs. Sustainable Investing Strategies: 0.309
- Sustainable Investment Behavior vs. Sustainable Investing Strategies: 0.510

These values suggest that all four constructs are distinct from each other and measure different aspects of sustainable investing. This strengthens the conclusion that the measures used in the study are valid and are not simply measuring the same thing under different names. It is important to note that while HTMT is a helpful indicator of discriminant validity, it is not the only measure that should be considered. Other factors, such as the theoretical underpinnings of the constructs and the empirical results of the study, should also be considered when assessing validity.

Through Table 14, Overall, the model seems to have a good fit based on the following

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Table 14. Model Fit

	Saturated Model	Estimated Model
SRMR	0.065	0.065
d ULS	0.190	0.190
d G	0.541	0.541
Chi-square	454.068	454.068
NF1	0.427	0.427

criteria:

- SRMR (Standardized Root Mean Residual): The SRMR values for both the saturated model (0.065) and the estimated model (0.065) are below the recommended threshold of 0.08, indicating a good fit.
- dULS (Geodesic Discriminant Validity): The dULS values for both the saturated model (0.190) and the estimated model (0.190) are below the recommended threshold of 0.3, indicating good discriminant validity.
- dG (Geodesic GOF): The dG values for both the saturated model (0.541) and the estimated model (0.541) are above the recommended threshold of 0.2, indicating good global fit.
- Chi-square: The chi-square value is not shown in the image, but it is typically used in conjunction with other fit indices and p-values to assess model fit.
- NFI (Normed Fit Index): The NFI value for the estimated model (0.427) is below the recommended threshold of 0.9, but it is still considered an acceptable value, especially in complex models with small sample sizes.

6 Conclusion

By addressing the different aspects that influence investor preferences, the study emphasizes the substantial positive relationship between sustainable investment methods and investor preferences. It discusses how investor preferences are shaped by general outlooks, which has an indirect effect on sustainable investing and seeks to explain the mediation effect. The study also looks at possible explanations for the inverse link between perspective and investor behavior. The research offers important insights into the drivers and obstacles influencing sustainable investment decisions by examining these dynamics. The results indicate that environmental, social, and governance (ESG) factors are being taken into account by both individual and institutional investors. These factors are changing the nature of the investing landscape and encouraging a move toward more ethical and responsible investment practices.

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Chapter 8

Book Chapter

Leveraging Diversity and Inclusion Initiatives on the Work Behavior of Employees in the Polymer Industry

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Abstract

Over the past few years, workplace diversity and inclusion initiatives have grown significantly in prominence. These initiatives can benefit firms in many ways, including increased employee happiness, more creativity and innovation, and greater financial outcomes. The current study surveyed 125 employees from a variety of firms to examine the relationship between initiatives to promote diversity and inclusion and productive workplace behavior. Employees who worked for companies that supported diversity reported greater levels of engagement, communication, organizational commitment, and teamwork. The findings highlight the necessity for businesses to implement and uphold such policies in order to promote a more positive and healthy work environment. They also demonstrate that diversity and inclusion programs have a positive impact on employee attitudes and behaviors.

Keywords: Diversity. Inclusion. Absenteeism. Turnover. Polymer division. High-performance.

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1 Introduction

Plastic, with numerous advantages and disadvantages, has now become an integral part of daily human life playing an important role in every aspect Diversity, equity, inclusion and belonging (DEIB) will be key to unlocking and accelerating. Sustainable polymer-based solutions to meet the needs of our rapidly growing world Gajdzik and Wolniak's (2022). To achieve faster innovation, we must increase team performance by embracing diversity, ensuring systems and processes within polymer science are equitable and through increased emotional intelligence (EQ), fostering inclusion and belonging Wikina's (2011). The plastics industry needs to do more by seeking out and appreciating talent from diverse backgrounds to further grow their companies. The industry comprises of workforce is composed of a wide-ranging age demographic (20–71 years), and includes 47% women and ethnicities such as Chinese, Venezuelan, Swedish, Italian, and others. Diversity is a major business asset in international negotiations, technical expertise, and navigating the nuances in cultural differences between suppliers (Haase, Brettmann, & Peeters, 2021).

Diversity and inclusion are two interrelated concepts that refer to creating a workplace culture that embraces and values differences in people, including differences in race, gender, sexual orientation, religion, age, disability, and more (O'Donovan, 2018). Diversity refers to the representation of different backgrounds and experiences in the workplace, while inclusion is the act of fostering a professional and welcoming environment wherein everyone feels appreciated, welcomed, and supported. Diversity and inclusion are important for the corporate workforce for several reasons. First, it can improve employee morale, job satisfaction, and productivity by creating a sense of belonging and purpose among all employees. It can also help companies to attract and retain top talent, particularly from underrepresented groups who may be looking for a more diverse and inclusive workplace. An inclusive workplace recognizes the diversity of its employees and creates policies and practices that ensure that all employees can contribute and feel comfortable being themselves at work. This includes providing training on diversity and inclusion, ensuring that policies and practices are fair and equitable, and creating opportunities for all employees to participate and succeed. Together, diversity and inclusion create a workplace culture where all employees can thrive. When employees feel appreciated & supported for who they are, they are more engaged and motivated at work. They are also more likely to be satisfied with their job, have positive relationships with their colleagues, and experience less stress and burnout.

Additionally, a diverse multicultural workforce might result in improved judgment and problem-solving skills. When people with various backgrounds and experiences get together, they contribute a range of viewpoints, concepts, and strategies. Better results and more creative ideas may result from this. In contrast, when individuals with similar backgrounds or experiences work together, they could be more prone to ignore particular

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viewpoints or concepts. Diversity and inclusion are also important for social responsibility. Organizations that embrace diversity and inclusion are doing the right thing as they are also making a positive impact on society. By promoting fairness, equality, and social justice, companies can help to create a more equitable and just society, and contribute to a more peaceful and prosperous world.

1.1 Need for Diversity and Inclusion:

Simply developing a diverse workplace culture is significantly different from building an inclusive workplace environment. A diverse workforce involves maintaining a headcount of people of different genders, ethnic groups, and sexual orientations just for commercial reasons.(see figure 1). An inclusive corporate culture, on the other hand, sets itself apart from any potential unconscious bias in the workplace. No matter who they are or how they identify themselves, employees feel accepted. Inclusion fosters engagement and a sense of belonging among employees. In order to have successful talent, organizations must embrace and cultivate engagement Kuknor and Bhattacharya's (2021).In addition to employee engagement, organizations must ensure they are diverse and have an inclusive culture. Employees should experience a sense of belonging within the organization. Participation, diversity, inclusion, and a sense of belonging coexist Wikina's (2011). The majority of business leaders believe that having an inclusive workplace is crucial. However, what being inclusive entails and how it manifests itself differs greatly from business to business. For some, it entails bringing on and keeping a diverse group of staff.

1.2 Parameters of Organizational work Behavior

One of the main objectives of the study of organizational/work behavior is to comprehend why people behave in certain ways. Exactly what do we mean when we refer to "behaviors"? Work behavior is influenced by job effectiveness, corporate citizenship practices, absenteeism, and attrition.(see figure 2). The intention or method of communication a person uses to interact with others at work may also be referred to as work behavior. For instance, verbal communication in the workplace frequently mirrors the nonverbal behavior of confidence. It conveys how you feel about your teammates and coworkers. This helps in achieving corporate sustainability (Okr glicka, Mittal, & Navickas, 2023). A person's positive and effective work behavior helps to boost morale, productivity, and team or individual success. From an organizational standpoint, this is the most important topic for human resource specialists to focus on.

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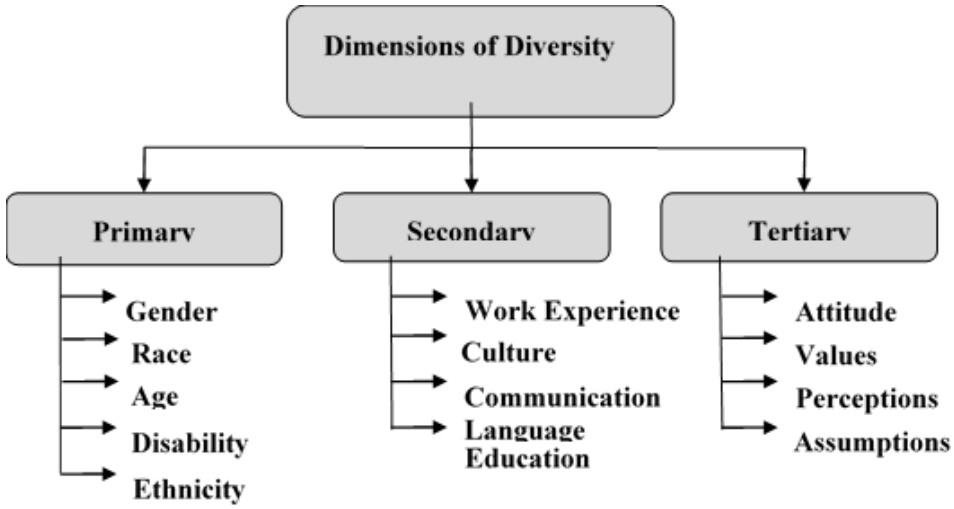

Figure 1. Dimension of Diversity

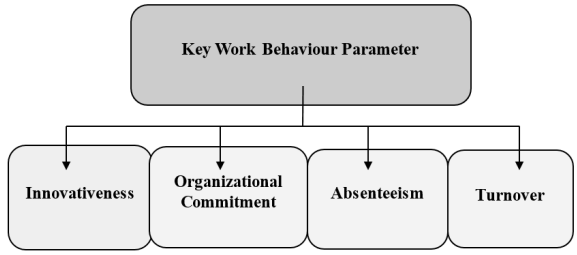

Figure 2. Key work Behaviour Parameters

2 Objectives

- To identify the various diversity initiatives in Polymer Industry of India.
- To study how significantly diversity & inclusion initiatives impact employee innovativeness, absenteeism, organization commitment, and turnover at workplace.

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3 Literature Review

Pai's (2021), in this study there are three components that make up workforce diversity: primary, secondary, and tertiary components. Feelings of inclusion are assumed to be fostered through perceptions of value, belonging, and equality. To put it another way, if employees feel valued and included, they will assert that they are not just treated fairly and professionally but also that their unique worth is acknowledged and appreciated that they are a member of a team. A technique and organizational approach known as inclusion identifies, values, and respects groups or individuals from varied cultural and social origins. Instances of such alterations which might be self-evident or more basic include education, nationality, age, ethnic origin, faith, sexuality, marital status, and socioeconomic position. Handayani et al.'s (2017) in his research the aims was to examine how diversity in the workforce enhances employee performance and organizational effectiveness by reviewing existing research papers on workplace diversity.

Patrick and Kumar's (2012) explored the purpose of diversity management is to develop and sustain an inclusive work environment that celebrates both the unique and shared characteristics of individuals. Literature on diversity management has focused extensively on organisational culture, its influence on diversity openness, human resource management practices, institutional environments and organisational contexts to pressure and expectations related to diversity, requirements and incentives, perceived practices, and organisational outcomes associated with managing a diverse workforce. In this study, a number of barriers to diversity are analysed, and suggestions are provided for enhancing workplace inclusion and diversity. The analysis was built from a survey of three hundred IT specialists. The findings of the study suggest that an organisation's profitability may increase and its employees may be more dedicated, joyful, and productive if diversity is managed effectively.

The objective of the study by Kundu and Mor's (2017) was to analyze the relationship between perceived organizational performance and employee perceptions of diversity It also seeks to ascertain the opinions of employees in the Indian IT sector from various diverse backgrounds. The primary data was collected from 402 respondents using statistical methods such as factor analysis, regression analysis, correlations, means, grand means & analysis of variance. The paper by Cletus et al.'s (2018) focused on and evaluated key issues influencing diversity in modern organisations throughout the globe. The researchers were able to recognize, evaluate, and emphasise the many advantages and challenges that workplace diversity presents. The findings of the study demonstrate that diversity stimulates fresh concepts and skills in the workplace, employee development and progress, the blending of various competencies, company attractiveness, and analytical and problem-solving skills. Sadly, a no. of problems, including but not limited to the following, are currently hindering the full realization of these advantages. Gender and lifestyle preferences, eth-

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nic and cultural differences, physical or mental disability, workplace communication, and generational differences are among the primary causes of workplace problems.

Itam and Bagali's (2018) reveled that a survey suggests that many companies may not have the requisite diversity in their workforces. According to a separate study, some employees may experience feelings of exclusion because they believe that only a small portion of the components that comprise their social identities are appreciated and recognised. These actions could result in low morale, a high rate of absenteeism, and an absence of job satisfaction, poor reputations, and other issues that could ultimately cause the alienated employee to quit their job or organisation. The performance of people, groups, and organisations is examined in relation to inclusivity and diversity via the lens of employee engagement. The study's goal is to offer a framework with solid theoretical support for its ability to determine if a company has genuinely produced an egalitarian and stimulating work environment for its employees.

Alshaabani, Hamza, and Rudnák's (2022) explored that the constant changes in the world caused by globalization, new technological breakthroughs, and a rise in migratory patterns have resulted in an extremely diverse workforce. Managers addressed these difficulties by implementing the most effective diversity management practises for long-term human resource management. These practises are also seen to be particularly beneficial in terms of increasing staff productivity, motivation, and work engagement. This study examines the link between employee engagement and diversity management systems in service organizations, as well as the moderating factors of organisational trust and job insecurity. The poll is based on a questionnaire distributed to 580 workers of Hungarian companies specialising in marketing, management consulting, information technology, and logistics in order to fully assess the hypothesis established from the literature review. The findings show that when structural equation modelling (SEM) is used as a data analysis tool, organisational trust and job insecurity dramatically and effectively change the relationship between diversity management and worker engagement. According to research, managers may positively aid their staff, enhance engagement, and reduce job fears by implementing efficient diversity management practises and delivering a dependable atmosphere and outstanding working circumstances. This study lends credence to the social exchange idea.

Seliverstova's (2021) studied that the main objective of the research is to analyze the concept of the theoretical contributions that have been made to the term "workforce diversity management" in order to systematize the body of existing knowledge, clarify the meaning of WDM in organizations, and pinpoint areas that require further investigation. In this theoretical investigation, samples were taken from the Scopus. 19 studies that have been published since 2015 were found, and the chosen papers were then examined in accordance with important research definitions. WDM frequently plays a vital role

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in HRM in businesses as it enables organizations to maintain a competitive advantage in the present globalization and innovation era. The study's findings indicate that a modest number of current publications view Diversity Management as a strategy that contributes to both an advantageous company culture and organizational success. The work contributes to the literature on management and business by evaluating recent studies on Diversity Management & shows the potential because the field under consideration appears to be a desirable one for further study.

Urbancová, Hudáková, and Fajčíková's (2020) studied the Globalization is expanding variety to all areas of human performance, including the workplace and teams. This study examines diversity management as a predictor of competitive advantage in light of these changes. Primary analysis collected data from 549 Czech enterprises via questionnaire. Diversity management implementation correlates with corporate size and industry. Diversity management was most beneficial for retaining important personnel (43.9%), improving employee performance and motivation (39.3%), and adapting to the working environment (33.9%). Organizations should focus more on this issue as the talent shortage intensifies. This requires prioritising underrepresented groups of potential hires.

Satharasinghe and Ushara's (2023) studied that the Diversity in the workplace has been touted as a key competitive advantage. This research examines how workforce diversity affects garment workers in Sri Lanka.Many diversity factors can influence how well employees perform, but this research only looked at the most important ones. These factors were diversity in the employees' ages, educational backgrounds, religions, work experiences, and attitudes towards their jobs. Employee performance in an organization served as the dependent variable. Data for this study was gathered by personally delivering 120 questionnaires to the production level employees of one of the garment companies in Sri Lanka using the basic random sample approach. The influence of the factors was discovered using the regression analysis approach. The findings showed that variety in workforce has a substantial and favourable impact on employee performance.

4 Research Methodology

The study is conducted using primary data in the form of a structured questionnaire. It is a descriptive study. This type of research design involves systematically observing, documenting, and analysing existing phenomena or situations in order to describe and understand them. Snowball and Convenience sampling methods have been used to collect the data for analysis. Sample size taken for the study is 125.The geographic area of the study is Delhi NCR .Secondary data will be studied for better analysis and supplementing the findings.

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5 Data Analysis and Interpretation:

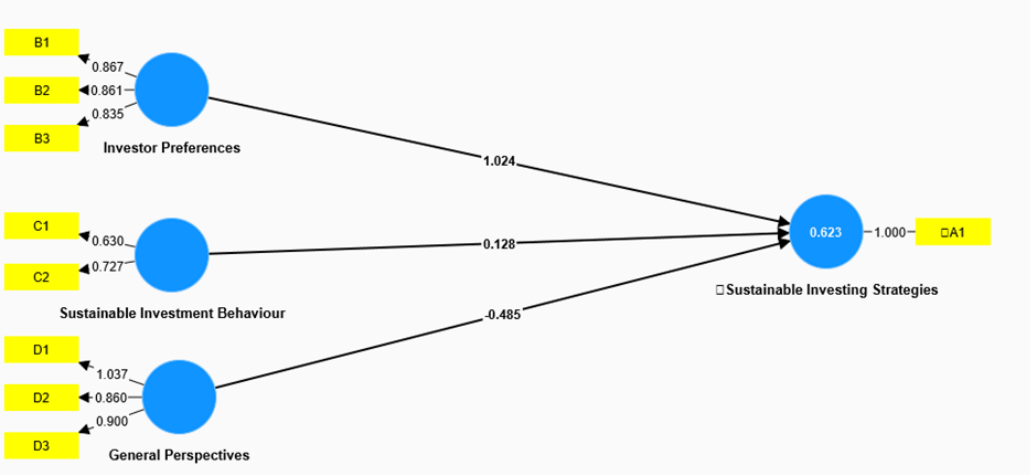

Figure 3. Diversity, Work Behaviour and Inclusion

As shown in figure 3 HO1: Diversity factors have no influence on inclusion practices H11: Diversity factors positively influence inclusion practices

Table 1. Correlation between Work Behaviour and Diversity

	WORK BEHAVIOUR	DIVERSITY
WORK BEHAVIOUR	1	
DIVERSITY	0.584278462	1

A correlation value of 0.584278462 between diversity and work behavior implies that as workplace diversity rises, work behavior is more likely to exhibit a somewhat good trend.(see table 1). This indicates that work behavior (such as innovativeness, organizational dedication, absenteeism, and turnover) is more likely to grow or demonstrate positive changes when the level of staff diversity (for example, variety in terms of ethnic background, gender, values, and communication language) increases.

Inclusion and work behavior have a substantial positive connection of 0.850741652.(see table 2). This suggests that workplace inclusivity improves work performance. For instance, individuals who feel included and valued at work are more likely to be innovative, absentee, loyal, and committed.

Diversity and inclusion have a perfect positive relationship, indicating that as diversity

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Table 2. Correlation between Inclusion and Work Behaviour

	INCLUSION	WORK BEHAVIOUR
INCLUSION	1	
WORK BEHAVIOUR	0.850741652	1

Table 3. Correlation between Diversity and Inclusion

	DIVERSITY	INCLUSION
DIVERSITY	1	
INCLUSION	1	1

boosts inclusion increases and vice versa.(see table 3). This implies that an organization that encourages and supports diversity, such as having a workforce that is reflective of different genders, ethnicities, values, and communication languages, is likely to have a strong culture of inclusion, where all individuals feel belonging, uniqueness, and collaborate with one another and get opportunities regardless of their differences. An inclusive workplace that values everyone's opinions and contributions will also recruit and retain a varied staff.A coefficient of correlation of 1 shows that inclusion and diversity are strongly and favorably related, and organizations that prioritize both are likely to benefit from a more diverse and inclusive workplace culture.

HO2: Workforce diversity has no impact on organizational innovativeness, organizational commitment, absenteeism & turnover H12: Workforce diversity positively impacts organizational innovativeness, organizational commitment, absenteeism & turnover

5.1 Regression Analysis

Table 4 represents the Regression Statistics.

Table 4. Diversity and Work Behaviour Summary Output

Regression Statistics	
Multiple R	0.645610535
R Square	0.416802607
Adjusted R Square	0.384227179
Standard Error	0.813079959
Observations	135

The ANOVA results have been demonstrated in table 5:

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Table 5. ANOVA

	df	SS	MS	F	Significance F
Regression	4	57.63473149	14.40868287	21.902074	7.3286E-14
Residual	130	85.05984059	0.654306466		
Total	134	142.6945721			

A p-value of 0.000111056, which is below the significance level of 0.05, indicates that the association between team diversity and innovativeness is statistically significant.(see table 6). This indicates that, based on the regression analysis, there is sufficient evidence to reject the null hypothesis and draw the conclusion that diversity in the team does, in fact, facilitate the introduction of innovative and creative ideas. We therefore accept the alternate hypothesis. The hypothesis that the company's diversity and inclusion activities have a positive impact on an employee's commitment to the organization is supported by data with a p-value of 0.027981, which is less than the significance level of 0.05. This indicates that the organization's personnel are probably becoming more committed as a result of the inclusion and diversity activities. We therefore accept the alternate hypothesis

A p-value of 0.896570137 above the 0.05 criterion of significance. The results are not statistically significant and might have happened by chance if the p-value is higher than 0.05. Accordingly, in this instance, the study and the provided p-value do not support the argument that diversity has a significant impact on workplace attendance. We shall therefore accept the null hypothesis. The association between diversity and the likelihood of quitting the company owing to unwelcoming workplace culture is not statistically significant at levels of significance of 0.05, according to a p-value of 0.564556965. It implies that there is insufficient evidence to establish the existence of a significant association between diversity and the likelihood of quitting the company owing to a lack of an inclusive workplace culture, the p-value is larger than the utilized level of significance.

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Table 6. Coefficients with Detailed Descriptions

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	2.1210	0.2794	4.3335	2.91E-05	0.6581	1.7634
Q12: I think that diversity in my team contributes to the introduction of new and innovative ideas.	0.3744	0.09391	3.9868	0.0001	0.1868	0.5601
Q13: You feel that the company's diversity and inclusion initiatives have positively impacted your commitment to the organization.	0.2189	0.09851	2.2224	0.0279	0.02404	0.4138
Q14: I feel that the company's diversity and inclusion initiatives have positively impacted my attendance at work.	0.0119	0.09167	0.13025	0.89657	-0.1692	1.1933
Q15: I have considered leaving the organization due to a lack of inclusive workplace culture.	0.03995	0.0691	0.5776	0.5645	-0.0969	0.1768

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6 Discussion and Findings

The bulk of respondents (53.3%) identified as male, followed by females (31.9%), with lesser percentages identifying as non-binary and those who prefer not to say (8.9%). This predominately male population, alongside the small percentage of non-binary respondents and those who prefer not to say, indicates a lack of gender diversity. Additionally, the majority of respondents were in the 25–34 age range, followed by the 18–24 age range, further highlighting the lack of generational diversity in the IT business. The survey also showed religious diversity, with the bulk of respondents from the Hindu group and similar numbers from other communities. In the area where the study was conducted, English and Hindi were the most common workplace languages, indicating their predominance in communication. Cultural celebrations or events were more popular than participation in Employee Resource Groups (ERGs) focused on specific origins or experiences as part of inclusion practices.

Despite most respondents feeling comfortable expressing their views at work, there is room for improvement in fostering a culture of open expression. Most respondents have access to formal training or resources on working with colleagues from diverse backgrounds, yet a small minority do not, pointing to the need for more research and support. While the majority believe their organization provides adequate resources and support for bringing new perspectives to work, some indifferent and unfavorable responses indicate room for improvement in diversity and inclusion commitments. Additionally, while most respondents think diversity on their team fosters innovative ideas, some disagree, highlighting the need for greater education on the benefits of diversity. Overall, the majority agree that the company's diversity and inclusion initiatives positively impact organizational commitment, though neutral and disagreeing comments underscore the need for continuous review and improvement.

7 Conclusion

In the current global economy, organizations that capitalize on the strengths of a diverse workforce are better positioned to compete and innovate. Embracing diversity and inclusion broadens the talent pool and fosters the development of new ideas, products, and services. A primary research study indicates that diversity initiatives positively impact workplace behavior by strengthening organizational commitment, boosting innovation, and reducing turnover. These findings are crucial for executives and policymakers advocating for diversity, as they demonstrate the tangible benefits of such initiatives. However, addressing bias, discrimination, and harassment is essential to fully realize these benefits. Overall, fostering a diverse and inclusive culture enhances employee satisfaction and retention, leading to improved organizational performance and productivity.

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Fintech: Self Organizing Maps for Fraud Detection

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Abstract

Our relationships with the outside world have changed as a result of digitalization, which has also created new growth potential and drastically changed the banking sector. Large volumes of data were created as banks made the switch to digital operations; as of right now, the internet contains more than 44 zettabytes of data. This change brought about new vulnerabilities and enhanced efficiency, but it also exposed the financial sector to never-before-seen levels of fraud. In order to overcome this difficulty, machine learning becomes a vital instrument for spotting and stopping fraud. Large, precisely labeled datasets are necessary for standard machine learning techniques, but obtaining them can be challenging and time-consuming. This problem is avoided by deep learning models, including convolutional neural networks (CNNs) and recurrent neural networks (RNNs), which learn from raw data without explicit labeling. This allows for the development of reliable fraud detection systems. This chapter provides an account on Self-Organizing Maps (SOMs), a powerful deep-learning method that performs exceptionally well in grouping and dimensionality reduction.

Keywords: Financial Fraud. Detection. Deep Learning. Fintech. Self-Organizing Maps.

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1 Introduction

The financial industry has seen a variety of fraudulent actions in the financial markets recently, which has put professionals and auditors—who are responsible for assuring accuracy and transparency—in a difficult situation (Mittal, Kaur, & Gupta, 2021). Cyber attacks on banks have grown more frequent. Nearly 30,000 cyber attacks on banks have been documented globally in 2022. Financial damages from these assaults are also increasing, and are expected to exceed $10 billion by 2022. Phishing is the most popular sort of cyber attack targeting banks. Phishing is a sort of social engineering crime in which emails or text messages act like to come from an official source, such as a bank.These emails or text messages frequently include a link that, when clicked, redirects the victim to a phony website that seems to be the genuine bank's website. The attacker can take the victim's personal information if they input it on the bogus website (Alkhalil et al., 2021). Digitization has a strong impact on the financial services industry. We are witnessing a sea-change in Information and communication technology (ICT) reshaping the ways we interact and perform activities in everyday life. The term financial technology or short. FinTech reflects this development of an IT-induced transformation (Puschmann, 2017).Nowadays, credit card fraud detection is of great importance to finan-cial institutions (Zaslavsky & Strizhak, 2006). With the advancements in technology, the probability of online fraud and manipulation has also increased. There is a huge discussion about deep learning models in the community, as complex and unstructured data, manual computation gets more and more expensive with the use of the traditional (On paper method).

There are plenty of stories, of the wrong person caught due to human errors, hence where computers and artificial intelligence come in, with the power of computers and new learning techniques computers can identify irregularities in the data ("You are not similar to me, you are not a part of my family"), with time new techniques to identify these gaps in the data immerged, our main focus on this study brings one of these deep learning models to Fintech and help to identify these gaps without manually interpreting details of each account this is where computational power comes, surfing on this huge dataset and finding out outliers in the data or data points that don t make any sense. This is where machine intelligence comes into play, with this new field of innovative informative tech, before getting into Self Organizing we need to understand what K-Nearest Neighbor Algorithm is and how Self Organizing map solves its limitations.

2 Literature Review

Chicco, Napoli, and Piglione's (2003) published a paper on the application of clustering algorithms and self-organizing maps to classify Electricity Customers, the paper talks about the competition among the electricity markets distribution of service providers,

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they proved that with the help of fuzzy-K-NN, hierarchical clustering, and Self Organizing Maps group together the identified customer patterns which exhibit load diagrams. The researchers had to examine 234 Non-Residential Customers. For this set valuable indicators to records quality data which were usually property-based, They came to conclusion that follow the leader and hierarchical clustering out performed all the other algorithms on the data, as the algorithms provided with highly detailed and separated the clusters, that isolated the load patterns with the unsettling or uncommon behavioral patterns where follow the leader algorithm toped the spot, measured on clusters adequacy and computational speed. Due to its isolation feature its performs best on such dataset.

Globally, the application of artificial intelligence has significantly improved both traditional methods' and a machine's capacity to deal with the manipulation of financial information (Mehta et al., 2022).Abdulsattar and Hammad's (2020) in the paper talked about how advancement in e-commerce had an explosion in number of credit and debit card which is a comprehensive derive, they proposed that we can use machine learning algorithms like SGD Classifier, DT, RF, J48 and IBK machine learning algorithms to perform on UCSD Data Mining Contest 2009 Dataset for this particular problems they defined a pipeline Dataset Data Preprocessing Training Classifiers Testing Classifiers and Fraudulent Detection Legitimate or Fraudulent. They concluded that after the classifications they evaluated the models through evaluation matrixes like Confusion Matrix, Precision Score, Recall, F-measure, Kappa Statistics, MAE and RMSE, MCC and more which resulted in classifications were 97-98% accurate. Based on the Kappa evaluation Random Forest outperformed all the algorithms. In the paper by Mongwe and Malan's (2020) they have discussed the fraud in the financial bodies the total amount estimated to be about a Billion Dollars, this paper tries to asses the efficiency of the Financial Ratios in finding frauds in the financial statements at the local authorities. They try to make this into an unsupervised learning problem, as they might get handy in fraud detection in the public sector, after the training of their SOMs, the researchers conclude that financial ratios are useful in detecting frauds.

Organisational behavioral factors at the human-technology interface can help small and medium-sized firms (SMEs) embrace artificial intelligence (AI). The authors concentrate on the influence of AI deployment on sustainable practices and supply chain resilience (SCR) (Perifanis & Kitsios, 2023). One of the most important conclusions is that leadership is critical in pushing AI adoption in these SMEs. Effective leadership is seen in the establishment of a data-driven and digital organizational culture suitable to AI implementation. Furthermore, great leadership improves staff skills and competencies, which contributes to the successful implementation of AI (Lingam & Vanishree, 2024).

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3 Method

3.1 K-Nearest Neighbours

K-Nearest Neighbors is the simplest algorithm of all the data algorithms available in the field of Data Science usually applied to find patterns in the data specifically used in classification problems (Bansal, Goyal, & Choudhary, 2022).Although it produces astonishing results usually domain-specific in nature for which the person forging the data for fitting in the algorithm, as the performance of the algorithm highly depends on the distance matrix usually talking about the L1 & L2 methods for calculating the distance as shown in figure 1. The approaches used the difference between 2 numeric values or a difference in points on a Cartesian plane using Euclidian Distance.

Euclidian Distance:$\mathrm{d}(\mathrm{x}_i, x_j) = \sqrt{\sum_{r=1}^{n} \left(w_r \left(a_r(x_i) - a_r(x_j) \right)^2 \right)}$

As shown in the Figure 1 below –

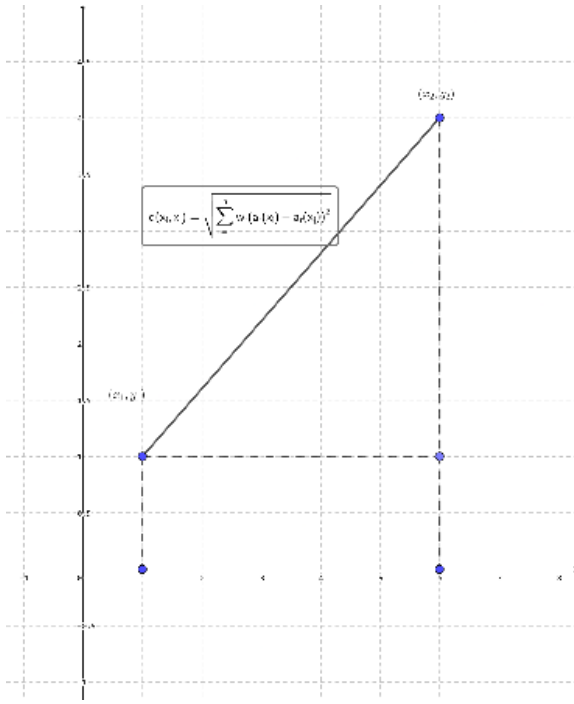

Figure 1. Euclidean Distance

Where $x = (a_1, \ldots, a_n)$ is the dimensionality of the feature vector, a_r is the rth attribute

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and w_r is the weight of the rth attribute ranging from 1 to n. Classes are determined by the votes for each k nearest neighbor:

$$d(x_i, x_j) = \sqrt{\sum_{r=1}^{n} \left(w_r \left(a_r(x_i) - a_r(x_j) \right)^2 \right)}$$

Where d_i is the testing example for which the class has to be estimated, x_j is its nearest neighbor in the training set, $y(x_j, c_k)$ tells which class x_j belongs to. The above equation predicts the classes based on the number of members in the nearest class:

$$d_i = \arg\max_k \sum_{x_j \in \mathrm{NN}} y(x_j, c_k)$$

The limitation of KNN algorithm:

- Strict Decision Boundaries: In the predicting process as algorithm strictly classified the data into k neighbors but in case if there is a data point that lies exactly at the middle of 2 or more neighbor decision boundaries it has to select one of the classes it cannot go around by telling it s a 50-50 probability, which reduces that accuracy of the model.
- Labeled Data Required: KNN being a supervised learning models which requires pre-labeled data for training of the data after which predictions need to be done hence for preparing such a labeled classification, the data needs to be prepared by manually analyzing these frauds and classing them to be a fraud or a regular transaction.

3.2 Artificial Neural Networks

ANN is an ML algorithm that tries to tries to mimic the synchronic bhaviors of human brains adapting to the envirments as iterations for training in a particular environment, its consist of neurons interconnected with each other, which consists of 3 layers namely Input Layer, Hidden Layer and an Output Layer, if ANN works when the inputs are initialized and multiplied with a weights and a small about of bias which prevents the model from memorizing the data, which through a output which is then compared to the original value and cost functions is calculated which then feed back in the inner layers through backprogation and weight are modified accordingly (Dey et al., 2023).

3.3 Self Organising Maps

Self-Organizing Maps were first introduced by Kohonen's (2001), a Finnish academic, who made a huge contribution to the artificial neural network, some of his other algorithms also include the Learning Vector Quantization algorithm, which is a supervised classification technique, theories of distributed associative memory, it s a super memory system that is

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capable of searching through every high dimensional application, as in this memory the data is stored in the cache and memory forms. But the most famous and know contribution is the self-organizing maps.

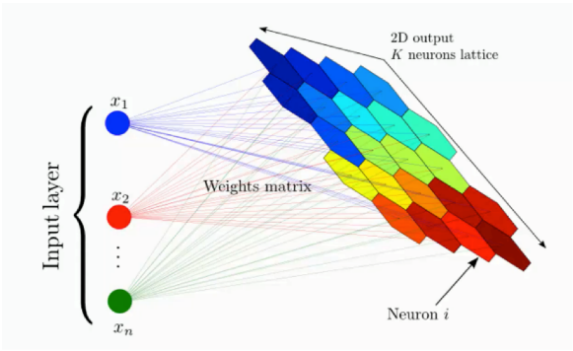

Figure 2. SOM Working

The SOM or the Kohonen Map starts with a hypothesis that the model is based on learning rules and interactions, the processing units maintain the proximity as they grow.(see figure 2). The algorithm uses neurons (array of post synaptic neurons).Van Hulle's (2012) demonstrated with input vectors that are connected to each of these units of the Lattice (Map), with some weights assigned to these attachments, as iterations go by the weights are then updated according and the whole process goes on and on till the models converge and no new points converge into the neighborhood, On this lattice, there is a concept of neighborhoods, as the neurons are interconnected to each other, each neuron has its neighbors as the whole concepts of SOM is that the neurons grow together. The goal here is to find the weights that adjacent values have similar values, and centroids with most neighbors become clusters and we can find irregularities in the data that don't lie in the vectors space or points that are too far from the neighborhood or in the wrong neighborhood. The objective of the SoM is to find weight values such that the adjacent values have similar values, then inputs are assigned to each unit that similar to the unit, the objective here is to be as close as to the input but we are not copying it all, then each identified unit becomes a center of the clusters.

Given input x, find the ith term with the closest weight vectors by competition, which means we fix the centroid and the data movies around it, for each unit j in the neighborhood Ni of the winning neuron i we update the weight j (wj) keeping in mind weights outside the Ni are not updated. SOM has 3 Stages –> Compatition – Collaboration – Weight updates (Van Hulle, 2012).

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Stage 1 - Competition
Find the most similar unit:

$$i(x) = \arg\max_j \|x - w_j\|_2 \quad \text{where } j = 1, \ldots, m \text{ and } m \neq \text{units}$$

Stage 2 – Collaboration
Use the lateral distance d_{ij} between the winner unit i and unit j:

$$h_{ij}(d_{ij}) = \exp\left(\frac{-d_{ij}}{2\delta^2}\right)$$

which is also known as the Gaussian Neighborhood.

$$\delta(n) = \delta_0 \exp\left(\frac{-n}{T}\right)$$

where n is the number of iterations and T is a constant.
Stage 3 – Weight Updates

$$w_j(n+1) = w_j(n) + \Delta w_j \quad \text{—- (1)}$$

Where Δw_j is made up of 2 theories, namely Hebb's Rule and the Forgetting Rule:

$$\Delta w_j = \eta y_j X - g(y_j) w_j \quad \text{where } \eta \text{ is a constant}$$

In the above equation $g(y_j) = \eta y_j$ which is also the neighborhood $\eta h_{ij}(X)$.
Now, from (1):

$$w_j(n+1) = w_j(n) + \eta(n) h_{ij}(n)[X - w_j(n)]$$

And:

$$\eta(\eta) = \eta_0 \exp\left(\frac{-n}{T_2}\right)$$

where T_2 is a constant.
Things to Keep in Mind

- Many Iterations are required (Almost 1000 times the data shape)
- Stop when no notisible change is visible
- Takes a long time to converge
- Variable Results (Not all runnings will give the same number of clusters as k is not defined like in K-Neighbours Clusters)

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4 Data Analysis

4.1 Data description

In the methodology section the SOM have been used to detect anamolies in the dataset which has been dicusses thoroughly in the sections below Credit Card Transactions Fraud Detection Dataset was utilised in this research, which contains credit card approval records with 18 attributes. A brief description about the attributes are given below :

- cc_num - Account number of the person making the transaction
- merchant - Merchant ID receiving the transaction
- category - Type of the shop
- amt - Amount of the transaction
- gender - Gender of the person making the payment
- street - Street address of the merchant
- city - City where the merchant's shop is located
- state - State where the merchant's shop is located
- zip - Zip code
- lat - Latitude of the person making the transaction
- long - Longitude of the person making the transaction
- city_pop - Population of the city where the transaction takes place
- job - Job of the person making the transaction
- trans_num - Transaction number
- unix_time - Unix timestamp of the transaction
- merch_lat - Latitude of the merchant's shop
- merch_long - Longitude of the merchant's shop
- is_fraud - Indicator of whether the transaction is fraudulent

4.2 Data Preprocessing

To prepare the data, exploratory analysis is performed initially, which includes looking at summary statistics from the dataset, such as the number of occurrences, characteristics, accepted credits, and rejected credits. The Kolmogorov Smirnov test and the Scipy library are then used to verify the data for normalcy. Because the data is not normally distributed, and after checking the splits between genuine and fraudulent entries 50-50 sampling needed to done which is a classic case of over sampling data. After the sampling of the the data we tend to reduce the data between 0 and 1 using the standard scaller after which the data is ready to fit the model, after extracting the accounts that might be misread as frauds and some genuine.

The analyzer can print out these fraud cases and hand them over to the inspection

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teams to look into these accounts and people and get the frauds out (Figure1), for this minisom library is used to create the SOM, and extracts the relevant frauds from the map being produced.

4.3 Training the SOM

For training a Self-Organizing Map (SOM), we can either build one from scratch or use a pre-built Python library. In this paper, we will use a pre-built library named MiniSom. The user can install the library with pip. There are several steps to training a SOM:

Step 1 – Initializing the MiniSom Library

After importing the MiniSom library, we need to initialize the SOM by setting the required hyperparameters: x and y (the dimensions of the grid), and input_length (the number of variables on which the model will be trained, in this case, 15).

Step 2 – Randomly Initializing the Weights of the SOM

We will use the random_weights_init function to randomize the weights of the SOM, which will be adjusted accordingly as the model iterates multiple times over the dataset and finally converges.

Step 3 – Running the Iterations

After setting the parameters and initializing the weights of the model, we train the model. As it completes, it produces the winning nodes.

Step 4 – Visualizing the Results to Identify Outliers

In Figure 3, colors in the boxes depict the mean interval distances (MIDs) between nodes. We use the pylab library to make the plot that represents the MIDs of the points. The further the MID, the higher the chances of the account being fraudulent. The brighter the box or portion, the further the node is from its neighborhood, and it is considered a potential fraud. The green boxes represent people whose credits were approved, and the red circles represent those that were rejected.

Step 5 – Extracting the Customer IDs

To get the Customer IDs, we need to extract the IDs from the map. The SOM has an inbuilt function win_map that extracts the data behind the color grid. By concatenating the mapped coordinates, we can get the fraud IDs. Analysts can also match timestamps and check all these accounts to gain a better understanding of the data.

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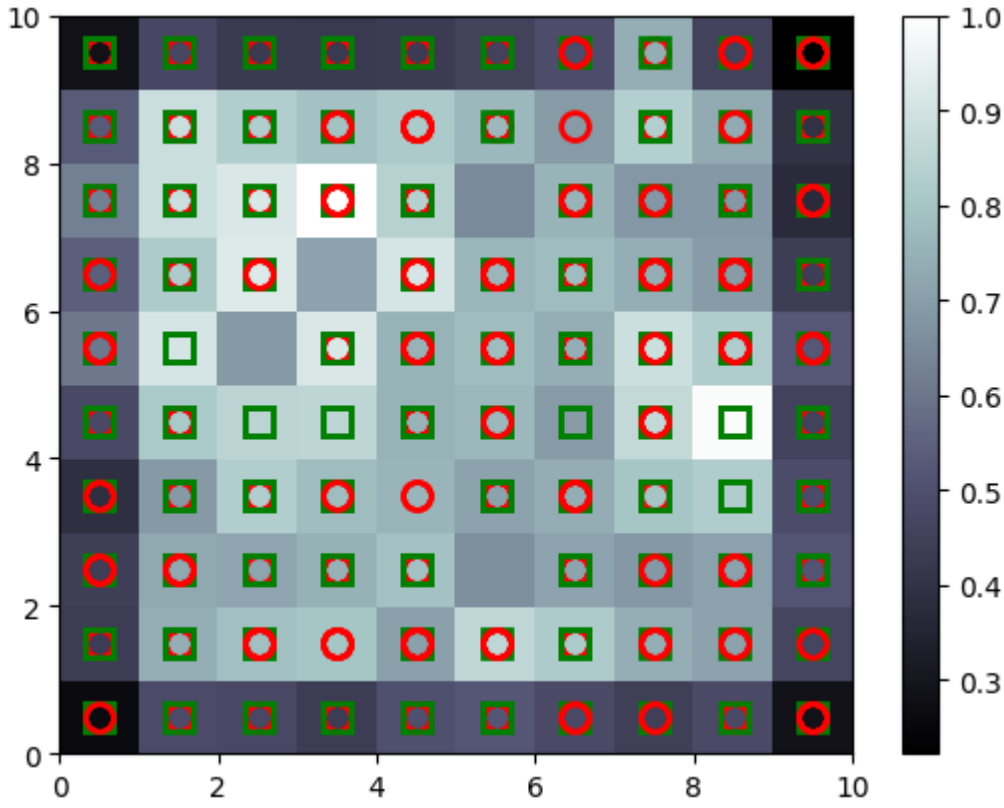

Figure 3

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Table 1. Fraud Customers Table

cc_n	merc	cate	amt	G	stre	city	state	zip	lat	long	city_job	tran	unix	mer	merc1	merc2	
###	352	4	369	0	693	281	14	###	38	-89	###	396	###	###	39	-89	
###	64	4	348	0	742	461	37	###	44	###	###	443	###	###	44	###	
###	472	4	309	0	742	461	37	###	44	###	443	###	###	###	44	###	
###	20	4	358	0	742	461	37	###	44	###	443	###	###	###	44	###	
###	583	9	51	0	742	461	37	###	44	###	443	###	###	###	44	###	
###	212	3	68	1	924	597	4	###	38	###	43	###	###	###	37	###	
###	63	9	8.8	1	924	597	4	###	38	###	43	###	###	###	38	###	
###	291	3	60	1	924	597	4	###	38	###	###	43	###	###	38	###	
###	452	9	1.7	1	969	812	26	###	49	###	192	205	###	###	50	###	
###	24	2	12	1	622	806	16	###	39	-96	###	88	###	###	39	-96	
###	106	0	8.2	1	909	493	14	###	41	-89	532	42	###	###	41	-89	
###	250	9	25	1	969	812	26	###	49	###	192	205	###	###	49	###	

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Table 1 contains the extracted accounts that are considered to have potential frauds, on which the banks can conduct investigations to identify the actual fraudulent accounts.

4.4 Evaluating the Fit of the Model

To evaluate fit of the SOM, toplogical error and quantization error the best for the task, they initially tell whether the model depects the inputs effectively and accuracy trained on the dataset, lower error tell how well the model fits into the dataset.

4.4.1 Topological Error

Topological error, sometimes referred to as topographic error or mapping error, quantifies how effectively the SOM maintains the topological relationships of the input data in the map (Birgitta Dresp-Langley John Mwangi Wandeto et al., 2018).The spatial arrangement of data points in the original feature space is referred to as topology. The purpose of a SOM is to maintain as many of the neighborhood relationships of input data points as feasible. The topological defect identifies cases in which this neighborhood association is not correctly retained in the SOM. This error is measured mathematically as the fraction of data instances for which the Best Matching Unit (BMU) (the winning neuron) lacks nearby neurons on the map that belong to the same class or category. In other words, it measures the frequency with which the BMUs of neighboring data instances end up on distinct regions of the map. A reduced topological error suggests that the SOM accurately represents the topological structure of the data. Thus, Topological and quantization errors are both utilized to fine-tune the SOM's training process, measure convergence, and compare the quality of different SOMs for different datasets.

4.4.2 Quantization Error

Quantization error, also known as mean quantization error or representation error, is a metric that quantifies how well the SOM reflects the original input data in the reduced map space.(see figure 4). It evaluates how well the codebook vectors (the weights of neurons) mimic the input data. A lower quantization error indicates that the neurons of the SOM closely match the input data points in the feature space. The average Euclidean distance between each input data point and its corresponding BMU (the neuron that best reflects that data point) is used to compute the quantization error. It essentially estimates how far each input data point must "travel" in the SOM's map space to reach its BMU. A reduced quantization error suggests a better data representation in the SOM. Accoding to the error the SOM fits pretty nicely with the data as it is able to represent amost 70% of the data right off the bat which is considered to be pretty good fit for a model.

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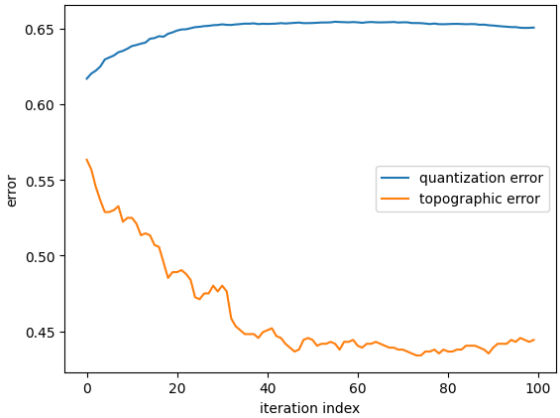

Figure 4. Quantization &Topological Error

5 Findings and Arguments

The key finding from our work is that putting a simple or a super complex dataset, SOMs can be applied to any industry, if put in the correct form, just like the fintech case, these companies can easily charge the banks for detecting potential frauds and charge huge chunks of Data, the same application can be used in the education sectors to finding out potential students who need additional help as they might be passing through unfair means, which is not at all good for them in the long run, and cause problems for them in the future. For detecting fair charges for real estate, and locations too good to be true can be found in case of parameters relating to the price of the property, which might come in handy to rule out potential customers. More trustworthy reports can be formed with greater insights that might be a great asset for any business organization. Businesses can use these methods for suppliers and frequent buyers to understand frauds on supplies and buyers who might be shoplifting, whole data is currently available to the business.

6 Conclusion

We came to understand that the field of AI, Machine Learning, and Deep Learning will be setting the future norms through which we would be living our lives, and it brings great opportunities for businesses to get the bites of these technologies, as the field of advanced machine learning and deep learning models will bring new opportunities and many ways to getting things done, from fraud detection finding innovations into the world. The same was the aim of the project to let the readers know about the potential of simple deep

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learning models such as the SOMs. If we attach the results we received from this fraud detection and we attach it to Artificial Neural Network for detecting the probability of the frauds of these identified customers the banks can priorities their investigations more efficiently.

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Chapter 10

Book Chapter

An Evaluation of Technology's Effect on Drivers of Investor's Preferences for the Debt and Equity

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Abstract

The geographic landscape of investments has shifted dramatically due to the rise of financial technology, or FinTech, which has affected investor preferences and decision-making processes for both debt and equity investments. This study aims to evaluate the impact of technology innovations, such as financial apps and online platforms, on investors' preferences for debt and equity securities. The study used a quantitative research methodology that encompasses statistical analysis and questionnaires to examine the impact of FinTech services on investors' risk perception, return expectations, mindfulness, and accessibility to investment options. The findings show that there is a favourable perception of the use of online investment platforms and FinTech software/platforms for investigating and understanding investment opportunities, particularly about debt and equity investments.

Keywords: FinTech. Debt Securities. Risk Perception. Return Expectations. Investor Preferences.

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1 Introduction

Within the constantly changing realm of global finance markets, the influence of technology on investment decision-making has increasingly become a prominent factor. Fintech or financial technology is a relatively new subject in the literature but commonly cited as one of the most important innovations in the financial industry (Hastings & Tejeda-Ashton, 2013). As technological advancements continue to reshape the financial industry, investors are faced with a myriad of options when it comes to allocating their capital. Over the past two decades, the government of India in coordination with Reserve Bank of India (RBI) has taken up many initiatives to achieve the objective of financial inclusion (Inderst, Kaminker, & Stewart, 2016). This research paper delves into the empirical evaluation of how technology impacts the key drivers of investors' preferences for debt and equity securities.

Fintech has a cross-disciplinary nature.(see figure 1).The intersection of finance and technology, often referred to as "fintech," has given rise to a plethora of tools and platforms that facilitate investment processes. From algorithmic trading and robo-advisors to blockchain technology and crowdfunding platforms, the ways in which investors interact with financial markets have undergone substantial transformations. Consequently, it becomes imperative to understand the nuanced ways in which these technological advancements influence the factors that drive investors' choices between debt and equity instruments.

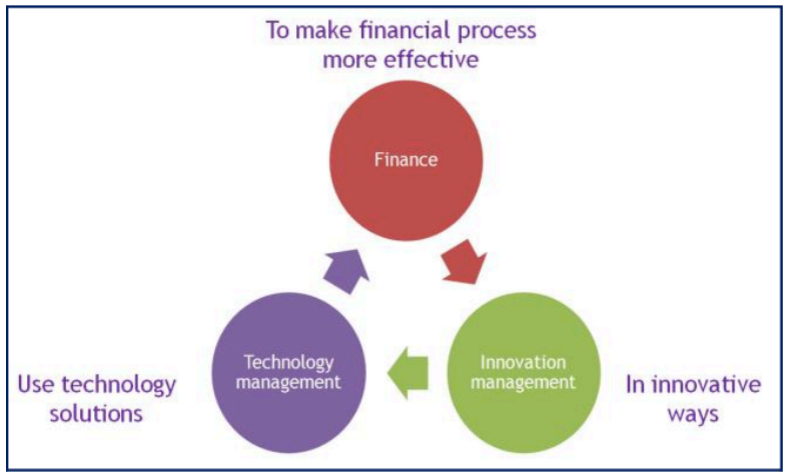

Figure 1. FinTech is a cross-disciplinary subject

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Fintech or financial technology, has rapidly transformed the landscape of the finance sector, including how retail investors approach investment behaviour. FinTech developments may also damage financial well-being by triggering impulsive consumer behaviour when interacting with financial technologies and platforms. For example, mobile apps could attract impulsive and unsophisticated individuals, who lack the necessary skills to forecast future preferences (dan Michael, 2022). Fintech services, such as online investment platforms, robot-advisors, and mobile banking apps, have provided retail investors with easier access to financial markets, increased transparency, and enhanced convenience. From mobile payments, robo-advising, app-based investing platforms, to online banking solutions, FinTech developments have impacted upon financial planning, financial well-being, and economic inequality (Kaur, Sharma, & Singh, 2024). These advancements have significantly impacted the investment behaviour of retail investors, shaping their decision-making processes, investment strategies, and risk tolerance. To provide the tools for better financial decision-making, one must assess not only what people know but also what they need to know, and then evaluate the gap between those things. There are a few fundamental concepts at the basis of most financial decision-making (Iman, 2020).

One major impact of finch services on retail investors' investment behaviour is the democratisation of investment opportunities. Previously, traditional banking services often required significant minimum investments, complex paperwork, and long processing times, which limited access to financial markets for retail investors. However, with the advent of fintech services, retail investors can now easily open investment accounts with low or no minimum investment requirements, access a wide range of investment options, and conveniently manage their investments online or via mobile apps. This has empowered retail investors to participate in the financial markets and make investment decisions based on their own preferences and financial goals. Due to reasons like rising internet penetration, smartphone use, government programs like Digital India, and the growth of digital payments, fintech investments, software development, and platforms have increased significantly in India in recent years. The government's goal for a cashless economy and the widespread use of smartphones have contributed to the exponential growth of the digital payments market in India. The National Payments Corporation of India (NPCI) changed the game by introducing UPI, which makes peer-to-peer and peer-to-merchant transactions easy and quick. Businesses such as Paytm, Google Pay, BharatPe, and PhonePe (owned by Walmart) have amassed substantial market share by providing easily navigable mobile payment applications that address a range of requirements, including online shopping, bill payments, and retail transactions. These platforms now offer entire financial solutions since they have incorporated extra services like insurance, wealth management, and utility bill paying.

By utilising technology to expedite lending procedures and more precisely determine

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creditworthiness, fintech lending platforms have responded to the credit needs of both individuals and small enterprises. Peer-to-peer networks provide direct lending between individuals, providing investors with larger returns and borrowers with better interest rates than traditional financial institutions. Digital lending platforms have surfaced as substitute credit providers, especially for marginalised demographics. from the business point of view, the future developments of FinTech technologies should, directly or indirectly, related to improving information sharing process, lowering transaction costs, enabling new financing alternatives, or supporting better financing decision making . To evaluate risk and provide customised lending products, they make use of data analytics, machine learning, and other credit scoring techniques. Due to their ability to provide credit to people who might not have had easy access to traditional banking services, these platforms have been essential in promoting financial inclusion.

2 Objectives of the Study

- To assess the level of environmental awareness and technology adoption among Small and Medium Enterprises (SMEs).
- To examine the extent of implementation of green innovations within SMEs.
- To investigate the relationship between green innovations and environmental awareness among SMEs.
- To analyze the impact of green innovations on technology adoption within SMEs.

3 Literature Review

In the study by Asif et al.'s (2023) the authors investigate the impact of fintech services on the investment behavior of retail investors in the banking sector. The study analyzes the role of fintech services in shaping the investment decisions of retail investors, including factors such as ease of access, convenience, and user experience. The authors highlight the increasing use of fintech services in the banking sector and its influence on the investment behavior of retail investors." Tidjani and Madouri's (2024) examine the impact of fintech on financial behaviour, with a particular focus on financial inclusion and financial education. The authors explore how fintech services, including investment-related services, have the potential to improve financial inclusion and promote financial education among retail investors. The study emphasizes the role of fintech in increasing access to investment opportunities for retail investors and enhancing their financial literacy.

According to Jack and Suri's (2014), advancements in financial technology could offer more efficient and cost-effective solutions by reducing transaction costs. By lowering the expenses related to alternative payment methods, this also aids micro and small businesses in growing their sales (JHAVERI & KORGAONKAR, 2024). After carrying out an em-

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pirical analysis of mobile money, Aron's (2018) discovered evidence which is supporting the idea that mobile money can improve risk-sharing. Other notable research, including those by Mbiti and Weil's (2013) and Wieser et al.'s (2019) show that a growth in fintech usage is associated with a decrease in the use of unofficial savings methods and an increase in the volume of remittance transactions.

Technology entered the banking industry in the 1960s under the moniker "Banking IT," which denoted digital systems developed to ease information flow both inside and outside of the company (Panos & Wilson, 2020). However, Lee and Shin (2018) contended that the 1990s saw the spread of the internet, which they claimed was responsible for the development of finance, the collection of technologies that allowed for the online provision of services like banking, trading, and insurance. At this time, the information craze spurred innovation to replace labour intensive human interaction with sophisticated algorithms and generalised automation, resulting in less expensive "Fintech " dates to the 1990s, when Citigroup's predecessor used it for the Financial Services Technology Consortium, which shared innovations across market participants (Vu, Nguyen, & Duc, 2024).Four reasons, according to Alt, Beck, and Smits's (2018), contributed to the evolution of fintech into what it is today:

1. The consequences of the global financial crisis, which forced financial institutions to maintain high capital requirements, forbidding smaller and riskier investments and compelling the direct identification of profitable products/services;

2. Shifts in the behaviour of banking clients, as the generation that follows is better informed due to the increased use of digital channels, which is both expected and transparent;

3. The incorporation of high-tech hardware into everyday life, such as smartphones and tablets, which sparks a frenzy of software distribution; and

4. The rise of non-banks, which attempted to create new business models that their previous incumbents did not provide. By moving the emphasis from the organization to the consumer, these drivers revitalised an otherwise antiquated and bureaucratic sector of the economy.

Technology affects equity-based returns differently in each industry and has been more influential in transforming some than others. Automate, information, and transform are the three major categories into which these studies classify the strategic responsibilities of IT (Armstong & Sambamurthy, 1999). Businesses usually employ IT to replace human labour in automation sectors. IT's primary function in informatics sectors is to supply data that engages workers and gives senior management more influence. IT profoundly alters

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market structures and business models in transformative industries, making conventional business techniques obsolete.

A growing body of research, Financial literacy has an impact on financial well-being, and differences in early financial knowledge can explain a significant amount of adult financial and overall well-being (dan Michael, 2022). Financial technology, or FinTech, is revolutionising the financial services industry at a pace never seen before. There are differing views on how FinTech will likely impact people's social welfare, wellbeing, and personal financial planning. Examples of these initiatives include financial education and informed financial advice. This special issue presents seven new studies that come from four concurrent streams of literature about responsible finance and financial literacy, addressing this significant academic and policy priority. Further, Ramdhan, Bujang, and Muhamat's (2023) investigated the impact of fintech services on investment decision-making, focusing on peer-to-peer (P2P) lending. The study examines how the availability of fintech services, such as P2P lending platforms, influences the investment decisions of retail investors. The authors highlight the potential benefits and risks associated with fintech services in the context of investment decision-making. Moreover, in the study by Vu, Nguyen, and Duc's (2024) examined the impact of fintech services on investment behaviour among retail investors in Vietnam. The study explores the factors that influence retail investors' decision to use fintech services for investment purposes, and the effects of fintech services on their investment behaviour. The authors provide insights into the adoption and impact of fintech services in the investment landscape of Vietnam.

FinTech innovations have an impact on financial planning, financial well-being, and economic inequality. Examples of these innovations include mobile payments, Roboadvising, app-based investing platforms, and online banking solutions. FinTech can improve one's capacity to manage money. In addition to creating the next wave of financial tools, start-ups and platforms that leverage technology to expedite financial planning procedures and simplify personal finance are also promoting and enabling financial education Furthermore, the development of supply-side solutions that improve financial literacy and lessen disparities among demographic groups depends in large part on the involvement of financial institutions, businesses, and entrepreneurs. Research and practice in financial literacy should aim to comprehend how to enhance the design and delivery of financial education to increase its efficacy (Iman, 2020). Following the FinTech age, financial inclusion depends on visualisation and accessibility/user-friendliness. It has been demonstrated that people with little financial literacy make different decisions depending on how financial information is presented (Bouri et al., 2017).

In this systematic review of literature, the authors examine the role of fintech in investment decision-making (Rathod & Arelli, 2013). The study provides an overview of existing research on the impact of fintech on investment behaviour, including the role of

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fintech services in influencing the investment decisions of retail investors. The authors analyse the findings of previous studies and identify key trends and gaps in the literature related to fintech and investment behaviour. Most Indian financial institutions monitor the sector and strive to learn from others' experiences (Inderst, Kaminker, & Stewart, 2016). Fast change and mobile money are about to be adopted by Indian MFIs as they prepare to relaunch, while new players are looking at possible collaborations and alternatives. In India's poor regions, there is a notable dearth of access to financial services due to several institutional flaws and other problems. As technologies mature and scale up, debt financing becomes more prevalent, especially for asset-based investments (Jack & Suri, 2014).

Advancements in financial technology could offer more economical and effective solutions by reducing transaction costs (Vial, 2019). By lowering the expenses related to alternative payment methods, this also aids micro and small businesses in growing their sales. Determining all the opportunities and challenges for every stakeholder is crucial. Most Indian financial institutions monitor the sector and strive to learn from others' experiences (Inderst, Kaminker, & Stewart, 2016). Fast change and mobile money are about to be adopted by Indian MFIs as they prepare to relaunch, while new players are looking at possible collaborations and alternatives. In India's poor regions, there is a notable dearth of access to financial services due to several institutional flaws and other problems. Because people aren't taking advantage of their own economic prospects, the economy can't expand to its full potential.

4 Research Methodology

The objective of the study is to identify the various fintech services being utilized by investors and to assess the Impact of Technological Advancements on Investor Awareness. Traditional financial services have been disrupted by the rise of financial technology, or fintech changed options for investors. The impact of fintech services on investor behaviour in the banking sector is uncertain and needs further investigation to understand the effects of fintech adoption on their investment choices. Structured questionnaires were utilised to collect information from individuals working in the automobile industry. The survey included closed-ended questions using Likert scales to obtain quantitative data. A convenient sampling technique was used to select a sample of 100 individuals for the study.

Sample Size and Design: A sample size of 100 individuals was chosen using convenient sampling techniques

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Table 1. Age

	Frequency	Percentage
18-24	12	12
25-34	25	25
35-44	29	29
45+	34	34

4.1 Discussion And Aanlysis

The age distribution data indicates the majority falling within the 25-44 range, constituting a whopping 54% of the sample group.(see table 1). Notably, individuals aged 45 and above comprise a significant portion, accounting for the total 34%. This distribution suggests a diverse demographic, potentially offering valuable insights into various age-related perspectives or behaviours.

Table 2. Education Level

	Frequency	Percentage
SOME COLLEGE/ASSOCIATE DEGREE	26	26
BACHELOR'S DEGREE	29	29
MASTER'S DEGREE	18	18
DOCTORAL DEGREE	27	27
TOTAL	100	100

The data on education level demonstrates an, like, even distribution among the surveyed population, with bachelor's and doctoral degrees being the most prevalent, each representing 29% and 27%, respectively.(see table 2). Additionally, individuals, like, with some college or associate degrees, comprise 26%, while those with master's degrees constitute 18%, like, of the total sample; This distribution suggests a diverse educational background among respondents, potentially offering varied perspectives and insights within the surveyed population.

Table 3 represents what extent do you believe Fin-Tech Software/ Platform contributes to Improving and Understanding Debt & Equity Investments?. Futher Table 4 reflects on how often/Likely do you use online Investment Platforms to Reach Investment Options.

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Table 3. To what extent do you believe Fin-Tech Software/ Platform contributes to Improving and Understanding Debt & Equity Investments?

	Frequency	Percentage
STRONGLY DISAGREE	10	10
DISAGREE	19	19
NEUTRAL	21	21
AGREE	24	24
STRONGLY AGREE	26	26
TOTAL	100	100

Table 4. How often/Likely do you use online Investment Platforms to Reach Investment Options.

	Frequency	Percentage
NOT AT ALL	8	8
SLIGHTLY	12	12
MODERATELY	15	15
VERY MUCH	30	30
EXTREMELY	35	35
TOTAL	100	100

The table 5 presents survey results on the level of trust and belief in online platforms' ability to provide better access to investment opportunities, both in debt and equity. The respondents were categorized into five levels of trust: "Not at all," "Slightly," "Moderately," "Very much," and "Completely." The frequencies and corresponding percentages for each category are as follows: 12 respondents (12%) reported no trust at all, 14 respondents (14%) indicated slight trust, 17 respondents (17%) had moderate trust, 27 respondents (27%) expressed a strong belief, and 30 respondents (30%) had complete trust. The total number of respondents was 100, ensuring that the percentage values directly correspond to the frequency values. The data suggests a generally positive perception, with the majority of respondents (57%) expressing significant trust (either "Very much" or "Completely") in online platforms for accessing investment opportunities. Additionally, Table 6 illustrates the extent to which respondents believe their awareness of debt and equity has changed. The survey results are categorized into five levels: "Strongly Disagree," "Disagree," "Neutral," "Agree," and "Strongly Agree." The frequencies and corresponding percentages are as follows: 11 respondents (11%) strongly disagree that their awareness has changed, 15 respondents (15%) disagree, 19 respondents (19%) are neutral, 30 respondents (30%)

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agree, and 25 respondents (25%) strongly agree. The total number of respondents is 100, making the percentage values directly proportional to the frequency values. This data indicates that a significant portion of respondents (55%) agree or strongly agree that their awareness of debt and equity has increased, suggesting a general trend towards improved understanding in these areas among the surveyed group.

Table 5. Do you trust & believe that online platforms provide better access to investment opportunities (Both Debt & Equity)?

	Frequency	Percentage
NOT AT ALL	12	12
SLIGHTLY	14	14
MODERATELY	17	17
VERY MUCH	27	27
COMPLETELY	30	30
TOTAL	100	100

Table 6. To what extent do you believe YOUR AWARENESS OF DEBT AND EQUITY HAS CHANGED?

	Frequency	Percentage
STRONGLY DISAGREE	11	11
DISAGREE	15	15
NEUTRAL	19	19
AGREE	30	30
STRONGLY AGREE	25	25
TOTAL	100	100

4.2 Hypothesis Testing

H0: there is no significant difference between fin-tech awareness among different education level The t-test has been illustrated in table 7:

After calculation the outcomes of the statistical study expose a significant difference in awareness levels among individuals that have various levels of. This is supported by the test statistic value of 0.000 and a p-value of 0.05, which is frequently used as the threshold for identifying statistical importance in research. Because the p-value (0.05) is less than the significance level (usually set at 0.05), it reveals that there is a statistically meaningful variation in awareness levels based on educational achievement. So, we have to deny the

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Table 7. T-test Results(Education Level)

Paired		Differences			t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Conf Int				
			Lower	Upper			
0.9252	1.2416	0.1200	-0.6873	1.1632	-7.708	106	0.000

void hypothesis (H0), and the information proposes that educational attainment impacts awareness levels!

H1: there is a significant difference between fin-tech awareness levels among different age groups.(see table 8).

Table 8. T test results(Age)

	'Mean'	'N'	'Std. Deviation'	'Std. Error Mean'
Age	1.804	107	1.0041	0.0971
Pair 1 Fully Aware	3.4012	107	1.0081	0.0975

Table 9. Paired Differences in Awareness Levels by Age Group

Paired		Differences			t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Interval Difference				
			Lower	Upper			
1.5981	1.3931	0.1347	-1.3311	1.824	-11.866	106	0.000

5 Results

Upon analysing the t-test results, it was found that there is a significant difference in awareness levels among different age groups. The calculated value is 0.000, and the p-value stands at 0.05 Moreover, the extremely low p-value of 0.000 indicates the likelihood of obtaining such extreme results by pure chance alone is very low. This leads to the rejection of the null hypothesis (H0), which posits no variation in awareness levels among age groups. The computed value of 0.000 suggests that the variation in awareness levels

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between age groups is statistically significant. Thus, it is more probable that the observed difference in awareness levels reflects a genuine difference in the population than being a result of random sampling error.(see table 9). Age is one factor that influences the use of Fintech services. With these findings, it's crucial to acknowledge the impact of age on awareness levels and how it influences the utilisation of Fintech services. Nonetheless, further studies are necessary for a comprehensive understanding of these relationships.

6 Conclusion

In recent years, the fintech sector has experienced significant growth, driven by new startups and technological advancements that have reshaped banking and finance. Projections suggest that this trend will continue, with a focus on offering comprehensive financial services and overcoming traditional obstacles like high fees and regulatory burdens. Consequently, there is potential for future research to explore how traditional banks perceive their role in this evolving landscape, emphasising the need for collaboration with innovative entrepreneurs to stay competitive and integrate new technologies effectively. However, alongside the benefits of technology-driven investing, there are notable challenges to consider. Firstly, investors must possess a level of technological literacy to navigate online platforms and utilise data analytics securely. Additionally, managing risk is crucial, as easy market access can lead to uninformed decision-making. Cybersecurity is a major concern, requiring robust measures to safeguard personal and financial data. Lastly, increased market volatility, influenced by retail investor sentiment and algorithmic trading, demands careful consideration and informed decision-making from investors.

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Chapter 11

Book Chapter

Disruption of Artificial Intelligence on Human Resource Management: The Impact on Hiring Process

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Abstract

Organizations with effective recruiting strategies are able to hire the right individuals to control the digital world and develop the business environment. Therefore, an organization's recruitment strategy is the most important factor in recruiting qualified employees who will be the most effective and efficient in accomplishing their job goals. Recruitment strategy seems to use data analysis in its decision-making process as it is a key function of the organization. Data analysis is known as "Artificial Intelligence" and plays an important role in hiring decisions. In its most basic form, artificial intelligence is created by intelligent machines created by humans. AI acts and reacts like humans. The ultimate goal is to make it easier for computers to do tasks that humans normally do. AI takes the lead with unbelievable speed and accuracy. The main purpose of this paper is to investigate how artificial intelligence influences recruitment strategies. The study also sheds light on how companies are using AI in their recruitment. This research is based entirely on secondary sources of information, such as articles on the concept, various books, journal papers, and websites were used to delve deeper into the idea.

Keywords: Disruption. Artificial Intelligence. Automation. Human Resource Management. Recruitment. Recruiters.

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1 Introduction

AI is an umbrella term that encompasses various related concepts such as machine learning, machine intelligence, and cognitive computing. In general, AI is technology that can make judgments without direct human input and independently of people. This means that machines can learn autonomously from their environment and base their conclusions on what they discover. One industry undergoing major changes due to AI is human resources (HR). HR professionals use tools and software to handle the hiring, onboarding, and training processes. The future of artificial intelligence in HR includes automating some of these processes, allowing HR to use time and money more strategically (Nawaz et al., 2024).A major application area for AI is recruitment. This process involves filtering applicants based on skills, experience, competencies, and cultural fit to find the best fit for open positions. Machine learning helps HR professionals identify these attributes with greater accuracy than traditional classification methods such as resume screening or phone screening.AI in recruitment plays a key role in talent acquisition (Laurano, 2022). In order to cut costs and downtime and fill open positions with qualified candidates, about 30% of businesses employ AI in their hiring processes. AI helps HR managers make the hiring process more efficient by making intelligent, data-driven decisions. According to a study conducted by Wahdaniah et al.'s (2023), 87% of 4,444 HR leaders agree that digital technology will transform the way central HR works. By validating a candidate's available skills and improving matching to open positions, you can attract better talent faster and more accurately. Improve HR services by increasing productivity, reducing costs, and eliminating human error and bias. However, Organizations must train their employees on the use of these machines or software designed for business purposes (Chen, 2023)

Swedish luxury car giant Volvo made headlines at its Brussels Motor show by unveiling his AI-integrated car, which was used to interview job seekers for service technicians. It reduced labor and created some ambiguity between the labor force of and the capabilities of machines (Geetha & Bhanu Sree, 2018; Ul-Hameed et al., 2019). However, people's daily lives have been greatly changed by AI technology in many different ways. In contrast to how it was, how it would be, or how it is perceived, technology and its innovations have reached every corner of the world among people, from the use of smartphone keyboards to voice-controlled assistants on tablets and laptops. Even the exploitation of AI can be done for the benefit of a country & people working in sectors such as economic sectors, healthcare, security services, education, defense and governance. However, AI is integrated in almost all the sectors of the economy (Gautam & Mittal, 2022). Finding the appropriate candidate at the ideal time is the human resource manager's primary goal during the recruitment process. The use of the extra sources or numbers will allow you to extend this activity. We would use a wide range of channels to locate and place the best applicants to fill the designated vacancies. The efficacy of every firm using various methods and

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processes when recruiting depends on the two major components of recruitment, or internal factor and external factor. The hiring process is successful when top candidates who can perform well on the job are chosen and encouraged. When information, data, and sources are developed and supplied precisely for each application, it is more effective.

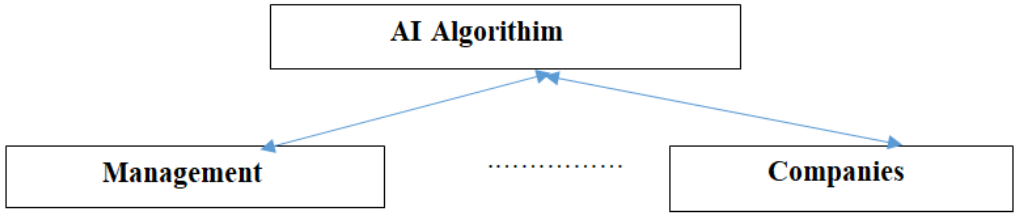

Figure 1. Relationship between company, Management and Artificial Intelligence

Sandeep et al.'s (2022) examined a relationship between company, management and AI.(see figure 1). The researchers Geetha and Bhanu Sree's (2018) have described how artificial intelligence is used in the hiring process, where it plays a crucial role. Artificial intelligence assists in interview scheduling, auto-generated communications to applicants, employee relations, and candidate screening. Jarrahi's (2018) cover the benefits of AI for people. Artificial intelligence has aided organizations in making decisions, managing ambiguity, and particularly ambiguous decisions. Still, when subconscious choices are necessary to assess and assist the consequences of decisions, humans play a crucial part in a business and technology must rely on them. Amla and Malhotra's (2017) in his research paper digital technologies are being used by companies like SAT, Facebook, and GE to evaluate applicants, conduct interviews, and find fresh talent for the hiring process. Hiring managers can examine applications using AI, and candidates might get swift responses. In the study by Pratap Singh Rathore's (2023) chat box systems or automated response machines play a crucial role in resolving inquiries and issues related to AI's application in reducing favoritism and enhancing workplace openness. The company will then have the option of selecting the CV. The use of AI tools can be used to analyse job descriptions.

Table 1 highlights the differences between the human mind and artificial intelligence in handling decision-making. The human mind navigates uncertainty quickly and intuitively, relying on experience and gut feelings, while AI leverages real-time data for informed decisions. Humans decide where to seek information and negotiate agreements, whereas AI processes and analyzes data systematically, providing multiple perspectives based on emotional analysis. This comparison underscores the complementary strengths of human intuition and AI's data-driven precision.

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Table 1. Comparison Between Human Mind and Artificial Intelligence in Decision-Making

	Human Mind	Artificial intelligence
Uncertainty	Quickly and intuitively decides in the face of uncertainty	Access "real time" data is available
Complexity	Decide where to look for information and acquire it. Choose a choice that has comparable data support	Data collection, correct processing, and analysis
Equivocality	Develop an agreement via negotiation and mobilise support	Analyse feelings and give several points of view

2 Objectives

1. To comprehend AI's function in modern human resource management.
2. To comprehend the justifications for using artificial intelligence.
3. To comprehend the chatbot-based AI hiring process.
4. To research the kind of skill set needed for human-machine interaction and HRM function to coexist.

3 Research Methodology

The study makes use of a descriptive research design. The researcher employed secondary data in the research investigation. The secondary data were acquired from websites, research reports from various research organizations, academic publications on human resources, books, blogs, and websites.

4 Recruitment Process through Chatbots

1. Simplifying the first stage

   Today's chatbots are very versatile. You can analyze CVs and ask for clarification. Chatbots are automated software programs that interact directly with applicants via text messages. Chatbots get their information from the experience of their applicants, solve their queries and collect vast amounts of data that a representative of human selection must analyze. After the application is received, screening it is a very time-consuming process. During the first round of pre-screening calls, recruiters often confirm which candidates are suitable; while we know this works, the process

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needs to be revised. The use of chatbots is a remarkable innovation that makes the review process much better and better. The right candidates can be distinguished from the unsuitable ones by sending a text message to each potential applicant, asking a series of short, pre-written questions. Using AI chatbot technology, recruiters may send numerous texts in a matter of minutes and receive responses rapidly, as opposed to the days or even weeks that call and texts might take during the traditional recruiting process. The eligible candidates can be successfully distinguished from the unfit candidates by asking an applicant a series of quick, predetermined questions.

2. Correct Data at Real time

   Every firm want to update its candidate database daily, respond to customers more quickly, and build long-term relationships with their applicants It. Companies can use a chatbot that is linked to the database to update it daily. Companies may examine the information in their database, which has a significant impact. Companies can update candidates' accessibility, present situation, flexibility, or even a new certification through personalized and automated interactions. By using a chatbot among their target audience, businesses can enrich their database.

3. Qualifying Candidates

   By asking candidates queries about their skills, credentials, and experience. chatbots can do an excellent job of separating the good candidates from the undesirables. Otherwise, it would be a tedious and time-consuming task for recruiters. With the help of the skills, ability it can then efficiently rank and qualify a large group of applicants based on organizational needs (Albassam, 2023). Chatbots can save a lot of administrative work related to recruiting a candidate by scheduling the required conversations and appointments with mutual consideration. Although it seems that humans are needed at different stages of the process, the chatbot makes sure that all prerequisites are met before humans take control.

4. Get more Qualified Appliers into Job Offers

   In order to increase the number of job applicants, organizations are actively forwarding emails to their database. The success rate, however, falls short of expectations. With the help of a chatbot on messaging applications, organizations may access a database of applicants and direct them to the ideal position at the right moment. Through the chatbot, applicants may apply without any hassle. They do not need to sign in or go through a time-consuming application procedure to access a website. Instead of emails, job offers are sent to candidates via their messaging apps.

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5. Question and Answer (FQA)

   Candidates must investigate the position, the organization, and a number of prerequisites before applying. It is really annoying to have to go through an FAQ page to get all these answers. With the use of chatbots, this can change completely. Chatbots can be used by companies to respond to frequently asked questions by identifying keywords provided by applicants. Responses need to be straightforward and informative so the candidate can quickly get information and a thorough understanding, leading to their satisfaction. If the answer is unclear, chatbots can respond to candidates in an approachable manner, and also connect the application to the right person to ensure a positive experience. In the era of data-driven decisions, chatbots might be connected to a platform that gathers essential information. The business will be able to monitor how frequently a particular issue is raised and what prospects want and are seeking for with the use of this kind of platform. Chatbots are a fantastic resource for recruiters as they are quick to respond and always available.

6. Screening Candidates Application

   When applicants apply on a company's employment site, chatbots can start a dialogue with them. While conversing with chatbots, they may ask several queries. The inquiries might range from inquiring about job experience. When this procedure is completed, the chatbots evaluate the application for relevance to the available post. Using information from the conversation, the candidate's resume, and an evaluation of the position's requirements, the recruitment chatbot determines whether the applicant is the best fit for the job.

7. Interview Scheduling of the Candidates

   Setting up the candidate's interview is yet another time-consuming procedure. Intellectual chatbots can query recruiter's calendars to see whether they are available and then plan a day and time for the suitable candidate. The majority of candidates no longer respond to unidentified phone numbers, therefore contacting them directly is no longer effective. Also, calling the applicant when they are working at their present firm won't be convenient to pick the calls. This entire procedure might take a long time. This activity, however, will not be boring for a chatbot, as chatbots flourish at this sort of repetitious task.

8. Candidate Experience

   It is not surprising that a chatbot will be required for this part of the operation. When a new position becomes available, many people will apply, making it challenging for someone to manage. In other words, a chatbot can step in and speed up the

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process with a quicker response. Recruiters must rethink their strategy and become more applicant-driven if they want to break through the confusion. There should be little delay between when candidates submit applications and when recruiters get in touch with them. Chabots can assist in it by responding rapidly to applicants, keeping both candidates and recruiters happy.

5 Importance of Artificial Intelligence in HR

1. Bots doing in-person interviews:

   Bots, another name for robots, are now taught to conduct in-person interviews as part of the employment procedure. These bots evaluate a candidate's eligibility by scanning their soft skills and personality traits using both natural language processing (NLP) and interview analytics. Bots may conduct physical interviews, which is useful for recruiters since it maintains consistency throughout the interview process and ensures that all candidates have the same interview experience.

2. Background checks powered by AI:

   Although laborious and time-consuming, background screening for candidates is just as crucial as a skills evaluation. Background checks are performed by 92% of businesses for the straightforward reason of risk reduction. In comparison to using the manual process, AI has made that experience faster, easier, and more effective. Background checks enabled by AI assure businesses of fair, private processes that safeguard both the business and the candidates.

3. Improving employee satisfaction :

   Once the individuals have been located and contacted by your AI software, it may quickly and efficiently lead them through the hiring process, providing a pleasant candidate experience. Recruiter chatbots can provide prompt responses to candidate questions, provide succinct remarks, and suggest next steps. They can schedule interviews, explain firm hours and location, and provide links to promising job descriptions (Huseynov, 2023).

4. Onboarding:

   Onboarding AI is also enhancing the onboarding process by, for example, automating time-consuming operations like producing offer letter templates, completing background checks, and compiling benefit paperwork. All onboarding paperwork can be organized, printed, and sent with the aid of AI.

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5.1 Advancement of Hiring Process through Artificial Intelligence

In this way Hiring process is advanced through Artificial Intelligence:

1. Lessen the workload of the office employees.
2. It will aid in the recruitment of talent and help find the best candidates for the position.
3. AI enables forecasting of workplace employee retention rates.
4. It is able to function properly and get around human limitations.
5. There will be a reduced possibility of error.
6. It keeps the various departments' workflows running smoothly.
7. Businesses can obtain precise results through AI.
8. It will boost workplace morale among employees.
9. It will lessen the tendency to make biased decisions.

5.2 Some problems may occur due to Artificial Intelligence

1. Potentially Less Accurate

   Because AI requires data to work, it may not be accurate enough for your hiring process if you have poor or insufficient data. There are still some aspects of AI that are developing, so you might occasionally make a mistake.

2. Less Human Interaction

   In this regard, artificial intelligence has both benefits and drawbacks. Sometimes it's difficult to determine someone's suitability for a job based solely on their application. A machine won't always be able to meet the organization's precise objectives when looking for the appropriate candidate.

3. It May Not Always Be Realisable

   Similar to how personnel in the HR department do not feel ready to upgrade their abilities, companies believe they are not yet ready to integrate AI into their processes. Any kind of major change requires a lot of time and work, which some firms just don't have.

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4. Too many keywords are used too frequently

   AI primarily relies on certain keywords when sifting through its candidate pool. Candidates who are well-informed about the programming behind AI might be able to exploit this flaw by providing specific phrases that could fool the system and make them seem like good fits for various positions when they are not.

5.3 Traditional Recruitment V/S AI Recruitment

1. Better Job Description

   A comprehensive list of job qualifications is necessary in the conventional hiring procedure. Always be a good fit for the talent pool. Because of this, many deserving abilities are simply disregarded. This is due to the fact that not every box on the list is ticked. Companies go broke when they are thus strict and inflexible. His leader in the company cannot permit it in the tumultuous environment of today.

2. Market Scenario

   Adopting AI enables businesses to utilize algorithms to carry out quick but important operations. Companies may entice more talent without losing the essential job criteria by revising processes in a way that produces different and better results in real time. Additionally, AI systems may develop and learn by selecting the best candidate based on consistent feedback.

3. Intelligent Screening

   Traditional hiring practices are cumbersome, ineffective, and even prone to mistakes. Additionally, it prolongs the employment process and eventually raises hiring expenses for the business. By assessing candidate profiles based on performance, turnover, tenure, skills, aptitudes, public data/social media, and more, AI recruiting enables organisations to use the potential of intelligence screening throughout the recruiting process.

4. Identification of Relevant Passive Candidates

   Any company's candidate search should include passive applicants. Finding and attracting resistant individuals is becoming more and more crucial due to a skill shortage. Talent in today's market is aware of their value and always considers what recruiters have to say.In comparison to conventional recruitment methods, passive applicant search is far more frictionless using AI and ML algorithms. Companies may make the most of AI and ML technologies to locate the finest employees fast by taking into account a variety of factors, including employee tenure, if the firm is decreasing, experience, and relevancy to position.

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5. Automatic Candidate Search

   The manual search for candidates, which is frequently a key step in conventional recruitment strategies, takes a lot of time and money. Additionally, recruiting efforts are being led by HR teams, which adds to the strain and pressure. Adopting AI enables businesses to locate people by utilizing the potential of intelligent solutions. It not only helps hiring teams do more extensive searches and reach a bigger talent pool for effective hiring, but it also saves time and money.

6. Affective Computing and Emotional AI

   Utilising AI in recruiting does not yet need eliminating the human component. Companies today have access to emotional AI, which ensures a natural type of connection while bringing the advantages of artificial intelligence to the employment process. Although traditional recruiting adds a crucial human aspect, it is time, money, and effort-intensive. Emotional AI or Emotional Computing technology may be used by recruiting teams to provide a quicker, more effective, fair, and less expensive hiring process.

7. Real-Time Interactions

   One of the main difficulties with conventional recruiting is communication. Increased talent turnover, more misconceptions, and a general bad perception of the company are all caused by ineffective and premature communication. Companies may use AI-powered chatbots to ensure real-time engagement with applicants by adopting AI. Companies should avoid losing talent because of poor communication by providing responses to inquiries and comments as soon as possible. Additionally, it can result in a better candidate experience, which might draw in more talent for your business. One of the major problems with conventional recruiting is communication. Increased talent turnover, more misunderstandings, and an overall unfavorable perception of the organization are all caused by inefficient and hasty communication. Adopting AI enables businesses to use chatbots that are AI-powered to connect with candidates in real-time. Companies can avoid losing talent due to communication failures by providing questions and comments in a timely manner. Additionally, it can result in a better candidate experience, which might help your business draw in more talent.

8. Faster Setup

   Businesses pay high price for vacancies, and lengthy hiring procedures are more expensive than you may imagine. Additionally, typical recruitment techniques are time-consuming and expensive for companies to use. This results in inefficient budgeting and wasteful losses. This is a benefit that businesses can get from AI adoption.

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5.4 Limitations of Artificial Intelligence in Human Resource recruitment Process

Machines and technology should support people, not replace them. Apart from the profits obtained, using AI for recruitment has certain limitations. HR is all about people. Therefore, the human element cannot be removed from the procedure. Human qualities such as intuition, empathy, and emotional understanding are irreplaceable. Decision-making with integrated AI tools ignores the human factor and bases analysis and decisions solely on data. But too much of this data has been given to machines by humans. Keywords can also limit the selection of a recruiter's pool when searching for another potential applicant cannot be added. However, recruiters may lack the ideal baby boomer applicant with extensive experience in this field. Resumes cannot follow AI-powered application tracking systems. AI tools cannot replace observing the human body language in face-to-face interviews at the workplace.

Facial expressions in face-to-face interviews still play an important role in decision making in the selection process. For high-income jobs, it is difficult for AI to determine psychological traits. Machine language is difficult. Evaluate human capabilities for rapid learning, motivation, and decision making. Recruitment-related activity remains questionable. It reduces the handbook, but the participation and prejudice factors associated with people cause major problems. Relationships play an important role in the early stages of the hiring process. Since these are machines, candidates have no chance of knowing future employees. But these limitations aside, the future of AI in HR is just around the corner.

6 Conclusion

Artificial intelligence is technology that functions intelligently in a variety of situations, much like the human brain does. Compared to traditional recruiting methods, there is an increasing focus and importance in automating recruiting systems. Recruitment is the central activity of all labor organizations. Many industries are also focusing on changing their hiring processes. Recruiters who have AI technology can tweak all aspects and thus have a significant impact on hiring. These days, recruiters view this AI technology as a rival. However, it is made-up software designed to make your task easier. The procedure will go on. AI plays a role that combines human and AI capabilities. This ensures data maintenance, saves companies money and time, and makes it more accurate. Accessible throughout the hiring process, some settings remain traditional, but most of the setting area is digitization using AI tools and applications. It saves cost and time while automating various processes and making effective and efficient decisions.

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Artificial Intelligence and Fintech: Catalysts for Financial Transformation

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Abstract

Artificial Intelligence (AI) and Financial Technology (Fintech) have emerged as powerful catalysts for the transformation of the financial industry. This paper explores the synergistic relationship between AI and Fintech, elucidating how AI technologies are revolutionizing traditional financial services and driving innovation across various sectors. We delve into key applications of AI in Fintech, including automated trading, risk management, customer service automation, fraud detection, and personalized financial advice. By leveraging AI algorithms, machine learning techniques, natural language processing, and big data analytics, Fintech companies can enhance operational efficiency, optimize decision-making processes, and deliver tailored financial solutions to consumers. Moreover, we examine the challenges and opportunities associated with the integration of AI in Fintech, such as data privacy concerns, regulatory compliance, ethical considerations, and the need for talent with specialized skill sets. Through a comprehensive analysis, this paper underscores the transformative potential of AI in reshaping the future of finance and emphasizes the importance of strategic partnerships between technology firms, financial institutions, and regulatory bodies to foster innovation and ensure sustainable growth in the digital era.

Keywords: Artificial Intelligence. Fintech. Financial Transformation. Machine Learning. Data Privacy. Regulatory Compliance. Digital Finance.

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1 Introduction

The financial industry is undergoing a profound transformation driven by advancements in Artificial Intelligence (AI) and Financial Technology (Fintech). This convergence of technology and finance has led to unprecedented opportunities for innovation, disruption, and redefinition of traditional financial services. In this era of digitalization, AI serves as a catalyst for reshaping the landscape of finance, offering new solutions to age-old challenges and paving the way for enhanced efficiency, agility, and customer-centricity. This paper explores the transformative potential of AI in Fintech, examining how AI technologies are revolutionizing various facets of the financial sector and driving financial transformation on a global scale. By leveraging sophisticated algorithms, machine-learning techniques, natural language processing, and big data analytics, Fintech companies are reimagining traditional business models, streamlining operations, and delivering personalized financial services tailored to individual needs and preferences.

The synergistic relationship between AI and Fintech is evident in a multitude of applications, including automated trading, risk management, customer service automation, fraud detection, and personalized financial advice. These applications not only enhance operational efficiency and optimize decision-making processes but also empower consumers with greater access to financial resources and insights. Data privacy concerns, regulatory compliance, ethical considerations, and the need for talent with specialized skill sets pose significant hurdles to the widespread adoption of AI-driven financial technologies. Addressing these challenges requires collaboration and cooperation among technology firms, financial institutions, and regulatory bodies to establish robust frameworks and standards that safeguard consumer interests while fostering innovation and growth. This paper aims to shed light on the opportunities and challenges presented by the AI revolution in Fintech, emphasizing the importance of strategic partnerships, ethical practices, and regulatory frameworks in harnessing the full potential of AI for financial transformation. In the subsequent sections, we delve deeper into the key applications of AI in Fintech, examine case studies and industry trends, and provide insights into the future direction of AI-driven financial innovation.

2 Literature Review

The integration of digital capabilities and IT skills with government services in the public sector is crucial for societal and economic growth.(Mittal & Gautam, 2023). The intersection of AI and Fintech has attracted significant attention from researchers, practitioners, and policymakers alike, owing to its potential to revolutionize the financial industry. This literature review focuses on the transformative impact of AI in reshaping traditional financial services and driving financial transformation. The present trends involve data sharing

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in various sectors including finance and business.(Gautam & Mittal, 2022). Rühl and Palomo Zurdo's (2020) argued that the emergence of new actors, such as fintech companies in the banking sector, which heavily utilized new technologies for providing financial services, including disruptive solutions, compelled traditional banking to update its business model and prioritize customer-centricity. The development of the digital economy and collaborative economy reshaped relationship models between companies and consumers. An analysis of 31 major European commercial banks from 2010 to 2017 revealed significant competitive pressure from fintechs, prompting banks to shift towards greater client focus and adopt fintech technologies, ultimately democratizing financial services.

Guo and Polak's (2021) examined the evolution of AI technology within the finance sector, particularly amid the COVID-19 pandemic of 2020. It discussed not only AI applications but also regulatory aspects in FinTech. Proposing an innovative regulatory framework and mandatory supervision for AI-based technologies, aimed to foster sustainable growth. AI integration in finance emphasized digitalization and intelligence, enabling end-to-end systems and problem-solving assistance. Assessing AI's impact on achieving sustainable development goals became imperative as its influence expanded across industries. Further, Barroso and Laborda's (2022) examined the rise of new technologies in the financial sector and their integration into financial and investment practices, empowering organizations to surpass traditional financial institutions. They thoroughly reviewed and analyzed challenges, regulation, and collaboration through a systematic literature review. Srivastava and Dhamija's (2022) explored the role of Fintech in the Indian banking system, leveraging data from the RBI's Report on Fintech and Digital Banking. The study highlighted Fintech's integration into banking, transforming challenges into opportunities for enhanced adaptability and serviceability. It proposed pathways for Fintech's evolution, emphasizing the structured development of Fintech-based innovations and their impact on financial inclusion. The analysis underscored the potential value creation, insights offered by ongoing, and future financial technology advancements in the banking industry.

Mossavar Rahmani and Zohuri's (2023) provided a succinct examination of AI's far-reaching impact on the financial sector, encompassing various aspects such as customer experiences, security measures, risk management, operational efficiency, return on investment, and regulatory adherence. AI-powered chatbots and virtual assistants revolutionized customer interactions, while enhancing security through real-time fraud detection and biometric authentication. Predictive analytics reshaped risk management strategies, while AI-driven automation improved operational efficiency and ensured regulatory compliance. Achieving a balance between innovation and ethical considerations remained paramount in leveraging AI for positive transformation in finance. Mohsen, Hamdan, and Shoaib's (2024) investigated the transformative effects of integrating AI into the financial sector, encompassing machine learning, process automation, predictive analytics, and chatbots.

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The study aimed to assess AI's influence on financial institutions, products, and customer experiences, exploring its diverse facets and implications. Additionally, study by Rane, Choudhary, and Rane's (2024) explored how Artificial Intelligence (AI) revolutionized corporate finance by enhancing efficiency and decision-making. Leveraging machine learning, natural language processing (NLP), and robotic process automation (RPA), AI improved corporate governance and sustainability practices. Amidst increasing pressure to streamline operations and address ESG concerns, AI offered automated data analysis, pattern recognition, and predictive modeling for swift, informed decisions. Machine learning detected financial patterns, aiding risk management, while NLP extracted insights from unstructured data. RPA streamlined tasks, cutting costs, and ensuring regulatory compliance. AI adoption thus fostered innovation, optimized resources, and promoted sustainable growth in the dynamic business landscape.

Table 1 provides an overview of various applications of machine learning in corporate finance, along with brief descriptions, examples of use, and commonly used tools and frameworks for each application. Kaur, Sharma, and Singh's (2024) investigated how AI and machine learning (ML) revolutionized the financial sector, altering traditional wealth management approaches. They explored the historical progression of AI and ML within finance, showcasing how algorithms influenced trading strategies, risk evaluations, and customer services, disrupting traditional industry practices. The chapter clarified the core functionalities of AI and ML applications, highlighting their contributions to refining investment portfolios, streamlining trading processes, and fortifying cybersecurity measures. It emphasized the symbiotic collaboration between human expertise and machine intelligence to augment the accuracy and adaptability of financial decision-making. Automated trading algorithms powered by machine learning techniques have enabled faster execution, improved accuracy, and enhanced risk management strategies in financial markets. Natural language processing algorithms have been leveraged to automate customer service interactions, providing personalized recommendations and enhancing user experience. Similarly, AI-driven fraud detection systems have demonstrated remarkable effectiveness in detecting and preventing fraudulent activities, safeguarding financial institutions and consumers. Moreover, AI-powered robo-advisors have emerged as a popular choice for providing tailored financial advice, democratizing access to investment opportunities and financial planning services.

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Table 1. Machine Learning in Corporate Finance

Application	Description	Examples of Use	Tools and Frameworks
Credit Scoring	Assessing creditworthiness of individuals	Loan approval, risk assessment	Scikit-learn, XGBoost, LightGBM
Fraud Detection	Identifying and preventing fraudulent activities	Transaction monitoring, anomaly detection	TensorFlow, PyTorch, Scikit-learn
Portfolio Optimization	Optimizing investment portfolios	Asset allocation, risk management	QuantLib, CVXPY, PyPortfolioOpt
Financial Forecasting	Predicting future financial outcomes	Revenue forecasting, cash flow analysis	Prophet, ARIMA, LSTM, XGBoost
Customer Segmentation	Grouping customers based on behavior	Targeted marketing, personalized offers	K-means clustering, DBSCAN, PCA
Algorithmic Trading	Executing trades based on predefined criteria	High-frequency trading, automated trading	TensorFlow, Keras, PyTorch, Scikit-learn
Sentiment Analysis	Analyzing public sentiment towards stocks	Market sentiment analysis, sentiment-based trading	NLTK, TextBlob, Vader, Scikit-learn
Risk Management	Assessing and mitigating risks in financial operations	Credit risk assessment, fraud detection	TensorFlow, Scikit-learn, PyTorch
Loan Default Prediction	Predicting the likelihood of loan defaults	Default risk assessment, loan approval	Logistic Regression, Random Forest, XGBoost
Market Prediction	Forecasting market trends and movements	Stock price prediction, market trend analysis	LSTM, Random Forest, XGBoost, Prophet

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Researchers have also highlighted several challenges and opportunities associated with its implementation. Data privacy concerns, regulatory compliance, and ethical considerations represent significant hurdles to the widespread adoption of AI-driven financial technologies. Mehrotra and Menon's (2021) examined the evolving landscape of banking and financial services, characterized by the simultaneous growth of FinTech and fourth-generation technologies like IoT, blockchain, AI, and machine learning. They discussed the initial challenges of adapting to FinTech growth and strategizing collaboration, followed by the subsequent challenge of integrating newer technologies like IoT and AI into FinTech architecture. The aim was to meet the evolving demands of millennial customers through mobile payments, budgeting, crowdfunding, and other solutions, while ensuring regulatory compliance and cybersecurity.

Gwala and Ijaz's (2023) aimed to explore how artificial intelligence, financial technology (FinTech), and digitization, influenced by the fourth industrial revolution, catalyze economic growth in Africa. Their desktop literature review revealed ongoing FinTech and digitalization processes, led by traditional financial institutions and startups, yet hindered by technology barriers, resulting in unequal access and benefits.Chahal's (2023) analysis extensively explored the digital transformation of the financial industry, focusing on enhancing business processes. Financial institutions adapted to a changing landscape by leveraging cutting-edge technologies like cloud computing, blockchain, and AI for scalability and cost efficiency, despite challenges such as regulatory complexity and data security concerns. The study aimed to assess the impact of digital technology on process optimization and transformation within financial aspects. In the paper by Taherdoost's (2023) provided an objective analysis of fintech's impact on the financial services sector. He elucidated how technological advancements transformed conventional banking services into digital processes, giving rise to fintech companies. Despite the potential for safer and faster financial services, challenges persist in fintech applications, alongside opportunities for innovation driven by evolving customer preferences and habits. Ensuring transparency, fairness, and accountability in AI algorithms is crucial to maintaining consumer trust and confidence in Fintech platforms. Moreover, the swift rate of technological advancement requires ongoing skill development and adaptation among workers to align with the requirements of an AI-centric economy. Cooperative initiatives involving academia, industry, and government are imperative to tackle these hurdles and fully leverage AI's capabilities for revolutionizing finance. A fintech ecosystem has been demonstrated in figure 1).

Looking ahead, researchers have identified several avenues for future research and development in the field of AI-driven Fintech. Exploring the application of emerging technologies such as blockchain, Internet of Things (IoT), and quantum computing in conjunction with AI holds promise for unlocking new opportunities and addressing existing limitations in financial services. Utilizing a qualitative research design, they conducted

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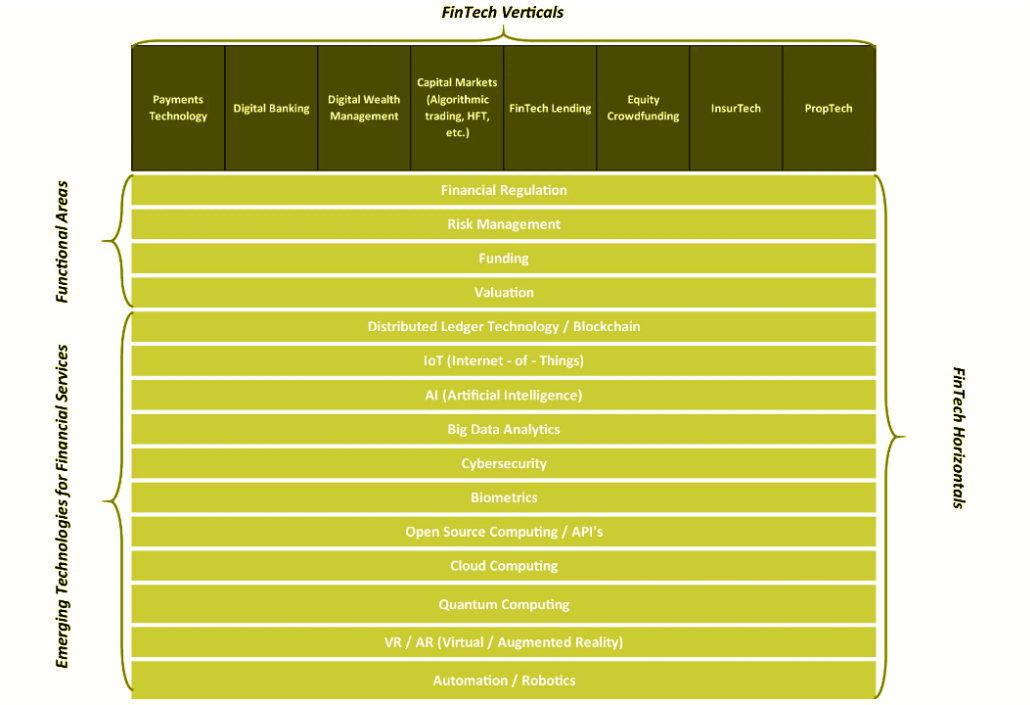

Figure 1. Fintech Ecosystem

a secondary source analysis, gathering data from various sources. It also highlighted the transformative role of Fintech businesses in offering diverse banking services, emphasizing future prospects for the industry's advancement. Additionally, investigating the societal implications of AI in Fintech, including its impact on job displacement, income inequality, and financial inclusion, is crucial for shaping responsible and sustainable AI policies.Further, Harsono and Suprapti's (2024) examined Fintech's role in reshaping traditional financial services, emphasizing its impact on industry transformation through technological advancements. Their research investigated how Fintech enhances efficiency, accessibility, and innovation in financial services, exploring concepts like Open Banking and financial inclusivity. Through a systematic literature review, they analyzed Fintech's implications, identified emerging trends, and discussed challenges, contributing to a comprehensive understanding of its evolution and potential societal benefits.

In their 2024 exploration,Sharma and Manhas's (2024) delved into the applications and consequences of AI in the finance sector. They scrutinized AI's utilization in trading, fraud detection, customer service, portfolio optimization, and risk management, along-

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side its future implications and trends. The study utilized literature reviews, industry reports, and case studies to comprehensively analyze AI's advantages in finance, including cost reduction, enhanced efficiency, and decision-making capabilities, while also exploring future trends and adoption rates. In conclusion, the literature on AI in Fintech underscores its transformative potential in revolutionizing financial services, driving innovation, and fostering inclusive economic growth. However, addressing the challenges and ethical considerations associated with AI adoption is paramount to realizing its full benefits and ensuring a more equitable and resilient financial ecosystem.

3 Discussion and Findings

The financial industry is undergoing a profound digital transformation driven by technological advancements such as AI, ML, blockchain, and IoT. This transformation has led to the replacement of traditional banking services with digital processes, significantly enhancing scalability, cost efficiency, and consumer experiences. Fintech companies are at the forefront of this revolution, leveraging technology to offer innovative financial services that promise safer, faster, and more cost-effective solutions. However, they also face significant challenges, including regulatory compliance, data security, and the need for skilled talent. AI and ML, in particular, have numerous applications within the finance sector, ranging from trading and customer service to fraud detection, risk management, and portfolio optimization. These technologies enable automated data analysis, predictive modeling, and pattern recognition, which enhance decision-making processes and operational efficiency. Despite the immense potential of AI and fintech to revolutionize the financial industry, challenges such as regulatory complexities and cybersecurity concerns persist. Nonetheless, these challenges are accompanied by substantial opportunities for innovation, driven by evolving customer preferences and the growing demand for personalized financial services. The future of finance is poised to be shaped by the integration of AI, ML, and other emerging technologies into fintech architectures, facilitating the development of holistic financial services that cater to the changing needs of customers. This includes services such as mobile payments, budgeting tools, crowdfunding platforms, and robo-advising solutions, all of which are becoming increasingly essential in the modern financial landscape.

To successfully navigate the challenges and opportunities presented by the digital transformation of the financial sector, financial institutions must adopt a multifaceted approach. Firstly, they should integrate technological innovations like AI, ML, blockchain, and IoT to remain competitive in a rapidly changing environment. Investing in fintech solutions can significantly enhance operational efficiency and customer experiences, helping firms adapt to shifting consumer preferences. Addressing regulatory compliance is crucial to mitigate risks and ensure legal adherence, while robust data security measures are essential

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to safeguard sensitive information and maintain customer trust. Furthermore, financial institutions need to focus on talent acquisition and development, investing in training initiatives to build a skilled workforce capable of effectively utilizing emerging technologies and fostering innovation. Agility and adaptability are key to responding quickly to market changes and technological advancements, ensuring sustained growth and competitiveness. Collaboration and partnerships with fintech startups and technology firms can provide valuable expertise and accelerate digital transformation efforts. Emphasizing customer-centricity by developing personalized financial services is vital to meeting the evolving needs and preferences of customers. Exploring new business models enabled by fintech and emerging technologies, such as subscription-based services, peer-to-peer lending, and decentralized finance (DeFi), can open up new revenue streams and growth opportunities. Continuous monitoring and evaluation of technological innovations and fintech initiatives are necessary to assess their impact on business performance, customer satisfaction, and regulatory compliance, driving ongoing improvement and innovation. By implementing these strategies, financial institutions can position themselves for success in the digital age, leveraging technology to transform their operations and deliver superior value to their customers.

4 Conclusion

In conclusion, the thorough investigation of how technology affects the financial industry highlights both the necessity of adapting and its detrimental potential. The research highlights how fintech, AI, and ML are being used in a variety of ways to improve consumer experiences and efficiency in the financial sector. It draws attention to issues like data security and regulatory compliance that need to be resolved in order to fully reap the rewards of technology integration. In order to foster innovation and maintain competitiveness in the digital age, financial institutions should emphasize investing in fintech solutions going forward, work with technology companies, and keep a close eye on emerging technology trends.

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