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Editorial

On behalf of the Editorial Board, we are glad to present Volume 23, Issue 1 of our journal, Pragyaa: Journal of Management (Pragyaa: JOM). It continues to gain appreciation and accolades as it provides a platform that stimulates and guides the intellectual quest of management scholars and practitioners.

Pragyaa: JOM is a bi-annual, double blind reviewed, open access journal that brings to the readers high quality research in Management that should help to address the challenges of 21st century. The journal contributes to the development of theory and practice in the field of management and presents literary work in the form of academic papers, case studies, and articles that contribute to contemporary research and practice. The journal aims to facilitate researchers, scholars, resource persons and practitioners to come together on a common platform and share the findings of their research with academia and practitioners so that research findings may be utilized to improve businesses and society at large.

The current issue taps the empirical and conceptual research work that deals with the topics such as: An Examination of the Intra-State Disparities in the MSME Sector in the Himalayan State of Uttarakhand; From Objectives to Outcomes: The Role of Workforce Diversity in Enhancing Organisational Performance; Exploring Educational Big Data and Learning Analytics: A Systematic Review of Research (2012–2023); Madhesh Movement and its Impact on Nepali Banking Sector: A Theoretical Analysis; A Study on Impact of Artificial Intelligence (AI) on HR Recruitment; The Influence of Leader's Social Intelligence on Follower's Resilience: A Study on the Perception of the Students from the Higher Educational Institutes of Uttarakhand; Towards Sustainable Decision-Making: Life Cycle Assessment and the Decoding of Environmental Footprints.

We are deeply thankful to the authors for their scholarly contributions to the journal. We express our gratitude to the panel of referees for the time and thought invested by them and for giving us sufficient insights to ensure the quality of papers. A heartfelt special thanks goes to Dr. Anil SubbaRao Paila, Hon'ble Vice Chancellor, members of the Editorial Board and the members of the Board of Management for their constructive feedback, warm encouragement, and never-ending support. We would like to express our gratitude to the Associate Editors for their valuable contribution in ensuring the quality and rigour of the journal and preparing the reader-friendly manuscript for the press.

Further, we are thankful to the faculty members of the School of Management for their cooperation and support.

We hope our readers find the contents, findings and suggestions contained in this issue of Pragyaa: JOM to be informative, thought-provoking and of practical relevance. We invite comments and suggestions from our readers to enable us to continuously improve our efforts for upgrading the quality of the journal.

Dr. P.G. Dangwal
Dr. Pankaj Misra
Editors

Pragyaan: Journal of Management

Volume 23, Issue 1, Jan-June 2025

CONTENTS	PAGE No.
Research Papers/Articles	
1. An Examination of the Intra-State Disparities in the MSME Sector in the Himalayan State of Uttarakhand Dr. Srishti Negi	1-10
2. From Objectives to Outcomes: The Role of Workforce Diversity in Enhancing Organisational Performance Sakshi Dhiman & Prof. (Dr.) Surekha Rana	11-18
3. Exploring Educational Big Data and Learning Analytics: A Systematic Review of Research (2012-2023) Kapil Pachauri & Shubham Gupta	19-27
4. Madhesh Movement and its Impact on Nepali Banking Sector: A Theoretical Analysis Dr. Sneha Chaurasiya	28-33
5. A Study on Impact of Artificial Intelligence (AI) on HR Recruitment Bhavya Chaudhary, Yasho Nandini & Dr. Vandana Singh	34-40
6. The Influence of Leader's Social Intelligence on Follower's Resilience: A Study on the Perception of the Students from the Higher Educational Institutes of Uttarakhand Dr. Yati Bhardwaj	41-52
7. Towards Sustainable Decision-Making: Life Cycle Assessment and the Decoding of Environmental Footprints Dr. Arpna Ratnakar, Dr. Ankita Dwivedi, Stuti Gupta & Krish Bhardwaj	53-59

An Examination of the Intra-State Disparities in the MSME Sector in the Himalayan State of Uttarakhand

**Dr. Srishti Negi*

ABSTRACT

MSMEs are considered to be the socio-economic growth drivers across the globe. In the state of Uttarakhand which is predominantly a hilly area MSMEs are believed to play a vital role in promoting sustainable livelihood as well as create self-employment opportunities by utilizing the local resources and reducing regional imbalance. This study based on primary data collected from 325 MSME units from Pauri District of the State (Hill Area) and Haridwar District (Plain Area) is an attempt to find out if there exists any hill plain dichotomy with regards to employment generation across the firm size category. The study also attempts to find out if there is any association between locality (hill or plain) and level of investment undertaken by the entrepreneurs. Besides this the paper also attempts to find out if there exists hill plain dichotomy with reference to challenges faced by the entrepreneurs. Multistage random sampling has been used in the study. Both parametric (Two-way ANOVA) and non-parametric (Chi-square and Friedman) tests have been applied. Two-way ANOVA revealed that locality and firm size category both had a statistically significant effect on employment generation. Also there was a statistically significant interaction effect found between locality and firm size category on employment generation. It was also observed from the study that MSMEs in the plain areas generated more employment than MSMEs located in the hilly areas. Further the findings of the Tukey's test for multiple comparisons revealed of the three categories of firm size, medium size enterprises generated maximum employment followed by small and micro enterprises. Chi-square test unveiled that there is association between locality and level of investment undertaken by the entrepreneurs. More investments were undertaken by the entrepreneurs in the plain areas as compared to hill areas. The results of the Friedman test clearly inferred the difference in the nature of problems faced by the MSMEs in the hill and plain areas of Uttarakhand. Thus the analysis of the study brings out the intra-state disparity in the MSME sector in the state of Uttarakhand where huge disparity in employment generation, investment and challenges faced by the MSME sector between the hill and plain districts is observed.

Keywords: MSMEs, Employment, Locality, Firm Size Category, Hill-Plain Dichotomy, Uttarakhand.

INTRODUCTION

MSMEs worldwide are considered as the "economic growth drivers". MSME sector is a highly heterogeneous sector contributing 45 percent to India's manufacturing output, 40 percent to exports, employing 73 million people and manufacturing more than 6000 products. MSMEs not only play an important role in promoting sustainable form of livelihood, creating self-employment in large number by utilizing the local resources but also plays a crucial role in achieving equitable regional development by promoting rapid industrialization especially in the backward areas of the nation. Hence the MSME sector is imperative to socio-economic development of the country.

Despite of the immense contribution of the MSME sector in the overall development of the nation, it is observed that the MSME sector is marked by huge regional disparities in India where the major contribution comes from a few developed states like Tamil Nadu, Maharashtra, Karnataka, Gujarat etc. while the other states especially the Himalayan states make negligible contribution towards the MSME sector. Hence concluding that huge inter-state disparity exists in the MSME sector. Not only inter-state but intra-state disparity is also observed in the MSME sector. The researcher in this paper has made an attempt to bring out such intra-state disparities existing in the MSME sector taking in consideration the Himalayan state of Uttarakhand which has a combination of plain

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districts and hill districts and at present is a growing state.

Uttarakhand, a Northern state of India was separated from Uttar Pradesh in November 2000 with the aim of fostering industrial development at a higher pace in the new geographical entity. For the purpose of bringing the state at par with other developed states, Uttarakhand was given the status of a special category state. The state has a total of 13 districts. Out of these 13 districts 3 districts are predominantly plain regions whereas the rest 10 districts are largely hilly areas. Each district has its own comparative advantage in terms of resources and investment opportunities and depends largely on geographical location and accessibility to the main markets.

Adhering to the absence of proper industrial policy framework, industrial development was not much observed before the formation of the state. Thus with the aim of promoting investment and hence industrialization in the state, the government came up with various industrial policies soon after the formation of the new state. The government in 2001 launched the first industrial policy of the state followed by the introduction of the Industrial Concessional Package of 2003.

This policy was especially formulated for the special category states like Uttarakhand and it incorporated various incentives for the industrial units. Despite of the huge success of the new industrial policy in speeding up the process of industrialization and hence the overall economic development in the state, it was observed that growth was skewed towards the plain areas of the state. Meaning thereby that the industries set up in the plain areas of the state were the major beneficiaries of the new industrial policy whereas the hill areas still remained underdeveloped on the industrial front. Thus largely on the grounds of hill area development, Special Integrated Industrial Development Promotion Policy was introduced in 2008 which was later amended in 2011. The main aim of this policy was to reduce the hill-plain disparity in the state by promoting the growth and expansion of MSMEs in the state.

As per the MSME Annual Report 2020-2021 of the state there are approximately 4.17 lakh MSME units operating in the State inclusive of both registered and unregistered units providing employment to 6.60 lakh people.

MSMEs are considered imperative for the progress of the mountain state of Uttarakhand as due to lack of high class infrastructural facilities combined with other topographical constraints like hilly and difficult terrains faced by the state, the scope for the establishment of the heavy industries becomes limited. Out migration from the hills due to limited employment opportunities available to people and the volatile nature of agriculture in the hills

further boosts the importance of the MSME sector for the development of the state of Uttarakhand. The MSME sector can promote entrepreneurship among the rural youth and hence harness their capabilities to create self-employment opportunities in the hills thereby putting an end to the problem of out migration from the hills.

Due to the massive potential of this labor-intensive sector in generating large scale employment opportunities for the rural communities in the hills thereby promoting sustainable development as well as entrepreneurial culture and skill development among the local youth, the government of Uttarakhand with the aim of sustainable and inclusive industrial growth has been working towards the development of MSME sector.

In context to this the Uttarakhand State government has come up with the MSME Policy 2015 which aims to promote public as well as private investment in the backward and hilly areas of the state in order to reduce regional disparities existing in the MSME sector. In order to promote such investments the government has introduced various schemes and incentives like Startup Policy 2018, Uttarakhand Mahila Udhya Vishesh Protsahan Yojna 2015, Uttarakhand Heavy Industrial Investment Employment Promotion 2018 etc. for the entrepreneurs setting up business in the hilly areas.

Despite of the constant efforts of the government to reduce the hill-plain disparity in the state with special focus on the development of the hill areas and thus ensure equitable industrial development of the state, it has been observed that the growth has been skewed towards the plain areas of the state. Better infrastructural facilities in the plain areas of the State has resulted in better scope for industrial development in these areas thereby proving the hill-plain dichotomy that exists within the state leading to out migration of the youth from the hilly and remote areas to plain areas of the state. In order to bring out such intra state hill plain dichotomy in the MSME sector in the state of Uttarakhand, the researcher has made the following objectives.

2. OBJECTIVES

- To study hill-plain dichotomy with regards to employment generation across the firm size category in the state of Uttarakhand.
- To study hill-plain dichotomy with regards to investment undertaken by the entrepreneurs in the state of Uttarakhand.
- To study hill-plain dichotomy with regards to challenges faced by the entrepreneurs in the state of Uttarakhand.

3. HYPOTHESIS

H01: There is no significant difference in mean employment generation for different firm size category with reference to locality [hills and plain] in the state of Uttarakhand.

H02: There is no significant association between investment undertaken by the entrepreneurs and locality [hills and plains] in the state of Uttarakhand.

H03: There is no significant difference in the mean rank of challenges faced by MSMEs entrepreneurs in the Pauri district of Uttarakhand.

H04: There is no significant difference in the mean rank of challenges faced by MSMEs entrepreneurs in the Haridwar district of Uttarakhand.

4. RESEARCH METHODOLOGY

4.1. Selection of Samples:

For the purpose of conducting the following study primary data has been collected from field survey through a pretested schedule and the research is descriptive and analytical in nature.

Since the study attempts to find out whether there is any hill plain dichotomy, one plain district Haridwar and one hill district Pauri has been selected as sample districts for the

state on the basis of highest concentration of number of MSMEs. Each district has been further divided into blocks and approximately 50 percent of the blocks have been selected on the basis of highest number of MSMEs for the time period 2010-11 to 2019-20 from each district. Further from each block selected, 5 percent of the total no. of MSMEs (inclusive of both Manufacturing and Services) have been selected proportionately as samples for the purpose of the study. Thus the samples of enterprises to be studied for the following research work have been selected through the method of multistage stratified sampling.

4.2. Sample Size:

For the present study a sample size of 318 (manufacturing and services) MSME units have been studied which includes 103 MSME units from Pauri district and 215 MSME units from Haridwar district.

5. RESULT AND DISCUSSION

5.1. Hill-plain dichotomy with regards to employment generation across the firm size category in Uttarakhand.

H01: There is no significant difference in mean employment generation for different firm size category with reference to locality [hills and plain] in the state of Uttarakhand.

Table 1: Descriptive Statistics

No. of Respondents	Skewness		Kurtosis	
	Statistics	Std. Error	Statistics	Std. Error
318	-0.115	0.137	-1.008	0.273

In order to analyze the objective Two-way ANOVA test was performed. Since the data did not follow bell shape i.e. due to the skewed nature of the data, log transformation was undertaken so as to conform the data approximately to normality. Further to check the normality of the transformed data descriptive statistics i.e., Skewness and Kurtosis was used (Table 1). As stated by George & Mallery

although the value of Skewness and Kurtosis for a normally distributed data should be equal to zero, values between -2 to +2 is also acceptable for the data to be proved normal. Since the values of skewness and kurtosis fall within the acceptable range of -2 to +2, as seen in Table 1 indicates that the data is fairly normal and the basic assumption of parametric testing is fulfilled.

Figure 1 is the Q-Q(quantile-quantile) plot which shows that the data is fairly normally distributed.

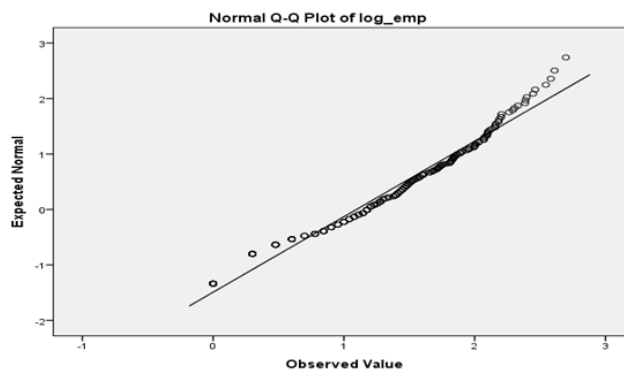


Figure 1: Normal Q-Q Plot

Another important assumption of parametric testing is the parametric testing is homogeneity of variance according to which the variance of the data should be equal for all. In order to test the assumption mentioned above, the equality of variance was tested through Levene's Test. The result is shown in Table 2.

Table 2: Levene's Test of equality of variance

F	Df	Df	Sig.
1.185	4	313	0.318

Dependent variable: Employment

As significance value of the Levene test is more than 0.05, so the variance of the population is equal. Since the prerequisites of the two-way ANOVA test were met, so the two-way ANOVA test was used to determine if locality (hill and plain) and firm size category (micro, small, medium) had a significant effect on employment generation as well as to determine whether or not there was an interaction between the two independent variables (locality and firm size category) on the dependent variable (employment generation).

Table 3: Descriptive Statistics of Employment Generation with Respect to Firm Size Category and Locality

Locality	Cat_unit	Mean	Std. Deviation	N
Plain	Micro	1.20	0.33	105
	Small	1.67	0.27	73
	Medium	2.14	0.26	37
	Total	1.52	0.46	215
Hill	Micro	0.22	0.29	96
	Small	0.96	0.32	7
	Total	0.27	0.34	103
Total	Micro	0.73	0.58	201
	Small	1.61	0.34	80
	Medium	2.14	0.26	37
	Total	1.11	0.73	318

It is evident from Table 3 that MSMEs in plain areas of Uttarakhand contribute to the highest employment generation (M/SD = 1.52/0.46), followed by low employment generation in hilly areas (M/SD=0.27/0.34). Out of the three firm size categories it is seen that medium enterprises have the highest contribution in employment generation in the plain areas (M/SD=2.14/0.26) followed by small enterprises (M/SD=1.67/0.27) in plains and (M/SD=0.96/0.32) in hills. Comparatively least employment is generated by the micro level enterprises both in plain (M/SD=1.20/0.33) and hilly areas (M/SD=0.22/0.29). Hence it can be inferred from the analysis above that the highest employment is generated by the medium enterprises in the plain areas of the state of Uttarakhand.

Table 4: Two-way ANOVA of Employment Generation with Respect to Firm Size Category and Locality of the Firm Tests of Between-Subjects Effects

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	139.551 ^a	4	34.888	391.323	.000
Intercept	147.454	1	147.454	1653.939	.000
Locality	16.351	1	16.351	183.406	.000
Cat_unit	23.954	2	11.977	134.340	.000
locality * Cat_unit	.388	1	.388	4.350	.037
Error	27.905	313	.089		
Total	564.897	318			
Corrected Total	167.456	317			

Dependent Variable: log_emp

Note: Significant at 5% level of significance

The Two-way ANOVA (Table 4) statistically depicts the mean difference significance in employment generation on the basis of firm size category and locality of MSMEs. The table analyzes the study of independent variables; firm size category and the locality on employment generation in view of main effects and interaction effects as follows:

Main effects:

Firm size category: There is a significant difference in employment generation ability of the MSMEs with respect to the independent variable firm size category at 5 percent level, having $p = .000 (< .05)$; hence null hypothesis is rejected.

Table 5: Post hoc Analysis of Employment Generation with Respect to Firm Size Category and Locality of the Firm

Tukey HSD				
(I)Cat_unit	(J) Cat_unit	Mean Difference (I-J)	Std. Error	Sig.
Medium	Micro	1.465109 [*]	.0487766	.000
	Small	.546270 [*]	.0545494	.000
Micro	Medium	-1.465109 [*]	.0487766	.000
	Small	-.918839 [*]	.0367958	.000
Small	Medium	-.546270 [*]	.0545494	.000
	Micro	.918839 [*]	.0367958	.000
The mean difference is significant at the 0.05 level.				

The multiple comparisons in Table 5 displays the p-values for the Tukey post-hoc comparisons between the three different firm size categories. It is evident from the post hoc analysis that there is a significant mean difference between medium and micro units ($I-J/p = 1.47/0.00$) and medium and small units ($I-J/p = 0.55/0.00$) at 5 percent level of significance for employment generation. In both the cases the mean score of medium units is comparatively higher than micro and small units. Table 5 also depicts a significant mean difference between small and micro units for employment generation ($I-J/p = 0.92/0.00$) at 5 percent level. The mean score of small units is comparatively higher than micro units.

Locality: There is a significant difference in employment generation ability of the MSMEs with respect to the independent locality at 5 percent level, having $p = .000 (< .05)$; hence rejecting the null hypothesis.

Interaction effect: There is statistically significant interaction effect between the independent variables firm size category and locality at 5 percent level, having $p = .037 (< .05)$ while deciding employment generation ability of the MSMEs of Uttarakhand.

5.2. Hill-plain dichotomy with regards to investment undertaken by the entrepreneurs in the state of Uttarakhand.

H02: There is no significant association between investment undertaken by the entrepreneurs and locality [hills and plains] in the state of Uttarakhand.

Table 6: Chi-square test for association between Locality and Investment

Locality	Investment					Total	Pearson Chi-Square	df	Asymp. Sig. (2-sided)
	<2.5L	>10L	2.5L-5L	5L-7.5L	7.5L-10L				
Haridwar	0 (0) [0]	215 (100) [96.4]	0 (0) [0]	0 (0) [0]	0 (0) [0]	215 (100) [66.1]	290.552 ^a	4	.000
Pauri	79 (71.8) [100]	8 (7.3) [3.6]	16 (14.6) [100]	4 (3.6) [100]	3 (2.7) [100]	110 (100) [33.9]			
Total	79 (24.3) [100]	223 (68.6) [100]	16 (4.9) [100]	4 (1.2) [100]	3 (1) [100]	325 (100) [100]			

Note: The value within () refers to row percentage

The value within [] refers to column percentage; Significance at .05 level.

The results of cross tabulation between locality and investment undertaken by the entrepreneurs in the state of Uttarakhand is clearly illustrated in Table 6. Based on row percentage, 100 percent of the entrepreneurs in Haridwar had undertaken investment greater than 10lakhs whereas in Pauri 71.8percent entrepreneurs had undertaken investment less than 2.5lakhs followed by 14.6 percent entrepreneurs who had undertaken investment between 2.5L-5L followed by 7.3 percent entrepreneurs who had undertaken investment greater than 10lakhs followed by 3.6 percent entrepreneurs who had undertaken investment between 5L-7.5L followed by 2.7 percent entrepreneurs who had undertaken investment between 7.5L-10L. Hence all the entrepreneurs in Haridwar had undertaken investment greater than 10lakhs and majority entrepreneurs in Pauri had undertaken investment less than 2.5Lakhs. The reason stated by the entrepreneurs for low investment in plain areas was lack of financial support from the financial institutions due to lack of collateral security and various other reasons. Lack of awareness about the various government schemes dedicated for the development of the MSMEs was another pertinent reason that the entrepreneurs were not able to reap benefits for their enterprise. Whereas in the plain areas the entrepreneurs were well aware of the latest schemes available for the MSMEs and had access to all the financial resources available hence could invest in their business.

Since the p value is less than 0.05, it can be stated that the null hypothesis is rejected at 5 percent level of significance. Hence, confirming that locality and investment undertaken by the entrepreneurs is associated with each other.

5.31. Hill-plain dichotomy with regards to challenges faced by the entrepreneurs in the state of Uttarakhand.

Due to the presence of abundant untapped natural resources at the disposal of the state of Uttarakhand, the MSME sector has huge potential in the overall socio-economic development of the state. These resources can be effectively put to use by the MSME sector to create sustainable form of livelihood especially for the people residing in the hills. Despite the abundant advantages that the state enjoys, it is observed that the MSME sector is not able to perform up to its capabilities due to various challenges faced by it. Some of the serious challenges faced by the sector in the state are lack of adequate

capital, dearth of skilled labour, insufficient infrastructural facilities, absence of proper market information, unavailability of high quality of inputs etc. This section of the paper has made an attempt to examine the challenges that hinder the growth of MSMEs in the Pauri and Haridwar districts of Uttarakhand.

For the purpose of the study five broad challenges i.e., financial, raw material, marketing, infrastructural and labour have been identified and to measure each challenge 4 four statements/variables under each challenge has been considered and respondents were asked to rate on 5-point rating scale ranging from 1- strongly disagree, 2- disagree, 3- neutral, 4- agree to 5- strongly agree.

In order to study the financial challenges faced by the entrepreneurs in hills and plains four statements/variables namely (i) too much paperwork, (ii) lack of collateral, (iii) high rate of interest and (iv) bank attitude have been considered. The recorded responses for each variable were summed up to get an average.

Raw material challenge was measured with four statements/variables namely (i) high cost of transportation, (ii) unavailability of transport, (iii) delay in procurement and (iv) irregular supply and an average were obtained.

The marketing challenge was measured with four statements/variables namely (i) insufficient demand, (ii) competition, (iii) lack of skills and (iv) budget constraint and an average were obtained.

In order to study the infrastructural challenges faced by the entrepreneurs in hills and plains four statements/variables namely (i) insufficient power supply, (ii) insufficient water supply, (iii) bad roads and (iv) poor drainage have been considered. The recorded responses for each variable were summed up to get an average.

In order to study the labour challenges faced by the entrepreneurs in hills and plains four statements/variables namely (i) lack of skilled labour,(ii) high rate of labour absenteeism, (iii) high cost of labour and (iv) low productivity of labour have been considered. The recorded responses for each variable were summed up to get an average.

On summing up the responses of each item an average for each challenge was obtained for both Pauri and Haridwar after which the Cronbach's alpha test was applied in SPSS to check if the challenges were consistent internally. Cronbach's alpha values for both Pauri and Haridwar are

Table 7 Reliability Statistics

Cronbach's Alpha for Haridwar	Cronbach's Alpha for Pauri	No. of Items
.750	.778	5

Cronbach's alpha value of greater than 0.7 for both Pauri and Haridwar indicated a high level of consistency/reliability of the scale. After checking for the reliability of the scale, the hypothesis (H03) given below was tested.

H03: There is no significant difference in the mean rank of challenges faced by MSMEs entrepreneurs in the Pauri district of Uttarakhand.

Friedman test was conducted in SPSS to test (H03) hypothesis. Since Friedman test is a non-parametric test which does not require to fulfil the assumption of normality, the test was conducted and following output table was obtained:

Table 8 Friedman test

Challenges faced by MSMEs	Mean Rank	Chi-Square value	p-value
Financial challenges	4.83	362.45	0.000**
Raw material challenges	2.55		
Marketing challenges	4.16		
Infrastructure challenges	1.87		
Labour challenges	1.59		

Note: **denotes significant at 1% level

The p value of less than 0.01 as shown in table 8 indicates the rejection of null hypothesis at 1% level of significance. Thereby concluding that there exists significant difference among mean ranks for the challenges faced by MSME entrepreneurs in Pauri. Based on mean rank, 'financial challenge' (4.83) was the most important challenge faced by the MSME entrepreneurs in Pauri followed by 'marketing challenge' (4.16), 'raw material challenge' (2.55), 'infrastructural challenge' (1.87) and 'labour challenge' (1.59). Due to all these challenges faced by MSMEs in the hills, the growth potential of these enterprises are hampered. The sampled entrepreneurs in Pauri revealed that lengthy paperwork and the negative attitude of the banks towards them were important reasons for not able to avail adequate finance for the growth of their business. Also low demand for their product due to high competition from the firms in the plain areas was an important problem faced by them. Low demand for their products forced the entrepreneurs to shut down their business and migrate to plain areas in search of jobs. Another major problem stated by the entrepreneurs was bad roads in the hills leading to delayed and irregular supply of raw materials. Likewise the challenges faced by the entrepreneurs in the Haridwar district were analysed. The hypothesis for the same is given below:

H04: There is no significant difference in the mean rank of challenges faced by MSMEs entrepreneurs in the Haridwar district of Uttarakhand.

The above hypothesis was tested using the Friedman test. The following output was obtained:

Table 9: Results of Friedman test

Challenges faced by MSMEs	Mean Rank	Chi-Square value	p-value
Financial challenges	2.91	466.603	0.000**
Raw material challenge	1.40		
Marketing challenges	3.58		
Infrastructural challenges	2.66		
Labour challenges	4.46		

Note: **denotes significant at 1% level

The p value of less than 0.01 as shown in table 9 indicates the rejection of null hypothesis at 1% level of significance. Thereby concluding that there exists significant difference among mean ranks for the challenges faced by MSME entrepreneurs in Haridwar. Based on mean rank, 'labour challenge' (4.46) was the most important challenge faced by the MSME entrepreneurs in Haridwar followed by 'marketing challenge' (3.58), 'financial challenge' (2.91), 'infrastructural challenge' (2.66) and 'raw material challenge' (1.40). Lack of skilled labour and the high rate of labour absenteeism were stated to be the most common problems faced by the entrepreneurs in Haridwar. Competition from big firms was another hurdle faced by these entrepreneurs.

From the above analysis of the challenges faced by both hill and plain districts it could be inferred that though obtaining adequate finance was the biggest challenge for the MSME entrepreneurs in the hills due to reasons like lack of collateral, cumbersome paperwork, high rate of interest, negative attitude of the banks and so on, the case was not the same for entrepreneurs in the plain areas. Entrepreneurs in the plain areas did not face much difficulty in obtaining finance but the most important problem that they faced was lack of skilled labour resulting in low productivity and hence slow business growth. Thus, it can be stated that although MSMEs in both hill and plain areas face challenges, the nature of problems faced by the entrepreneurs differs on the basis of locality.

6. RECOMMENDATIONS

The MSME sector certainly has high potential to write the growth story of the developing state of Uttarakhand, for which the need is to focus on the development of this sector so that the MSME sector can perform better and hence reduce the hill-plain dichotomy currently existing with respect to various aspects of MSMEs in Uttarakhand. A few recommendations by the researcher have been mentioned below.

- As observed by the researcher during the field research, an important obstacle in the development pathways of MSMEs in the hills was lack of good infrastructural facilities. Therefore, the researcher recommends the need of government support to reduce the regional disparity by developing required infrastructure in the hills like proper roads, regular water and electricity supply, proper telecom facility etc. The government can also promote private investment in the hills by providing the entrepreneurs with different kinds of incentives and subsidies.
- An important pre-requisite for a business to grow is timely and adequate access to finance. In Uttarakhand it was observed by the researcher that the entrepreneurs in the hills were not able to get

adequate finance from the different financial institutions. Meaning thereby that hill-plain dichotomy was observed by the researcher in terms of financial institutional support. Thus, the researcher has recommended that gap in the financial institutional support can be reduced by proper expansion of bank branches in the hill areas along with banks achieving 100 percent credit requirements of the entrepreneurs in the hills. Many entrepreneurs in the hills also complained of the lengthy paperwork that they had to go through in procuring finance because of which many of them refrained themselves from procuring finance from the financial institutions and thus depended on finance from other informal sources like friends and family. The researcher thus suggests that the paperwork can be reduced, and easy loans can be provided with no interest.

- Lack of managerial skills was another important barrier faced by the MSME entrepreneurs in the hills. It was observed by the researcher that the entrepreneurs lacked awareness about the changing market demand. Thus, the researcher recommended that an important step in this regard be taken by the government where it can introduce different skill development training programmes and make them all compulsory for the entrepreneurs to attend. Also, in order to get an idea about the existing market demands, the entrepreneurs can try to establish direct contact with the consumers (both industrial as well as end consumers).
- Marketing of product came across as a major impediment for the MSME entrepreneurs in the hills. The entrepreneurs were of the opinion that stiff competition, inadequate demand for their product as well as lack of proper marketing channel were the key issues faced by them in marketing their product. Hence the researcher suggests that the government here can play a pivot role in helping the entrepreneurs in marketing their product. This can be done by extending marketing support to the entrepreneurs by organizing exhibition, trade fairs, haats etc. in the state. Along with this the MSME entrepreneurs can be provided marketing assistance by the government. The government can also promote active participation of entrepreneurs in international exhibitions and trade fairs so as to boost their competitive spirit as well as make them aware of the market demand at the global level.
- Since high cost of transportation was another serious problem faced by the entrepreneurs especially in the hills therefore the researcher recommended that fuel subsidy can be given by the government which would also help in reducing the expenses of the

entrepreneurs.

- As observed by the researcher, dearth of skilled manpower was an important cause of concern in the state. Hence the researcher suggested that the government, in order to boost employment opportunities and entrepreneurship in the state, organize compulsory and regular skill development and capacity building programmes.

7. CONCLUSION

With the aim of bringing out the intra state disparities existing in the MSME sector in the state of Uttarakhand, the research was carried out in a total of 325 MSME units in the state. The Himalayan state is majorly divided into hill and plain districts therefore to bring out the hill-plain dichotomy in context of the MSME sector, the study was conducted in one plain district (Haridwar) and one Hill district (Pauri). The disparity within the state with respect to employment generation and investment in MSME sector was studied by the researcher. A two-way ANOVA test was conducted in order to determine if locality (hill and plain) and firm size category (micro, small, medium) had a significant effect on employment generation as well as to determine if there is an interaction effect between the two independent variables (locality and firm size category) on the dependent variable (employment generation). The findings of the test unveiled that locality and firm size category both had a statistically significant effect on employment generation. MSMEs in the plain areas generated more employment than MSMEs located in the hilly areas. Further, the findings of the Tukey's test for multiple comparisons stated that medium enterprises generated more employment followed by small and micro enterprises. Also, statistically significant interaction effect was found between locality and firm size category on employment generation. Hence it can be stated that there exists hill-plain dichotomy with respect to employment generation in the state of Uttarakhand. MSMEs in the plain areas provide better employment opportunities. This may be one of the pertinent reasons for out migration from the hill areas to the plain areas in Uttarakhand. A Chi-square test was performed to find out if there was any association between locality and level of investment undertaken by the entrepreneurs. The test findings unveiled the hill-plain dichotomy that persisted with respect to investment in the state of Uttarakhand. More investment was undertaken by the entrepreneurs in the plain areas may be due to better financial access as compared to hill areas. However other potential reasons for this hill plain dichotomy may be terrain constraints and thus availability of raw materials, lack of skilled labour due to large scale out migration. There is a huge need on the part of the government to ensure that the hill community feels encouraged to start

MSMEs in the hills otherwise the very purpose of curving out this state from Uttar Pradesh largely on the grounds of hill development in the year 2000 will get diluted. The researcher suggests that in order to enhance the productivity of MSMEs in the hills, the government can work towards providing infrastructure facilities in terms of better road connectivity, adequate power and water supply, good telecom facilities, proper drainage system, good health care institutes as well as good schools so that out-migration from the hills can be reduced. Along with this the government can provide self-employment opportunities to people in hilly areas through various schemes. Since the entrepreneurs in the hills are not very much aware of the ongoing government schemes and the benefits that they can accrue from those schemes, therefore the government can take important steps to create awareness among the entrepreneurs about the same. It has already been twenty-two years that this state has been formed and establishment of more and more MSME and regular monitoring of their health can act as a savior for this hill state by not only helping in employment generation but also by having various spillover effects.

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From Objectives to Outcomes: The Role of Workforce Diversity in Enhancing Organisational Performance

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ABSTRACT

This paper examines the growing importance of diversity in Indian businesses, emphasizing the need for fair and equitable work environments. As organizations increasingly recognize the value of diverse talent pools, the study explores various dimensions of workforce diversity, including gender identity, generational differences, and socioeconomic status. It argues that businesses must move beyond tokenistic approaches to diversity, advocating for meaningful initiatives that foster genuine inclusivity and support employees. The research emphasizes the role of transparent DEI goals and the engagement of diversity professionals in driving effective diversity initiatives. By prioritizing these efforts, companies can enhance their organizational culture, improve employee well-being, and ultimately achieve better performance outcomes. This study underscores that embracing diversity is not merely a compliance issue but a strategic advantage that can lead to innovation and creativity in the workplace. As businesses navigate an increasingly complex global landscape, the integration of diverse perspectives will be crucial for fostering a competitive edge and ensuring long-term success. Through a comprehensive understanding of workforce diversity, organizations can create environments where all employees feel valued and empowered to contribute their unique insights. The study findings suggest that effective diversity management, addressing challenges and issues, will enhance organizational performance and benefit the organization.

Keywords: Inclusivity, Bias Mitigation, Workforce Diversity Management (WDM), Diversity Equity & Inclusion (DEI).

1. Introduction

In recent years, diversity and inclusion have gained significant traction among Indian businesses as more of them seek to create fair work environments. Diversity makes business sense because it opens up access to new talent pools, experts said (Shefali Anand, 2022). DEI began in the 1960s with equal employment laws and affirmative action to address workplace discrimination, evolving to include gender diversity education by the 1970s-1980s (By Hellen Golden, 2024). Diversity is essential, impacting both company operations and employer branding. A Culture Amp poll shows 85% of HR and DEI professionals believe their company fosters diversity and inclusion (Nicole Schreiber-Shearer, 2023). At the SHRM India Annual Conference 2021, experts highlighted the shift toward a "bottoms-up approach" for diversity initiatives, promoting inclusion across gender, cultural, linguistic, socioeconomic, and physical abilities. With 1.4 billion people and over 450 languages, diversity in India also involves embracing varied sexual orientations (Shefali Anand, 2022). Workplace diversity encompasses inherent traits like race and gender, along with acquired

aspects such as culture and education, driving innovation, growth, and a strong company culture. (Coursera, 2024). Workplace diversity encompasses various backgrounds, genders, and cultures, fostering inclusivity. It includes four types: Internal Diversity (traits like gender and ethnicity), External Diversity (life experiences), Organizational Diversity (job roles and seniority), and Worldview Diversity (political and cultural perspectives). Together, these categories cultivate a forward-thinking environment where everyone feels valued. (Allaya Cooks-Campbell, 2023).

2. Objectives of The Study

1. To scrutinize and describe the concept of workforce diversity while highlighting various workforce diversity practices.
2. To inquire into the recent trends of workforce diversity.
3. To appraise how workplace diversity influences productivity and drives innovation, creativity, and problem-solving.
4. To project the process of change management in diversity (WDM).

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3. Concept of Workforce Diversity

3.1. Workforce

The term "workforce" encompasses all individuals working within an organization or sector, regardless of their employment status or level. A workforce refers to the group of employed individuals, often within a specific company or industry, but it can also describe workers in a city, state, or country. Internally, it's known as the "Workforce in Place. Workforce management involves strategically optimizing performance and productivity to meet organizational goals, aligning employees with operational demands and compliance requirements. (Time Champ, 2024)

3.2. Diversity

In today's globalized world, diversity plays a key role in society, workplaces, and education. It involves recognizing and valuing differences in aspects like gender, age, ethnicity, religion, sexual orientation, and abilities. Gardenswartz and Rowe's "4 Layers of Diversity" model describes diversity through four key dimensions: personality, internal factors, external influences, and organizational aspects. Embracing diversity encourages creativity and innovation by merging varied perspectives, resulting in better problem-solving and team satisfaction. Managing diversity effectively fosters inclusivity, combats discrimination, and promotes equal opportunities, boosting both social cohesion and organizational success. (Wayra Germany, 2021).

3.3. Workforce Diversity

Workforce diversity refers to the differences and similarities among employees in aspects like age, culture, abilities, race, religion, gender, and sexual orientation. People differ not only in these characteristics but also in their perspectives and biases. Historically, society has discriminated based on these differences. Diversity creates a heterogeneous workforce, and while hiring a diverse team is essential for organizations today, managing such diversity poses a significant challenge for management. (Ankita Saxena, 2014). HR professionals encounter challenges in managing workplace diversity, which can be mitigated by promoting inclusivity through tolerance, open communication, and conflict resolution strategies. Leaders must be self-aware of their backgrounds and recognize how their perspectives influence decision-making in diverse environments. Cultivating a culture of respect and inclusion fosters collaboration, ensures representation, and creates a workplace where employees feel valued and motivated to contribute effectively. A diverse workforce can have a positive impact on several aspects of an organization, including:

- The organizational culture and work environment
- Financial performance and profitability

- Business strategy and decision-making processes
- External perceptions and stakeholder opinions (Rachna Kumar, 2024).

4. Workforce Diversity Practices

To understand diversity more fully, it's crucial to identify the different factors that contribute to it—some are easily observable, while others are innate characteristics individuals possess from birth. These differences lay the groundwork for the establishment of four diversity categories. A useful approach to conceptualize these four types of diversity is as dimensions or classifications, each encompassing a variety of relevant subcategories:

4.1. Internal Diversity

Internal diversity refers to characteristics that individuals are born with and cannot change or choose. These traits are inherent and shape a person's identity. This includes:

- **Race:** A social construct lacking a biological or scientific basis that categorizes people by appearance, heritage, culture, and societal needs.
- **Ethnicity:** Refers to cultural practices, perspectives, and distinctions that differentiate groups, typically based on culture, religion, language, origin, and heritage.
- **Age:** Age diversity refers to embracing and valuing individuals of all ages, promoting equal opportunities regardless of age. (Adam Wyatt, 2023)
- **National origin:** National origin refers to the country where a person was born or where their ancestors originated.
- **Sexual orientation:** Sexual orientation is a person's lasting attraction to others, independent of gender identity. Transgender individuals can have any sexual orientation.
- **Cultural identity:** Cultural identities are shaped by factors like sexuality, gender, religion, and ethnicity, and are often inherited, making them largely involuntary.
- **Assigned sex:** A baby's sex is determined or assigned based on the appearance of external reproductive organs and sometimes through chromosomal testing.
- **Gender identity:** Gender identity refers to an individual's internal understanding of themselves as male, female, or another gender, which may not align with their biological sex. Sexual orientation involves enduring attraction to men, women, or both. (J Neuroendocrinol, 2018).
- **Physical ability:** Physical capability encompasses anatomical, physiological, biochemical, and psychological factors influencing motor skills and

movement control for executing physical tasks. (SCISPACE, 2024)

- **Mental ability:** Mental ability is shown through intelligent behavior, enabling observation, understanding, learning, thinking, memory, and effective problem-solving.

Alongside racial, age, and cultural diversity, physical and mental disabilities are key aspects of internal diversity. Companies support this by offering accommodations and inclusion training, creating a more inclusive workforce.

4.2. External Diversity

External diversity encompasses traits shaped by environment, experiences, and choices, including socioeconomic background, education, cultural exposure, and beliefs that evolve over time. Unlike inherent internal diversity, these factors offer unique perspectives and skills that enrich workplace culture. Embracing external diversity fosters innovation, inclusivity, and a deeper understanding of diverse viewpoints, ultimately improving team dynamics and enhancing problem-solving abilities. Some examples of external diversity include:

- **Personal interests:** Personal interests refer to the specific activities, events, or subjects that capture an individual's focus and attention. (ScienceDirect, 2019)
- **Education:** Education imparts knowledge, skills, and character traits, occurring in various forms. Formal education takes place in structured institutions, like public schools, and follows a set curriculum.
- **Appearance:** Appearance encompasses all visual qualities that define objects, including color, gloss, shape, texture, shine, haze, and translucency. (Richard W. Harold, 2001)
- **Citizenship:** A citizen actively participates in a political community, gaining rights through legal requirements and fulfilling obligations like obeying laws.
- **Religious beliefs:** Religious beliefs are the principles and accepted doctrines of a particular faith.
- **Location:** A position or location that is occupied or available, characterized by a specific distinguishing feature.
- **Familial status:** Familial status includes households with individuals under 18, covering biological or legal parents, authorized caregivers, pregnant individuals, and those seeking custody of minors.
- **Relationship status:** Relationship status refers to an individual's actual or perceived involvement in a legal, intimate relationship, including romantic

connections between consenting adults.

- **Socioeconomic status:** Socioeconomic status (SES) includes income, educational achievement, occupational prestige, and personal perceptions of social status and class.
- **Life experiences:** A life experience is an event or situation that a person encounters, significantly influencing their life.

4.3. Organisational Diversity

Organizational or functional diversity refers to differences in employee roles and identities assigned by the organization, influencing each individual's connection to the workplace. This diversity spans various sectors and enhances collaboration, reflecting the range of contributions within both small and large teams. There are various subsets, including:

- **Job function:** A job function refers to the activities or tasks an individual performs as part of their role within an organization.
- **Place of work:** A workplace is a location where individuals carry out tasks, jobs, and projects for their employer.
- **Management status:** Management status refers to an individual's position based on their past, present, or future role as a director, officer, manager, or board member of any company.
- **Employment status:** Employment status describes the relationship of a current or former employee with the organization where they work.
- **Pay type:** A pay type represents a blend of workplace policies, such as an "hourly" pay type, including overtime, vacation, and sick pay, excluding holiday pay.
- **Seniority:** Seniority is a preferred status determined by the length of continuous employment with a company.
- **Union affiliation:** A union affiliation refers to a relationship between two trade unions or between a union and another organization.

4.4. Worldview Diversity

Worldview diversity reflects the unique perspectives individuals hold, shaped by internal, external, and organizational influences. As people gain new experiences and insights, their worldviews evolve, enriching their understanding of others and the world around them. Though there are subtleties within each worldview, some examples include:

- **Political beliefs:** Political beliefs are an individual's expressed opinions on social, economic, and

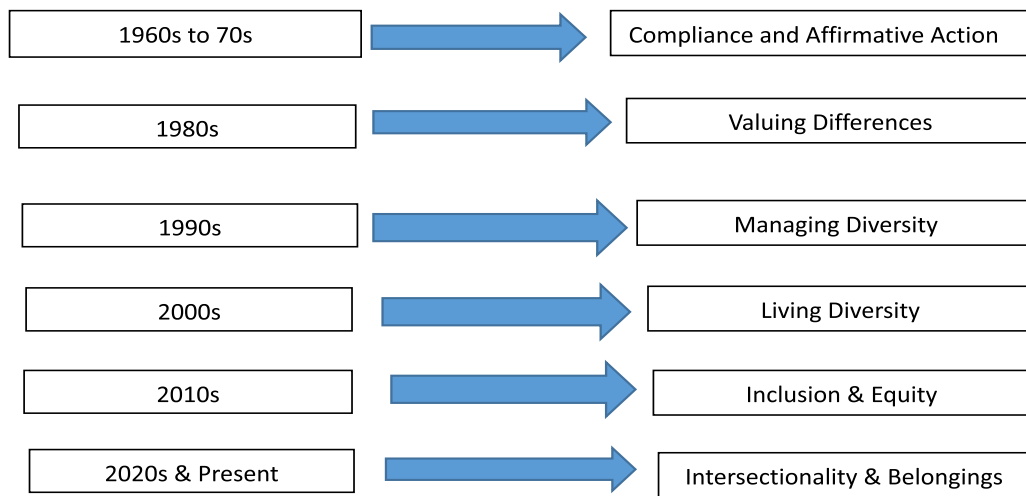
governmental structures, encompassing all lawful beliefs.

- **Moral compass:** A collection of principles or values that inform ethical decisions, judgments, and actions.
- **Outlook on life:** An individual's perspective or overall outlook on life.
- **Epistemology:** Epistemology, often referred to as the theory of knowledge, is the philosophical exploration of knowledge, investigating its nature and the different types it encompasses. (Rachna Kumar, 2024)

4.5. Workforce Diversity Management

Managing workforce diversity enables employees from varied backgrounds to contribute fully, fostering innovation and creativity. Diverse perspectives enhance

problem-solving, improve decision-making, and support organizational goals. Inclusivity drives engagement, growth, and innovation by encouraging unique ideas and understanding diverse markets (Forbs, 2024). Workforce diversity, though often seen as a challenge due to ingrained biases, can significantly enhance organizational productivity if managed effectively. (Ankita Saxena, 2014). The relationship between diversity and creativity across individual, team, and organizational levels calls for more dynamic, cross-level research to deepen the understanding of how various diversity attributes influence creativity. (Andreas Hunschell et al., 2021). Managing diversity has been challenging employers for decades, but especially in the last 20 years, companies have started to realize differences in gender, race, ethnicity, sexual orientation, religion, age, and other factors more.



The 1960s and 70s primarily focused on providing access to the system. The 1980s emphasized "valuing differences," while the 1990s shifted towards "managing diversity." In the 21st century, schools and corporations need to focus on "living diversity". The 2010s emphasize not just representation but also creating a sense of belonging and ensuring equitable opportunities for all employees. The 2020s focus on understanding and addressing the complex experiences of individuals with intersecting identities as well as fostering a culture of belonging for everyone.

5. Strategies for Managing Workplace Diversity

Creating a diverse workplace involves several key strategies. First, effective communication is essential; organizations should implement accessible policies that use translations and visuals to bridge language and

cultural gaps. It's important to view each employee as an individual, avoiding generalizations and evaluating them based on their unique merits and achievements rather than their background. Encouraging diverse teams can help dispel stereotypes and foster personal connections, enhancing appreciation for different perspectives. Additionally, organizations should establish objective standards that apply equally to all employees, ensuring fair treatment in all employment actions. Keeping an open mind is vital, as it encourages leaders and employees to recognize that various experiences and backgrounds contribute valuable perspectives. Finally, unbiased recruitment and hiring practices should focus on qualifications and skills to build a capable and varied team. Together, these strategies contribute to effectively managing diversity and fostering a more inclusive, cohesive, and productive work environment.

6. Recent Trends of Workforce Diversity

Employers are increasingly predicting D&I trends shaped by recent events, aiming to create equitable, inclusive environments that value diverse identities in 2024.

1. A changing workforce that works remotely: The COVID-19 pandemic accelerated the adoption of remote work, with 25-30% of the U.S. workforce expected to continue by 2023. Leaders must tackle challenges like work-life balance, health service access, and inadequate workspaces to support this model effectively.
2. Allowing for a range of gender expression and identity: Increasing awareness of diverse gender identities has prompted organizations to adopt inclusive practices, including gender-neutral restrooms, health benefits for transitioning employees, and the promotion of inclusive language for non-binary and transgender individuals.
3. Workforce spanning several generations: The workforce is more diverse than ever, spanning five generations: The Silent Generation (1928-45), Baby Boomers (1946-64), Generation X (1965-80), Millennials (1981-96), and Generation Z (1997 onward). Each group brings unique experiences, expectations, and skills. Employers and leaders must recognize these differences and adopt tailored strategies to engage and celebrate all generations effectively.
4. Getting rid of unconscious prejudice at work: Unconscious bias entails making decisions influenced by deep-seated prejudices, impacting workplace relationships. Leaders must proactively tackle and reduce these biases to foster an inclusive workforce.
5. Getting Ready for Systematic Reform: The events of 2020, revealed profound systemic injustices. Organizations must implement substantial changes to address discrimination and create a safe, inclusive environment, with leaders spearheading these initiatives.
6. Fairness, inclusivity, and diversity: Many workplaces prioritize DEI-diversity, equity, and inclusion. Equity focuses on fair processes and outcomes, recognizing that not everyone has the same starting point. Leaders must confront the challenges employees encounter to foster a fair and inclusive environment.
7. Employing experts in diversity: 'Diversity Professionals' are essential in workplaces, leading diversity and inclusion initiatives. They conduct training, cultivate inclusive cultures, advocate for inclusive language, and address discrimination issues. The demand for

these roles is anticipated to rise significantly this year.

8. Enhanced clarity in objectives Diversity alone does not guarantee equity and inclusion: In 2024, companies will emphasize establishing transparent D&I goals, fostering accountability, promoting open dialogue between leaders and employees, and encouraging collaborative solutions for inclusivity.
9. Assisting with the mental health of employees: The global pandemic significantly impacted employees' mental health, leading to greater discussions on well-being. In 2024, organizations will prioritize intentional support for the mental health of diverse talent, emphasizing effective policies and fostering empathetic communication among supervisors and coworkers.
10. Seeing past tokenism Diversity and inclusion go beyond token hires: In 2024, organizations must adopt meaningful D&I initiatives. Merely acknowledging events like Ramadan is insufficient; employers and HR professionals should empathize with employees observing the fast and actively support their cultural practices. (Vantage, 2024)

7. Key Eminent Researches

Astrid Podsiadlowski et. al (2012) designated the research as "Managing a culturally diverse workforce: Diversity perspectives in organizations". The studies explored how organizations perceived and managed diversity, identifying five diversity perspectives-Reinforcing Homogeneity, Color-Blind, Access, Fairness, and Integration and Learning. Study 1 found Access as dominant, while Study 2 highlighted Reinforcing Homogeneity, indicating a methodological bias. Both studies validated the DPQ tool and emphasized aligning diversity strategies with business goals for effective management.

Shatrughan Yadav and Usha Lenka(2020) designated the research as "Workforcediversity: from a literature review to future research agenda". This study conducted a systematic literature review on workforce diversity, analyzing research from 13 leading management journals (1990-2019). It revealed mixed and inconsistent findings, with most studies failing to address specific diversity dimensions. The study identified reasons for these inconsistencies, proposed a future research agenda, and offered a theoretical framework to enhance diversity management strategies.

Subhash C. Kundu et. al (2015) designated the research as "Managing Workforce Diversity Through HR Practices: A Review".The study found that effective diversity management positively influenced performance at

individual, group, and organizational levels. It highlighted the importance of top management's commitment and HR managers' role in fostering a supportive culture. Key HR practices-such as diversity training, support groups, audits, and work-life balance-acted as mediators, enhancing the link between workforce diversity and performance outcomes.

Lang Sanyang and Khatijah Othman (2019) designated the research as "WORK FORCE DIVERSITY AND ITS IMPACT ON ORGANISATIONAL PERFORMANCE". The study found that, despite mixed results, most scholars reported a positive relationship between workforce diversity factors (such as generational, gender, ethnic/racial, and educational diversity) and organizational performance. However, researchers agreed that managing a diverse workforce posed challenges, influencing whether diversity led to positive or negative outcomes.

Collins Reuben GAUNYA(2015) designated research as "Effect of Workforce Diversity Management on Employee Performance in the Public Sector in Kenya" The study found a statistically significant positive relationship between educational diversity and employee performance, while age diversity showed a statistically weak relationship with performance. A case study design was used, involving 190 participants from Kenya's Probation and Aftercare Services, with data analyzed through descriptive and inferential statistics. The study concluded that embracing workforce diversity, particularly educational diversity, could enhance employee performance in Kenya's public sector.

Quinetta M. Roberson (2019) designated the research as "Diversity in the Workplace: A Review, Synthesis, and Future Research Agenda" The study found that while significant progress was made in understanding workforce diversity across industrial and organizational psychology, human resource management, and organizational behavior, further research opportunities remained. The review utilized an analytical approach to examine existing literature. It concluded that advancing diversity research requires improving conceptualizations, methodologies, theoretical approaches, and practical applications to better understand and manage diversity in organizations.

Evelyn Mathuki and Jian Zhang (2022) designated the research as "Cognitive diversity, creativity and team effectiveness: the mediations of inclusion and knowledge sharing" The study found that cognitive diversity positively influenced team effectiveness but not creativity, except when mediated by enhanced inclusion and knowledge sharing. Using a quantitative method, data were collected from 391 participants in a China-based food company. It

concluded that fostering inclusion and knowledge sharing enhances the benefits of cognitive diversity.

Ongori Henry and Agolla J. Evans (2007) designated research as "Critical review of literature on workforce diversity" The study found that an organization's approach to managing diversity, not diversity itself, determined its positive or negative outcomes. It used a conceptual analysis of existing literature. The study concluded that organizations must implement strategies to value and utilize workforce diversity, as fostering an inclusive environment enhances competitiveness and supports long-term organizational survival and success.

Jasem M H J Alshemmari et. al (2024) designated the research as "Analyzing The Relationship Between Workplace Diversity and Innovation and Its Influence on Organizational Performance" The study found a significant positive relationship between workplace diversity and innovation, which enhanced organizational performance. Using a survey of 294 managers in the Kuwaiti banking sector and regression analysis, it concluded that diversity factors like socioeconomic status and religion foster innovation, emphasizing the importance of managing diversity for competitive advantage.

Parul Dixit (2015) designated the research as "Managing Workforce Diversity in Competitive Environment" The study found that effective diversity management improved organizational competitive advantage through innovation, better decision-making, and employee productivity. Using a survey of multinational companies in India, it concluded that while organizations prioritized women's advancement, areas like LGBT inclusion and PWDs remained underrepresented, highlighting the need for broader, fairer diversity practices.

Ankita Saxena(2014) designated research as "Workforce Diversity: A Key to Improve Productivity" The study found that effective diversity management increased organizational productivity and competitive advantage through innovation and better decision-making. Using literature reviews and surveys, it concluded that while organizations recognized diversity's value, areas like LGBT inclusion and PWDs remained underrepresented, emphasizing the need for fair policies and awareness to manage diversity effectively.

Daeyoun Won et. al (2020) designated research as "Assessing the effects of workforce diversity on project productivity performance for sustainable workplace in the construction industry" The study found that workforce diversity positively impacted project productivity performance (PPP) in the construction industry, especially through efficient decision-making and addressing skilled labor shortages. Using a literature review, expert

validation, and a survey of 58 Singaporean firms, it concluded that managing key diversity factors enhances productivity and promotes workplace sustainability.

Silda Nikaj et. al (2018) designated research as "Examining trends in the diversity of the U.S. National Institutes of Health participating and funded workforce" The study found that from 2009 to 2016, NIH-funded scientists increased by 2-5% annually, primarily benefiting experienced investigators. Despite the 2009 policy for early-stage investigators, their funding share declined. Using NIH data analysis, the study concluded that reduced support for early-career researchers may harm workforce diversity, especially among underrepresented minorities.

8. Limitations

The limitations of DEI initiatives include potential resistance to change within organizational cultures, insufficient training for leaders, and the risk of tokenism. Additionally, measuring the impact of DEI efforts can be challenging, and without genuine commitment, initiatives may fail to produce meaningful, long-lasting change in workplace dynamics.

9. Conclusion

In conclusion, integrating Diversity, Equity, and Inclusion (DEI) into Indian businesses is both a moral imperative and a strategic necessity. As organizations navigate the complexities of a diverse workforce, especially following the COVID-19 pandemic and the transition to remote work, prioritizing meaningful initiatives that promote genuine inclusivity is essential. By addressing mental health concerns and cultivating a culture of empathy, companies can enhance employee well-being and engagement. Additionally, establishing transparent DEI goals and hiring diversity professionals will foster accountability and facilitate systemic change. Embracing diversity as a core value will improve organizational culture and unlock new opportunities for innovation and creativity. Ultimately, organizations that commit to these principles will be better equipped to thrive in a competitive landscape, ensuring that all employees feel valued and empowered to share their unique perspectives. Overall, the studies concluded that effective workforce diversity management enhances organizational performance, creativity, innovation, and competitiveness. However, challenges remain in addressing underrepresented groups, requiring inclusive policies and awareness to maximize diversity's benefits.

10. Future Scope

The future scope of this paper offers several research directions. Future studies can focus on developing advanced metrics to measure the impact of workforce

diversity on organizational performance. Longitudinal research can provide insights into how diversity influences growth and sustainability over time. Comparative studies across industries and countries can reveal unique challenges and best practices. Additionally, exploring the role of emerging technologies in supporting diversity efforts and analyzing the impact of diverse leadership on decision-making can be valuable. Further research can also evaluate the effectiveness of diversity policies and explore strategies to build inclusive workplace cultures.

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Exploring Educational Big Data and Learning Analytics: A Systematic Review of Research (2012–2023)

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ABSTRACT

The integration of data in the contemporary era has significantly influenced different industries, especially education. This has led to the incorporation of technologies like Big Data into education, which entails the processing of substantial volumes of data. The advent of 'education big data' and subsequent utilization of 'learning analytics' have initiated a transformative period in the educational domain. This study presents a thorough bibliometric analysis spanning from 2012 to 2023, aimed at exploring the field of educational big data and learning analytics, a research area that is predominantly underexplored.

Keywords: Learning Analytics, Big Data in Education, Data-Driven Decision-Making, Personalized Learning, Student Performance Analytics

1. Introduction

Over the past decade, the educational landscape has experienced a significant transformation due to the incorporation of big data and learning analytics (Wang, 2016). This transition, commonly termed Industry 4.0, requires a reassessment of higher education programs to accommodate a highly digitized learning environment (Mkrttchian et al., 2021). The notion of big data has its foundation on the substantial rise in the volume, structure, and velocity of data generation (Daniel, 2017). Educators can evaluate and enhance the conventional educational system by utilizing big data (Drigas & Leliopoulos, 2014). Big Data specifically denotes the substantial volume of data produced due to technological advancements and the ongoing activities and interactions of users inside digital environments (Hussain & Cambria, 2018). Additional concepts associated with Big Data include data learning mining or learning analytics. Learning analytics is a concept originating from data mining, referring to the management, processing, and analysis of students' educational data, aimed at enhancing and optimizing the learning process (Liang et al, 2016). Learning analytics is a novel quantitative methodology aimed at enhancing our comprehension of learner behaviors and examining their interaction patterns through the analysis of extensive data sets. This enables the optimization and more efficient management of learning resources through the utilization of data gathered about learners. Enhanced decision-making and improved design of interactive learning systems are other advantages of this technique.

Learning analytics generally concentrates on the analysis and representation of data concerning learners to enhance educational outcomes (Clow, 2013). Users of learning analytics encompass students and intermediaries, such as educational advisors (Aguilar et al, 2014). Recent studies in learning analytics include the examination of student behavior in online learning environments (Brooks, 2014), the predictive modeling of academic results (Teplovs, 2011), and the methodology employed in learning analytics (Suthers, 2011).

Learning environments may be modified and improved based on insights derived from learning analytics data . Consequently, educational big data and learning analytics are significant enablers in improving the structure of the learning environment. The importance of Education Big Data and Learning Analytics is complex. They facilitate tailored learning experiences through the analysis of individual student data, hence improving engagement and understanding. Secondly, they enable the prompt identification of students in distress, facilitating appropriate interventions to avert academic difficulties. Third, universities can enhance educational content through data analysis, ensuring it aligns with learning objectives. Fourth, Learning Analytics facilitates effective resource allocation, optimizing teacher workloads and the utilization of learning materials.

The future objective of Education Big Data and Learning Analytics is to facilitate data-driven decision-making within educational ecosystems. Predictive analytics can anticipate learning trends, enabling proactive tactics to tackle emerging difficulties and promote evidence-based practices.

Ongoing professional development for educators is crucial to harness the capabilities of Education Big Data and Learning Analytics, emphasizing the cultivation of data literacy skills. Moreover, adaptive learning systems modify educational content in response to individual performance, hence improving the efficiency and efficacy of the learning process. Education Big Data and Learning Analytics represent a transition to evidence-based methodologies, aimed at enhancing learning experiences and promoting ongoing improvement in education through interdisciplinary collaboration and perpetual innovation.

Consequently, Big Data and the analysis of interactions among educational agents in virtual environments are emerging as novel solutions to address the deficiencies of the educational system (Picciano, 2012). thereby enhancing productivity, fostering innovation (Sanchez, 2015), and personalizing learning experiences (Dishon, 2017). Consequently, the purpose was established to examine the scientific output, defined as the published publications on Big Data in education in Scopus database.

Data presents inherent concerns and challenges. The concerns mostly pertain to data privacy and security, effective data administration and handling, as well as network traffic optimization and energy efficiency (Yadav & Sharma, 2016). Targeted literature reviews, classifications of solutions, and ideas (Nelson & Olovsson, 2016). exist for these concerns; nonetheless, the issues remain mostly unresolved due to the very dynamic and varied characteristics of big data.

The primary aim of this study is to provide a systematic literature review protocol to comprehensively grasp the big data methodologies utilized in Learning Analytics. We concentrate on the issues and their corresponding solutions in implementing various big data techniques in learning analytics. The anticipated result of the research project is the identification of application domains for the afore mentioned methodologies in learning analytics. We also concentrate on how the issues are tackled and the limitations that persist. We seek to identify prospects for more research in learning analytics within the framework of big data.

In order to address the aforementioned research issues we perform a systematic literature review protocol to gain a thorough understanding of the big data techniques applied to the field of Learning Analytics.

This study reviewed, classified, and synthesized research pertaining to Big Data and Learning Analytics within formal education, guided by the following research questions:

RQ1. Uncovering the distribution of education big data

and learning analytics publications across the years 2012-2023.

RQ2. Identifying the most influential journals and authors contributing to education big data and learning analytics research.

RQ3. Analyzing the significance of countries engaged in the realm of education big data and learning analytics.

To address the identified research issues, we conduct a systematic literature review protocol to achieve a comprehensive understanding of the big data techniques utilized in Learning Analytics.

2. Methodology

The research methodology employed for the study comprised the phases of the search protocol, screening process based on an inclusion-exclusion criterion, and review technique.

2.1. Data Sources

The electronic database Scopus served as the main source of data for this study, which concentrated on reviews, and articles about emerging technologies in education that were published between 2012 and 2023. Systematic retrieval with pre-established search strings and inclusion criteria will be the method of data collecting. In December 2023, the most recent searches were conducted.

2.2. Search Strategy

Since insufficient searches may yield erroneous results, a well-defined literature search method is crucial to improving the quality of theoretical data in systematic literature research. The keywords "education" "big data" "learning analytics" were combined using the 'AND' code.

2.3. Study Selection

To achieve the stated research goals, a set of selection criteria was devised and used for both inclusion and exclusion.

1. All studies published between 2012 and 2023
 2. All selected studies had to be articles.
 3. All selected studies are written in the English language
- were removed based on excluding criteria:

1. Duplicate record studies
2. Unretrieved record studies
3. Unrelated studies

2.4. Data Analysis

The selected works were systematically categorized as part of the data analysis process according to the predetermined objectives of the research. The study intends to identify patterns, trends, and insights about the distribution of Education Big Data & Learning Analytics in prestigious journals, influential authors, and nations

making significant contributions to the field by using tools like Microsoft Excel and bibliometric analysis software.

3. Background and related work

A review of the literature shows the advantages of using big data in higher education, which includes a number of learning analytics components that closely analyze the educational process in order to enhance learning. An additional advantage is the utilization of academic analytics, which modify learning by applying algorithms to different data points. Researchers can find valuable information that can help educational institutions, students, teachers, and researchers in a variety of ways by carefully analyzing big data. Focused course offerings, curriculum creation, student learning outcomes and behavior, tailored learning, enhanced teacher performance, post-educational job options, and better educational research are some of these stakeholder benefits. Armayor & Leonard, (2010) demonstrated that the utilization of big data enables educators to implement modifications and enhancements for curriculum development inside the educational system, shown by the application of data-driven curriculum mapping.

A notable benefit of big data and text mining is the capacity for educational institutions and educators to evaluate student learning outcomes in online education and enhance student performance (Bhardwaj & Pal, 2011). Researchers discovered that the application of educational data mining yielded favorable learning effects (AlShammari et.al, 2013). Data analysis can aid instructors in comprehending the student learning experience about interactions with technology instruments, including e-learning and mobile learning (Hung & Zhang, 2012).

The utilization of big data reveals learning behaviors, impacts adaptive learning, and indicates the level of persistence in the learning process (DiCerbo, 2014). Employing this data demonstrates how to enhance student learning and academic performance by understanding its impact on learner outcomes. Consequently, Learning Analytics empowers educators to evaluate various forms of knowledge and adjust course content accordingly.

Dietz-Uhler et al., (2013) assert that course designers neglect to account for students commencing coursework at varying learning stages and progressing, acquiring, and mastering course abilities at disparate rates. Learning analytics enables the acquisition of pertinent data in real time, its evaluation and integration, and the provision of immediate feedback to each student.

Leveraging data provides an opportunity to improve educator readiness, enabling them to engage more

effectively with students in a contemporary educational setting. Analysts can determine the online behaviors of educators by acquiring data produced from instructors' usage of technology and research tools in online libraries (Xu & Recker, 2012). Consequently, utilizing this information can help identify areas where the instructor must enhance interactions with students in the classroom.

Big data can aid educational system stakeholders in comprehending students' job prospects and assessing student learning programs for occupational alignment (Kostoglou, et al., 2013). This data can enhance instructional planning in a global learning context. It can assist companies in making improved hiring and budgetary decisions for college graduates across many disciplines.

An analysis of the benefits illustrates the advantages of big data in education. Data analysis provides educational stakeholders with a comprehensive overview of the institution's performance, curriculum, faculty, students, and post-graduation employment opportunities. To enable educators and institutions to rectify deficiencies in course offerings, it also equips researchers and academics with the insights necessary to identify the discrepancies between industry and education. Furthermore, the education sector may progress substantially by leveraging big data's ability to provide valuable insights to improve learning processes.

Furthermore, Learning Analytics facilitates education to keep pace with advancements in new technologies and information systems. Thus, stakeholders can have a clearer comprehension of the efficacy of the higher education process through the utilization of Learning Analytics (Grummon, 2009). The implementation of learning analytics can enhance university-level performance evaluation in higher education. It provides higher education institutions, educators, and students with enhanced metrics to evaluate the efficacy of teaching tactics, student engagement in the classroom, and the effectiveness of technology-assisted learning processes.

4. Current state of research in Education Bigdata and Learning Analytics:

4.1. Annual Scientific Production.

Table 1 outlines the annual scientific production of articles in the field of education big data and learning analytics from 2012 to 2023. It reveals a fluctuating trend in publication activity over the specified period. The year 2019 saw the highest scientific production with 10 articles, indicating a peak in research activity during that year.

The subsequent years, 2020 to 2023, witnessed a slight decline in publication output, with 8 articles published in

2020 and 2021, and 4 articles each in 2022 and 2023. This trend suggests variations in research interest and output within the field, which could be attributed to several factors such as funding availability, technological advancements, and evolving research priorities.

Table 1: Annual scientific production of articles

Year	Articles
2012	1
2013	0
2014	0
2015	2
2016	5
2017	6
2018	7
2019	10
2020	8
2021	8
2022	4
2023	4

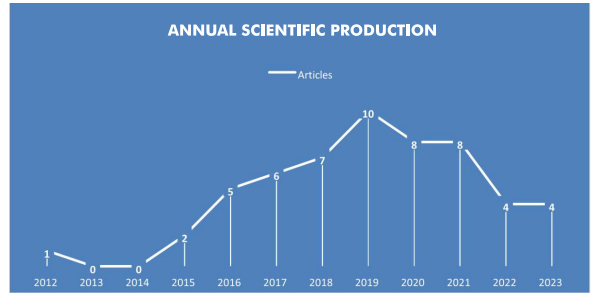


Figure 1: Annual Scientific production of Articles

4.2. Relevant Sources in the field of Education Bigdata and Learning Analytics:

This table identifies the most relevant sources or journals that have published articles in the field of education big data and learning analytics. "Technology, Knowledge and Learning" emerges as the top source with 4 articles, indicating its significant contribution to the dissemination of research in this domain. Journals like "Computers in Human Behavior" and "Indian Journal of Science and Technology" follow closely with 3 and 2 articles respectively, showcasing their prominence in publishing relevant research. Understanding the most relevant sources provides insights into where researchers are choosing to publish their work and the platforms that hold sway in the field.

Table 2: Most relevant sources

Sources	Articles
Technology, knowledge and learning	4
Computers in human behavior	3
Indian journal of science and technology	2
International journal of advanced computer science and applications	2
International journal of emerging technologies in learning	2
Techtrends	2
Artseduca	1
Asian association of open universities journal	1
Behaviour and information technology	1
Big data	1

4.3. Sources' Local Impact.

Table 3 provides a quantitative assessment of the impact of each source i.e. journal within the field based on various metrics such as h-index, g-index, and m-index. The h-index reflects the number of articles that have received at least h citations, offering a measure of the overall impact of a source's publications.

For instance, "Technology, Knowledge and Learning" has an h-index of 4, indicating that it has published at least 4 articles that have been cited at least 4 times each. The g-index and m-index provide further insights into the productivity and influence of sources within the field, offering a comprehensive understanding of their impact on scholarly discourse.

Table 3: Sources' Local Impact.

Element	h_index	g_index	m_index	TC	NP
Technology, knowledge and learning	4	4	0.5	191	4
Computers in human behavior	3	3	0.5	390	3
Indian journal of science and technology	2	2	0.2	13	2
International journal of emerging technologies in learning	2	2	0.286	199	2
Techtrends	2	2	0.2	137	2
Artseduca	1	1	0.5	4	1
Asian association of open universities journal	1	1	0.143	15	1
Behaviour and information technology	1	1	0.143	66	1
Big data	1	1	0.125	43	1
Big data and cognitive computing	1	1	0.143	13	1

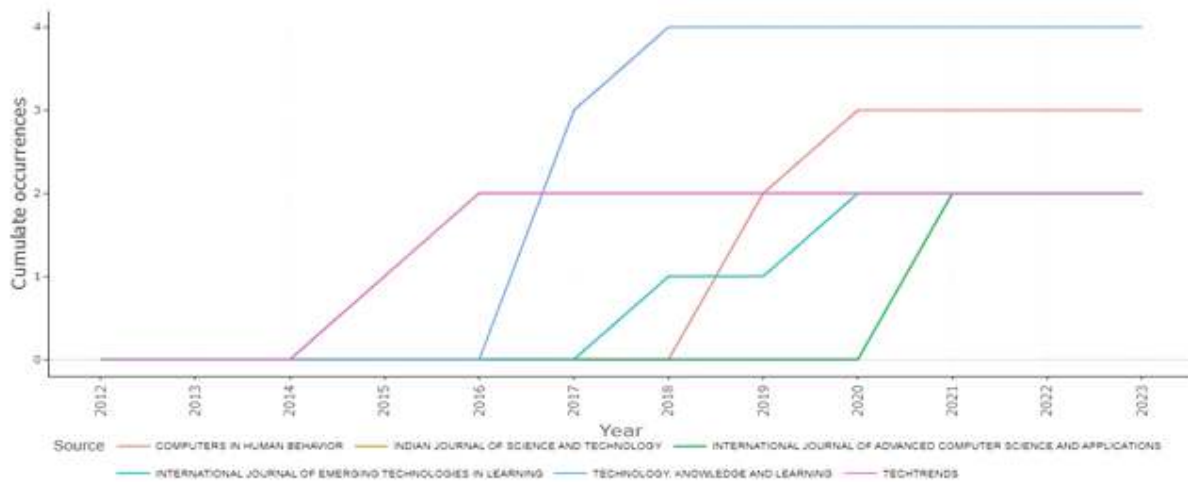


Figure 2: The line graph shows the number of Sources' Local Impact over 10 years.

Table 4: Most Relevant Authors.

Authors	Articles	Articles Fractionalized
Howell ja	3	0.83
Roberts ld	3	0.83
Seaman k	3	0.83
Aljohani nr	2	0.42
Daniel bk	2	0.83
Gibson dc	2	0.50
Hassan s-u	2	0.42
Hue j-p	2	0.67
Liu m	2	0.33
Sedkaoui s	2	1.50

4.5. Author's Local Impact.

Similar to sources, table 5 assesses the impact of individual authors within the field based on metrics such as h-index, g-index, and m-index. These metrics offer insights into the influence and productivity of authors, helping to

identify key contributors and thought leaders within the research community.

For instance, an author with a high h-index indicates that they have published several highly cited articles, thereby

Table 5: Authors' Local Impact

Element	h_index	g_index	m_index	TC	NP	PY_start
Howell ja	3	3	0.333	231	3	2016
Roberts ld	3	3	0.333	231	3	2016
Seaman k	3	3	0.333	231	3	2016
Aljohani nr	2	2	0.286	315	2	2018
Gibson dc	2	2	0.222	151	2	2016
Hassan s-u	2	2	0.286	315	2	2018
Hue j-p	2	2	0.2	13	2	2015
Liu m	2	2	0.25	51	2	2017
Sedkaoui s	2	2	0.286	53	2	2018
Shin s-s	2	2	0.2	13	2	2015

4.6. Most Relevant Affiliation in the field of Education Bigdata and Learning Analytics:

This table lists the affiliations of authors who have contributed significantly to the field, shedding light on the institutional landscape of research in education big data and learning analytics. Institutions such as Curtin University and Nanjing Agricultural University emerge as major contributors, with a notable presence of academic institutions from diverse geographical regions. Understanding the affiliations of influential authors provides insights into the distribution of research expertise and resources across different institutions, highlighting collaborative networks and potential research hubs.

Table 6: Most Relevant Affiliations

Affiliation	Articles
Curtin university	12
Nanjing agricultural university	6
The university of texas at austin	6
Xi'an jiaotong university	6
Information technology university	5
Universidad católica de murcia	5
Universiti teknologi malaysia	5
University of otago	5
Abdul wali khan university mardan	4
City university	4

4.7. Countries Scientific Production.

Table 7 presents the distribution of scientific production by country, offering insights into the global landscape of research activity in education big data and learning analytics.

The USA leads with the highest frequency of scientific production, followed by China, Australia, and the United Arab Emirates. This indicates the distribution of research activity across different countries, highlighting major contributors to the field.

Table 7: Countries' Scientific Production.

Region	Freq
USA	29
China	21
Australia	17
United Arab Emirates	13
Saudi Arabia	11
Pakistan	9
Spain	7
Ecuador	6

4.8 Most influential Documents in the field of Education Bigdata and Learning Analytics:

Table 8 identifies the most cited documents within the field based on metrics such as total citations, citations per year, and normalized TC.

Documents like "PICCIANO AG, 2012, J. ASYNCHRONOUS LEARN. NETW." and "WAHEED H, 2020, COMPUT. HUM. BEHAV." stand out with high total

citation counts and normalized TC, indicating their significant impact and influence within the research community.

Understanding the most globally cited documents provides insights into seminal works and key research findings that have shaped the trajectory of research in education big data and learning analytics, thus guiding future scholarship and inquiry.

Table 8: Most Global Cited Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
The evolution of big data and learning analytics in American higher education. <i>Journal of asynchronous learning networks</i> , 16(3), 9-20. (Picciano, 2012).	10.24059/olj.v16i3.267	284	21.85	1.00
Predicting academic performance of students from VLE big data using deep learning models. <i>Computers in Human behavior</i> , 104, 106189. (Waheed et al., 2020).	10.1016/j.chb.2019.106189	249	49.80	6.19
Big data emerging technology: insights into innovative environment for online learning resources. <i>International Journal of Emerging Technologies in Learning (IJET)</i> , 13(1), 23-36. (Huda et al., 2018).	10.3991/ijet.v13i01.6990	186	26.57	3.15
Analysis of student behavior in learning management systems through a Big Data framework. <i>Future Generation Computer Systems</i> , 90, 262-272. (Cantabella et al., 2019).	10.1016/j.future.2018.08.003	102	17.00	2.41
Student attitudes toward learning analytics in higher education: "The fitbit version of the learning world". <i>Frontiers in psychology</i> , 7, 1959. (Roberts et al., 2016).	10.3389/fpsyg.2016.01959	88	9.78	2.16
The skinny on big data in education: Learning analytics simplified. <i>TechTrends</i> , 59, 75-80. (Reyes, 2015).	10.1007/s11528-015-0842-1	88	8.80	1.85
Application of machine learning in predicting performance for computer engineering students: A case study. <i>Sustainability</i> , 11(10), 2833. (Buenaño-Fernández et al., 2019).	10.3390/su11102833	86	14.33	2.03
Harnessing the power of big data analytics in the cloud to support learning analytics in mobile learning environment. <i>Computers in Human behavior</i> , 92, 578-588. (Shorfuzzaman, 2019).	10.1016/j.chb.2018.07.002	82	13.67	1.93
Give me a customizable dashboard: Personalized learning analytics dashboards in higher education. <i>Technology, Knowledge and Learning</i> , 22, 317-333. (Roberts, 2017).	10.1007/s10758-017-9316-1	80	10.00	2.35
A bibliometric perspective of learning analytics research landscape. <i>Behaviour & Information Technology</i> , 37(10-11), 941-957. (Waheed, 2018)	10.1080/0144929X.2018.1467967	66	9.43	1.12

5. Conclusion

The new era is characterized by the vast quantities of data that should be fully leveraged to improve and advance traditional systems in a variety of sectors, particularly education. A bibliometric analysis of publications concerning education big data and learning analytics was conducted in this study.

Over the past decade, the integration of learning analytics and big data has driven a transformative transition in the education landscape. This paradigm shift has not only transformed conventional educational systems but has also facilitated the development of adaptive, personalized learning experiences. By conducting a systematic analysis of publications from 2012 to 2023 in the field of education big data and learning analytics, this research sought to address the disparity in comprehension of the thematic areas, key contributors, and evolving trends within this domain. There were numerous noteworthy discoveries that emerged from the examination. Subsequently, there was a minor decrease in the annual production of scientific articles in the years following 2012, which was followed by an upward trend. The dynamic character of research activity within the field is emphasized by this fluctuation. In addition, the identification of key sources, authors, and affiliations illuminated the prominent contributors and collaborative networks that are propelling research in education big data and learning analytics research. The global impact of research in this field was also emphasized by the analysis, with the United States, China, and Australia being the foremost countries in scientific production. This international engagement emphasizes the significance of knowledge exchange and collaboration in the advancement of research agendas and the resolution of intricate educational challenges. Additionally, the trajectory of research in education big data and learning analytics was influenced by seminal works that were identified through citation analysis. These works provided insights into critical research findings and foundational literature.

In summary, this research provides a thorough comprehension of the changing environment of education big data and learning analytics. This study provides valuable insights to the scholarly discourse in the field by identifying key contributors, highlighting influential works, and unearthing trends. In order to capitalize on the potential of big data and learning analytics to foster innovation and development in education, it will be imperative to maintain ongoing collaboration and interdisciplinary research endeavors.

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ABSTRACT

This paper delves into the Madhesh Movement's influence on the banking fabric of Nepal. Originating in the Terai region, the movement was spearheaded by the local Madhesi populace. The document scrutinizes both the advantageous and detrimental outcomes stemming from the movement within the Nepalese banking sector. It highlights the movement's role in fostering political participation, acknowledging ethnic identities, and advocating for equitable rights. And its influence in the Nepalese banking sector. Conversely, it also addresses the movement's potential disruption to national cohesion and ethnic harmony and devastating the economy and thrashing the banking sector. Utilizing academic studies and pivotal sources, this summary endeavors to encapsulate the intricate interplay of factors associated with the Madhesh Movement and its ramifications on the societal landscape of Nepal in the context of the Nepalese banking sector. The Nepalese banking sector and economy got highly affected due to the Madhesi Movement. Many Madhesis emerged as entrepreneurs which is highly appreciated.

Keywords: Madhesh Movement, Madhesi, Nepalese Banking, Nepalese Economy, Revolt.

JEL Classifications: G21, G28

1. Introduction:

The Madhesh Movement, also known as the Madhesi Movement, significantly influenced Nepal's socio-political landscape. Originating in the Terai region, this movement was led by the Madhesi community and aimed to address issues of identity recognition, representation, and autonomy. In 2007, the Madhesi community's pursuit of self-determination became highly visible through protests the Interim Constitution. They pressed for the Nepalese government to embrace federal restructuring and validate their self-determination by creating a self-governing region in the Tarai. Despite Nepal's progression towards federalism, the government has hesitated to officially affirm the Madhesi's claims to self-determination (HH Jhanwali,2023).

2. Review of literature:

In his study, Bashyal, L. K. (2023) discovered that the Madhesh issue entered the mainstream political discourse of Nepal following the second Jan Andolan (People's Movement of 2005-2006). The chapter seeks to examine the rise and impact of the Madhesh Movement within Nepal. The movement marked a significant chapter in Nepal's political history, witnessing the sacrifice of many Madhesi lives. Notable achievements of this movement include the incorporation of terms 'Madhesh' and 'Madhesi' in the second amendment of the interim constitution, granting them constitutional recognition and a federal framework. Because of the two countries' open border policy, informal trade across the Indo-Nepal border accounts for a sizeable amount of the local

economy, claim Singh and Sharma (2019).

Khan, M. (2022), in his research highlights that while calls for inclusion were strong across Nepal, the Terai region's mobilization was distinctively centered on ethnic identity and exclusion. The push for robust provinces, particularly in Madhesh, was rooted in ethnic identity. Despite the reasons for these demands, provinces play a pivotal role in executing federalism in a way that fosters inclusivity instead of centralization. Without this, the federal system, with its 753 local governments, risks regressing to centralization. Regrettably, the initial intertwining of the demand for potent provinces with ethnic issues led to the current constitution's formation, which significantly curtailed the provincial powers. Furthermore, many of these constitutional powers remain unenforced. Analyzing these implementation challenges through the lens of political settlements sheds light on this contradiction and its resultant issues, as well as the diverse forces at play. Understanding these dynamics is crucial for Nepali policymakers and international partners aiming to craft policies that enhance inclusion and economic opportunities, ensuring that such policies reinforce the integration of inclusivity rather than unintentionally backing entities that favor a return to over-centralization.

Dhokal, S. (2018), in his study found that the government should endeavor to fulfill the aspirations for rights, fair justice, representation, and ultimately, the acknowledgment of individuals from all ethnic backgrounds and geographic areas. The misunderstandings that arose between Nepal and India

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due to the Madhesh Movement and the border crisis of 2015 ought to be resolved through diplomatic means.

Khadka, K. (2017) posits in his research that the Madhesh Uprising was a foreseeable result of entrenched discrimination related to identity and ethnicity, and prolonged political exclusion. Furthermore, the study illustrates that such ingrained discrimination and political sidelining can incite violence and may be exploited for political ends.

3. Research Gap:

Numerous studies have been carried out, yet upon reviewing multiple scholarly articles, it was discovered that research specifically targeting the Nepalese banking sector in association with the Madhesi movement remains unexplored. This study explores the critical question: How has the Madhesi movement influenced the banking sector in Nepal? The investigation seeks to understand the ramifications of the socio-political dynamics on the financial institutions within the country.

4. Methodology:

To delve into the complexities of identity politics and Madhesi movements, a method is essential that enables the examination of behavioral trends, viewpoints, origins, relationships, and dynamics between the participants. From an epistemological standpoint, we have embraced an interpretive-critical approach grounded in the disputed link between Madhesh and the Madhesi movement, thereby shedding light on 'Nepali Banking Issues'. This study, adopting a social constructivist ontology, has utilized a qualitative method to depict the formation of identity as portrayed in local narratives, which in turn affects the banking sector and grassroots livelihoods.

5. Discussion and Analysis:

Impact on the Nepali banking sector.

5.1 Identity Recognition and Representation:

- The Madhesh Movement brought the Madhesi community's concerns to the forefront of national politics. It demanded equitable representation for Madhesi people in the country's state apparatus.
- While the movement succeeded in raising awareness about identity and representation, Madhesi leaders faced challenges. Their negotiation skills were lacking, hindering effective dialogue with the state while advocating for their rights.
- Despite the movement's influence, the returns for Madhesi communities were not as significant as expected. Madhes-based parties rose to power but failed to fully institutionalize the movement's achievements. Over time, their reputation

diminished, even within their own supporter base.

5.2 Federalism and Autonomy:

- Federalism was a major demand of the Madhes Movement. The interim constitution was amended to include provisions for restructuring Nepal into a federal structure.
- The Constitution of Nepal, promulgated in 2015, established seven provinces. Madhesh Province, with a clear majority of the Madhesi community, became one of these provinces.
- However, the federal government remains reluctant to fully devolve constitutional rights to the provinces. The Madhesh Province persists in championing its rights through lawful and nonviolent channels.

5.3 Challenges and Opportunities in the Banking Sector:

The Madhesh Movement's impact on the banking sector is multifaceted:

5.3.1 Positive Aspects:

- Increased self-esteem and confidence among Madhesi citizens due to the movement.
- Naming the province based on community identity, reflecting a sense of ownership.
- Some commendable efforts by the province government in infrastructure development.

5.3.2 Challenges:

- Limited rights for the province compared to the federal government.
- Provincial structures do not fully reflect internal diversity and proportional inclusion.
- Criticisms of poor governance, lack of transparency, and accountability.
- Growing frustration among citizens due to unmet expectations.

5.3.3 Hope and Trust:

- Amidst adversities, the citizens of Madhesh Province maintain optimism and confidence in the federal governance structure, considering their past encounters with bias and marginalization.

5.4 In summary, the Madhesh Movement played a pivotal role in introducing federalism to Nepal. Amidst adversities, the citizens of Madhesh Province maintain optimism and confidence in the federal governance structure, considering their past encounters with bias and marginalization. During the Madhesh Movement, the role of banks was not directly highlighted in the movement's primary objectives, which focused on political and social reforms. However, banks played a crucial role in maintaining economic stability and providing financial

services amidst the socio-political changes. Here are some ways in which banks were involved:

5.4.1 Financial Continuity:

Banks ensured the continuity of financial services during the tumultuous times of the movement. This was vital for the local economy and for individuals who relied on banking services for their daily transactions and livelihoods.

5.4.2 Economic Impact:

The movement led to disruptions in the regular economic activities in the Terai region. Banks had to manage the economic impact, such as handling the flow of remittances and providing loans to businesses affected by the movement.

5.4.3 Support for Reconstruction:

Post-movement, banks played a role in the reconstruction and rehabilitation efforts by financing infrastructure projects and supporting businesses in the affected areas.

5.4.4 Social Responsibility:

Some banks may have engaged in corporate social responsibility (CSR) initiatives to aid communities affected by the movement, although specific instances of such involvement are not prominently documented. It should be emphasized that the banks played a more auxiliary and responsive role in reaction to the developments of the Madhesh Movement, rather than engaging directly in the political objectives of the movement.

5.5 Challenges faced by the banks during the movement

Yes, banks in Nepal faced several challenges during the Madhesh Movement. The movement, which was centered on issues of political representation and social justice for the Madhesi community, had broader economic implications, including on the banking sector:

5.5.1 Operational Disruptions:

Banks in the Terai region experienced operational disruptions due to strikes and protests. This situation impacted on their capacity to deliver consistent services and resulted in the intermittent shutdown of branches.

5.5.2 Economic Slowdown:

The movement caused an economic slowdown in the region, which impacted loan repayments and the financial health of banks. Deposits experienced a downturn, while there was a rise in assets that were not yielding returns.

5.5.3 Security Concerns:

Banks were compelled to strengthen their security protocols to safeguard their assets and employees, due to the civil disturbances prompted by the movement.

5.5.4 Logistical Challenges:

The circulation of cash and other banking operations

faced disruptions owing to road blockades and strikes, which in turn impacted the banks' management of cash flow.

5.5.5 Impact on Investment:

The ambiguity surrounding the movement resulted in a reduction of investments within the area, consequently influencing the banks' expansion of credit.

Despite facing numerous obstacles, banks were instrumental in preserving the region's economic equilibrium and aided the community by engaging in social responsibility endeavors and funding rebuilding projects after the movement. The resilience of the banking sector was crucial in ensuring that financial services remained available to the people during and after the Madhesh Movement.

5.6 Banks collaboration with local communities during the movement

During the Madhesh Movement, banks collaborated with local communities in several ways to support them through socio-political changes. Here's how they contributed:

5.6.1 Financial Inclusion:

Banks worked towards financial inclusion by implementing policies that aimed at proportional representation. This entailed initiatives to recruit, advance, and designate members of underrepresented groups, including the Madhesi, within financial institutions.

5.6.2 Supporting Local Economy:

They provided essential banking services to ensure the local economy continued to function despite the disruptions caused by the movement. It encompassed ensuring the continuity of remittance transactions and extending credit facilities to local enterprises.

5.6.3 Infrastructure Development:

Financial institutions contributed to the development of infrastructure by providing funding for projects aligned with the provincial government's initiatives to promote social integration and boost economic development in the area.

5.6.4 Community Engagement:

At the community level, banks likely participated in outreach initiatives using local media outlets like newspapers and radio to maintain public engagement and awareness regarding the movement's endeavors.

Through these collaborations, banks not only maintained their operational stability but also contributed to the socio-economic resilience of the local communities during the Madhesh Movement.

5.7 Financial Assistance given to Madhesi Entrepreneurs by Bank

While the search results do not provide specific details on special financial aid to Madhesi entrepreneurs by banks during the Madhesh Movement, it is common for banks to offer support to local businesses and entrepreneurs in times of socio-political change. Banks may have provided financial assistance through various means:

5.7.1 Special Loan Programs:

Banks might have introduced special loan programs with favorable terms to support Madhesi entrepreneurs affected by the movement.

5.7.2 Microfinance Initiatives:

Microfinance institutions often play a significant role in empowering local entrepreneurs, especially in regions affected by socio-political movements.

5.7.3 Corporate Social Responsibility (CSR):

Banks could have engaged in CSR activities aimed at community development, which may include financial literacy programs and entrepreneurship training.

5.7.4 Government-Backed Schemes:

In collaboration with the government, banks may have facilitated access to government-backed schemes designed to promote entrepreneurship in marginalized communities. It's important to note that such initiatives would typically aim to foster economic development and stability in the region, contributing to the overall resilience of the community during and after the movement.

5.8 Banks assess the creditworthiness of local business in the Madhesh

Banks assess the creditworthiness of local businesses in the Terai region through a combination of qualitative and quantitative measures. Here's a general overview of the process:

5.8.1 Financial Analysis: Banks review the financial statements of businesses to evaluate their financial health. This includes analyzing balance sheets, income statements, and cash flow statements to understand the business's profitability, liquidity, and solvency.

5.8.2 Credit History: The credit history of the business is examined, including past loan repayments, credit scores, and any instances of defaults or delinquencies.

5.8.3 Business Plan and Model: A thorough review of the business plan and model is conducted to assess the viability and sustainability of the business. Banks look for a clear strategy, competitive advantage, and a strong management team.

5.8.4 Market Conditions: Banks consider the economic environment and market conditions of the Terai region, which can affect the business's ability to succeed and repay loans.

5.8.5 Collateral: The availability and value of collateral that the business can offer to secure the loan are also principal factors in the assessment.

5.8.6 Relationship with the Bank: The existing relationship between the business and the bank, including previous interactions and transactions, can influence the creditworthiness assessment.

5.8.7 Regulatory Compliance: Compliance with local and national regulations is crucial. Banks ensure that businesses adhere to the legal requirements to mitigate risk.

5.8.8 Risk Management Policies: Banks have implemented policies for extending credit and strategies for risk management to oversee and regulate the process of credit assessment.

This holistic strategy enables banks in the Terai area to make well-informed choices regarding the provision of loans to local enterprises, thus ensuring effective risk management while fostering economic advancement.

5.9 Loan handling by bank during the Madhesh movement

During the period of instability caused by the Madhesh Movement, banks in Nepal had to navigate the challenges of loan defaults with a strategic approach. Here's how they likely handled the situation:

5.9.1 Restructuring Loans: Banks may have offered to restructure loans for businesses affected by the movement, providing them with extended repayment periods or more favorable terms.

5.9.2 Moratoriums: A temporary moratorium on loan repayments could have been implemented to give borrowers time to stabilize their financial situation.

5.9.3 Engaging with Borrowers: Banks likely engaged directly with borrowers to understand their individual circumstances and work out feasible repayment plans.

5.9.4 Provisioning for Losses: Banks would have set aside provisions for potential losses from loan defaults, as part of their risk management practices.

5.9.5 Government Support: The banking sector may have received support from the government in the form of financial assistance or policy interventions to mitigate the impact of defaults.

5.9.6 Community Outreach: Banks might have conducted community outreach programs to educate borrowers about managing finances during the crisis and the importance of maintaining their creditworthiness.

5.10 Legal Changes related to loan recovery during the Madhesh movement

During the period of the Madhesh Movement, there were significant socio-political changes that may have influenced legal frameworks, including those related to loan recovery. However, the search results do not specify any legal changes about loan recovery during this time. In such periods of socio-political transition, governments may introduce legal reforms to address economic challenges and ensure financial stability. These reforms could include:

5.10.1 Amendments to Existing Laws: The government might amend existing financial laws to ease easier loan recovery processes or to provide relief to borrowers affected by the instability.

5.10.2 Introduction of New Policies: New policies could be introduced to protect the interests of both lenders and borrowers, ensuring that the financial system remains robust.

5.10.3 Special Provisions for Affected Regions: There might be special provisions or schemes for regions affected by movements like the Madhesh Movement, to aid in economic recovery.

5.11 Disputes between bankers and borrowers during Madhesh movement

During the Madhesh Movement, while the search results do not detail specific legal disputes between banks and borrowers, it is common in periods of socio-political unrest for such disputes to arise. Here are some potential scenarios:

5.11.1 Loan Repayment Challenges: Borrowers may have faced difficulties in repaying loans due to economic disruptions caused by the movement, leading to potential legal disputes over defaults and recoveries.

5.11.2 Contractual Obligations: Disputes could have emerged over the interpretation and fulfillment of contractual obligations under the changed circumstances.

5.11.3 Forbearance and Moratoriums: Banks may have implemented forbearance measures or moratoriums on loan repayments, which could have led to disagreements on the terms and duration of such relief.

5.11.4 Collateral Seizure: Legal disputes might have occurred if banks attempted to seize collateral due to non-payment, especially if borrowers contested the valuations or the process.

5.11.5 Restructuring Agreements: Negotiations for loan restructuring could have led to legal challenges if the parties disagreed on the updated terms.

5.11.6 Government Interventions: Any government interventions or changes in banking regulations during the movement could have resulted in legal disputes as parties adjusted to new legal frameworks.

It's significant to recognize that disputes of this nature are generally settled via legal avenues, with the goal of achieving an equitable outcome for all the parties concerned.

6. Conclusions:

The Madhesh Movement in Nepal had a mixed impact on the country's banking industry. Positively, it advanced political inclusion, identity recognition, and social justice for the long-marginalized Madhesi community. However, it also brought about some challenges. This movement introduced significant reforms and various strategies to adapt to the situation. The economy was boosted, and many entrepreneurial activities emerged with Nepalese Banking. The government implemented various initiatives to prevent a revolt by the Madhesis. Disputes between bankers and borrowers were managed with great care.

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ABSTRACT

The growing adoption of artificial intelligence (AI) in human resource (HR) recruitment has revolutionized traditional hiring practices by enhancing efficiency, automating repetitive tasks, and optimizing candidate selection. AI-powered recruitment tools enable HR professionals to streamline processes, allowing them to focus on strategic areas such as talent development and employee engagement. However, concerns about bias, fairness, transparency, and trust remain critical, as AI algorithms are only as reliable as the data they are trained on (Danks & London, 2017). This study examines the impact of AI on HR recruitment, analysing perceptions of AI-driven hiring tools among HR professionals, hiring managers, and job seekers. A quantitative research approach was employed, utilizing survey-based data collection to assess key factors such as efficiency, fairness, and trust. The data was analysed using multiple linear regression in Microsoft Excel to evaluate the relationship between AI adoption and recruitment outcomes. The findings highlight the need for human oversight to mitigate biases and ensure ethical, transparent, and fair AI-driven recruitment practices.

1. Introduction

Before the late 1990s, recruitment and selection were primarily manual processes. Human Resource (HR) professionals were responsible for attracting job seekers, screening applications, and making hiring decisions without technological assistance. However, this traditional approach was labor-intensive and often susceptible to both conscious and unconscious biases, leading to potential discrimination based on personal attributes such as gender and age. HR practitioners, knowingly or unknowingly, could influence hiring outcomes through subjective assessments.

The landscape of recruitment changed drastically with the rapid rise of the internet in the 1990s. A pivotal development during this period was the emergence of digital job boards, which compiled and advertised multiple job vacancies. This innovation enabled organizations to connect with a broader talent pool at a lower cost while offering a more engaging and efficient hiring process. The network effect played a crucial role in this transformation—more job postings attracted more job seekers, which in turn encouraged more employers to use these platforms.

At the same time, professional networking platforms emerged, allowing individuals to build communities around work-related interests and exchange valuable information. Websites such as LinkedIn, Glassdoor,

Indeed, and Monster exemplified this trend. Over time, the growing presence of job seekers on these platforms motivated companies to post more vacancies, fostering a cycle of expansion that laid the groundwork for AI-powered recruitment solutions.

Today, HR professionals navigate a rapidly evolving technological landscape. Many have recognized the transformative potential of artificial intelligence (AI) in talent acquisition and are increasingly incorporating AI-driven methods into recruitment and selection processes.

1.1 AI in Recruitment and Selection

With the exponential growth of AI technologies, industries including HR are witnessing significant shifts in their operational methodologies. The rise of AI in HR and recruitment has been termed "the new age of HR," as AI is increasingly automating routine tasks previously handled by human recruiters. Scholars such as Upadhyay and Khandelwal (2018) have extensively discussed this transformation. Despite the growing interest in AI-driven recruitment, limited research has focused on candidates' perceptions of AI in hiring processes. Understanding these perceptions is crucial, as it influences job seekers' trust in AI-based recruitment tools.

Many studies indicate that AI improves the efficiency of recruitment processes. Frail and László (2021) concluded that AI is particularly beneficial in recruitment due to its ability to streamline tasks such as resume screening and

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interview scheduling. Similarly, Lee and Cha (2023) introduced the Fairness, Accountability, and Transparency (FAT)-Complexity, Anxiety, and Trust (CAT) model to explain AI-driven hiring decisions.

Despite its advantages, AI in recruitment has raised ethical concerns. Scholars such as Figueroa-Armijos et al. (2022) have debated whether AI-powered hiring tools are fair and whether their proprietary nature makes them difficult to scrutinize. Additional concerns include job displacement due to automation and legal implications in decision-making. Furthermore, privacy and security issues arise as AI-driven tools process vast amounts of personal data, necessitating stringent measures to protect candidates' rights (Stahl & Wright, 2018). Thus, organizations must carefully weigh the benefits and drawbacks of AI in recruitment to ensure ethical and unbiased hiring practices.

Given these complexities, research on AI in HR remains limited, particularly in understanding how job seekers perceive AI-powered recruitment tools. This study contributes to the growing body of knowledge by highlighting AI's impact on candidate experiences and HR decision-making. Insights from this research can help HR professionals and software developers address AI's limitations, refine recruitment technologies, and improve the candidate experience.

1.2 AI-Based Recruitment Strategies

1. **Chatbots Conversational:** AI, or chatbots, facilitate interactions between recruiters and job seekers by providing instant responses to inquiries. Koivunen et al. (2022) examined the impact of chatbots on recruitment and found that they enhanced the candidate experience by offering quick and precise answers. Additionally, chatbots reduced recruiters' workload, enabling them to focus on complex tasks such as candidate evaluation. However, a key limitation of chatbots is their inability to answer nuanced questions or provide personalized responses, which may lead to a suboptimal candidate experience.
2. **Predictive Analytics:** Predictive analytics employs machine learning algorithms and data mining techniques to identify patterns and forecast outcomes. In recruitment, these tools assess candidates based on past behaviors and performance indicators, helping recruiters predict job offer acceptance rates and employee retention. Mehta et al. (2013) developed a decision-support system to enhance screening efficiency in large-scale hiring processes.
3. **Machine Learning Algorithms:** Machine learning algorithms facilitate resume screening by identifying

candidates who meet specific criteria. By analyzing vast datasets, these algorithms detect patterns and predict candidate suitability for a role. Additionally, they help mitigate biases in recruitment by identifying discriminatory patterns (Roy et al., 2020).

1.3 The Ambitions of AI-Driven Recruitment and Selection

AI has significantly altered the recruitment landscape by automating core HR functions such as outreach, screening, assessment, and coordination. AI applications can enhance job visibility by strategically placing job advertisements through targeted emails, text messages, and online banners. These digital marketing techniques maximize exposure and response rates.

Moreover, AI excels in screening job applications by rapidly analyzing candidate profiles and extracting key skills and attributes from digital records, including social media activity. AI tools also contribute to candidate assessment through innovative techniques such as gamification, streamlining coordination across different hiring stages.

Throughout the recruitment process, AI generates valuable data that can refine future hiring decisions. For example, assessment results can inform future outreach and screening strategies, creating a feedback loop that optimizes recruitment outcomes.

Recruitment and selection are fundamental to organizational success, as they determine the quality of human capital. The increasing adoption of AI in hiring is driven by the competitive "war for talent," where companies seek to enhance efficiency in recruitment while minimizing costs and efforts. Traditional hiring methods are often constrained by time and geographical limitations. AI-powered tools overcome these barriers by enabling organizations to access a global talent pool, eliminating the need for physical proximity in candidate selection.

By leveraging AI, companies can optimize their recruitment strategies, reduce biases, and improve the overall candidate experience. However, they must also address the ethical and legal challenges associated with AI-driven hiring to ensure fair and transparent recruitment processes.

2. Literature Review

Artificial intelligence (AI) is a field of study that utilizes computer models to analyze and replicate cognitive functions associated with human intelligence, applying them to artificial systems. Broadly, AI refers to computer systems capable of performing tasks typically requiring human intelligence, such as acquiring information, perceiving, reasoning, and decision-making. While AI is

often envisioned as electro-mechanical robots replacing humans, experts in the field recognize a fundamental distinction between human cognition and machine capabilities. While computers lack human creativity, emotions, and temperament, they can efficiently control machines that mimic certain human actions (e.g., object manipulation) and serve as the intelligence behind systems that emulate human decision-making in specialized domains, such as data analysis and medical diagnostics.

Advancements in computer technology, particularly the availability of powerful and cost-effective processors, have made large-scale AI research economically viable. Consequently, significant progress has been achieved in expert systems, a subfield of AI, which has proven beneficial in corporate decision-making. In an era of rapid technological advancement and increasing competition, HR managers leverage AI to collect precise data on workforce management, training, recruitment, onboarding, and performance evaluation, enhancing efficiency and strategic decision-making.

The integration of Artificial Intelligence (AI) in Human Resource Management (HRM) has garnered significant attention in recent years, driven by the widespread adoption of digital transformation across industries. AI implementation in HRM is seen as a strategic advancement that enhances organizational efficiency, improves decision-making accuracy, and elevates the overall quality of HR processes. Training programs have been found to help individuals focus more on dynamic online assessments during message evaluations, recognize contextual cues, minimize exposure to deceptive messages early on, and ultimately lower the risk of phishing attacks. An alternative training method based on the transactive memory system (TMS) theory has also been proposed. To facilitate its application, an app was developed featuring an interactive game designed to raise awareness of security training and encourage information sharing (Ritika Gupta, 2024). Research findings suggest that using digital platforms for training delivery can be an effective approach to strengthening organizational skills, knowledge, and security awareness. Preventive measures are effective because they frame phishing awareness as a learning process that enhances individuals' resistance by fostering behavioral adaptations over time (Ritika Gupta, 2024).

The recruitment domain has emerged as a key area where AI is being extensively utilized. Artificial intelligence is already playing a significant role in resume screening, candidate selection based on job requirements, and even conducting initial interviews through chatbots. Beyond expediting the hiring process, AI-driven self-service

technologies help eliminate biases associated with human decision-making (Upadhyay & Khandelwal, 2018). By leveraging AI, recruitment algorithms focus primarily on candidates' skills and qualifications, ensuring a more objective and fair selection process. AI-based recruitment solutions use predictive analytics and recommendation systems to identify the most suitable candidates for specific roles, ultimately enhancing the overall quality of hires (Jain & Gautam, 2016).

3. Problem Statement

AI recruitment involves the application of artificial intelligence technologies to streamline the hiring process. This includes AI-driven tools for resume screening, candidate sourcing, interview scheduling, and predictive analytics to identify top candidates. Additionally, AI recruitment seeks to understand applicants' expectations and refine AI recruitment software accordingly.

The primary objective of AI recruitment is to enhance efficiency by automating repetitive tasks and providing data-driven insights to recruiters. However, its implementation also brings challenges such as algorithmic bias, lack of transparency, data privacy concerns, reduced human interaction, and potential errors in decision-making. These challenges must be carefully addressed to ensure fairness and effectiveness in the hiring process.

This study aims to explore the acceptance of AI recruitment among applicants while considering these concerns, evaluating both its advantages and limitations, and identifying factors that influence candidate perceptions and trust in AI-driven hiring systems.

4. Objective of the Study

1. To evaluate the impact of AI adoption on recruitment efficiency by analysing its effects on time-to-hire, cost reduction, and quality of hire.

5. Hypothesis Formulation

5.1 Hypothesis (AI Adoption ? Recruitment Efficiency)

H₀ (Null Hypothesis): AI adoption in recruitment has no significant impact on hiring efficiency.

H₁ (Alternative Hypothesis): AI adoption in recruitment significantly improves hiring efficiency by reducing time-to-hire, lowering costs, and enhancing the quality of hire.

Dependent Variable (Y): Hiring Efficiency (Time to Hire, Cost Reduction, Quality of Hire)

Independent Variable (X): AI Adoption Level

H₀: AI adoption does not reduce bias in recruitment decisions.

H₁: AI adoption helps in reducing bias in recruitment by improving candidate screening processes.

Dependent Variable (Y): Perceived Bias Reduction

Independent Variable (X): AI Usage for Candidate Screening

5.3 Research Methodology

5.3.1 Research Design

The influence of AI adoption on HR recruitment procedures is assessed in this study using a quantitative research methodology and survey-based data gathering. The effectiveness of AI in recruiting, bias reduction, and recruiter replacement is evaluated using an explanatory

research design. To offer a comprehensive perspective and AI-driven hiring, the study considers insights from HR professionals, hiring managers and job seekers.

5.3.2 Population: The survey targeted HR professionals, hiring managers, and job seekers to ensure a diverse range of insights.

5.3.3 Sampling Method: Convenience sampling was used to collect responses from professionals in IMS Unison University, Graphic Era University, Venture quest hiring agency and Lance soft hiring office.

HR Professionals	Hiring Managers	Job Seekers
32	21	47

5.3.4 Sample Size: 100 responses

5.3.5. Sampling Area: Dehradun

5.3.6 Data Collection

- **Primary data:** A self-framed questionnaire was used to assess participants' perceptions of AI in recruitment which consists of 10 items.
- **Secondary data:** Secondary data was collected from journals, research papers, articles, reports.

- **Regression Model:** Multiple linear regression was conducted using Excel's Data Analysis ToolPak.
- **Statistical Metrics:** Regression coefficients, R-squared values, p-values, were analysed to determine statistical significance.

5.3.7 Data Processing & Analysis (Using Microsoft Excel)

6. Result and Data Interpretation

Hypothesis 1 : AI Adoption ? Hiring Efficiency

Table:1 Regression Statistics (Model Summary)

Multiple R	0.542095
R Square	0.293867
Adjusted R Square	0.2718
Standard Error	0.602553
Observations	100

Table:2 ANOVA

Model	Sum of Squares	df	Mean Square	F	Significance F
Regression	14.50527	3	4.835092	13.31724	2.44E-07
Residual	34.85473	96	0.36307		
Total	49.36	99			

Table:3 Coefficients

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.334892	0.314858	4.239668	5.15E-05	0.709905	1.95988	0.709905	1.95988
X Variable 1	0.305885	0.106532	2.871307	0.00503	0.094421	0.517348	0.094421	0.517348
X Variable 2	0.205253	0.132273	1.551737	0.124016	-0.05731	0.467814	-0.05731	0.467814
X Variable 3	-0.07044	0.103447	-0.68096	0.497537	-0.27578	0.134897	-0.27578	0.134897

The regression results indicate that AI adoption has a statistically significant impact on hiring efficiency. With an R² value of 0.2939, the model suggests that 29.4% of the variance in hiring efficiency can be explained by AI adoption. This is a relatively strong explanatory power compared to many HR-related studies.

The positive coefficient of 0.3059 for X Variable 1 implies that for every one-unit increase in AI adoption, hiring efficiency improves by approximately 0.3059 units. This finding is statistically significant with a p-value of 0.0050, confirming that the relationship is not due to chance.

These findings align with existing literature, which emphasizes that AI-driven recruitment tools automate repetitive processes, reduce recruitment time, and improve the quality of candidate selection. By leveraging AI for resume screening, chatbots for initial candidate interactions, and predictive analytics for decision-making, organizations can enhance recruitment efficiency while minimizing human effort. Furthermore, the results suggest that AI contributes to reducing recruitment costs, as indicated by its role in streamlining hiring processes and eliminating redundant manual work.

2. Hypothesis 2: (AI ? Recruitment Bias Reduction)

Table:4 Regression Statistics (Model Summary)

Multiple R	0.817965
R Square	0.669066
Adjusted R Square	0.658725
Standard Error	0.628093
Observations	100

Table:5 ANOVA

Models	Sum of Squares	df	Mean Square	F	Significance F
Regression	76.56796	3	25.52265	64.69615	5.74E-23
Residual	37.87204	96	0.3945		
Total	114.44	99			

Table: 6 Coefficients

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.967199	0.27406	3.529147	0.000642	0.423194	1.511205	0.423194	1.511205
X Variable 1	0.212678	0.083439	2.548888	0.012392	0.047052	0.378304	0.047052	0.378304
X Variable 2	0.127456	0.060313	2.113229	0.037175	0.007735	0.247177	0.007735	0.247177
X Variable 3	0.530119	0.07584	6.989922	3.64E-10	0.379577	0.680661	0.379577	0.680661

The regression analysis suggests that AI adoption plays a significant role in reducing bias in recruitment decisions. The results show a strong relationship between AI usage for candidate screening and perceived bias reduction, with about 66.9% of the variation in bias reduction explained by AI-related factors. Additionally, all the predictors in the model are statistically significant, meaning they have a real and measurable impact Coefficient Analysis

- **Intercept (0.967):** The intercept represents the baseline level of perceived bias reduction when AI usage for candidate screening and other variables are zero. This baseline suggests a relatively moderate level of bias reduction even without AI intervention.
- **X Variable 1 (0.213, p-value = 0.012):** This coefficient indicates that for each unit increase in AI usage for candidate screening, perceived bias reduction increases by 0.213 units. The statistically significant p-value suggests that AI usage is an important predictor of bias reduction in recruitment processes.
- **X Variable 2 (0.128, p-value = 0.037):** Similarly, this coefficient indicates that each unit increase in a second AI-related variable leads to a 0.128 unit increase in perceived bias reduction. The p-value (0.037) confirms the significance of this effect, implying that additional AI-related factors contribute positively to bias reduction.
- " **X Variable 3 (0.530, p-value < 0.001):** The strongest effect is observed with this variable, where for each unit increase in this factor, perceived bias reduction increases by 0.530 units. The extremely low p-value (<0.001) reinforces the robustness of this relationship, indicating a highly significant effect.

7. Conclusion

This research explored the relationship between AI adoption and two key aspects of recruitment: bias reduction and hiring efficiency. The findings from both analyses provide compelling evidence supporting the role of AI in transforming recruitment practices.

AI Adoption and Bias Reduction:

The regression analysis showed that AI adoption significantly reduces perceived bias in recruitment decisions. With an R^2 value of 0.669, the model explained a substantial portion of the variance in perceived bias reduction, suggesting that AI usage for candidate screening is a crucial factor in mitigating bias. All independent variables were statistically significant, confirming that AI interventions such as automated candidate screening and AI-assisted decision-making contribute to fairer recruitment outcomes. These results align with the hypothesis (H?) that AI adoption helps

reduce bias, thus enhancing the fairness and inclusivity of recruitment processes.

AI Adoption and Hiring Efficiency:

The analysis of AI adoption's impact on hiring efficiency also yielded significant results. The model explained 29.4% of the variance in hiring efficiency ($R^2 = 0.2939$), indicating a moderate but meaningful relationship between AI adoption and improvements in recruitment outcomes. Specifically, the positive coefficient for X Variable 1 (0.3059) highlights that as AI adoption increases, hiring efficiency improves. This finding is statistically significant (p-value = 0.0050), suggesting that AI has a real and measurable impact on reducing the time and effort required for recruitment. Automated processes, such as resume screening and predictive analytics, contribute to streamlining hiring practices, reducing costs, and enhancing overall recruitment speed.

The combined findings of this research confirm that AI adoption has a dual benefit in recruitment: it not only helps reduce bias but also improves hiring efficiency. By automating time-consuming tasks and supporting data-driven decision-making, AI enhances both the fairness and productivity of recruitment processes. These results are consistent with existing literature, which emphasizes the advantages of AI in automating administrative functions and minimizing human biases, making it a powerful tool for modernizing recruitment. The study provides strong evidence in support of AI's positive impact on recruitment practices, thus advocating for its broader adoption across organizations to achieve more efficient and equitable hiring outcomes.

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The Influence of Leader's Social Intelligence on Follower's Resilience: A Study on the Perception of the Students from The Higher Educational Institutes of Uttarakhand

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ABSTRACT

This study aimed to analyze students' perceptions of their teachers' social intelligence and its influence on the resilience of these students in higher education institutions of Uttarakhand. An exploratory-descriptive research design was utilized, wherein non-probability sampling strategies were applied, including convenience and purposive sampling, to recruit 193 student participants.

Data was collected through a comprehensive survey with validated measures assessing social intelligence and resilience as the independent and dependent constructs respectively, organized in a structured questionnaire using 7-point Likert scales. Findings indicated that students generally perceived their teachers as possessing high social intelligence, particularly in accommodating student aspirations, effective communication, and maintaining ethical integrity. Nevertheless, areas for the teachers were identified, including the need for enhanced empathy, authenticity, and targeted support for struggling students.

Notably, the analysis revealed a strong positive correlation ($r = 0.759$) between teachers' social intelligence and students' resilience. This suggests that increased social intelligence among educators is associated with higher resilience levels in their students. The study concluded that the relationship between teachers' social intelligence and student resilience is statistically significant.

Multiple regression analysis showed a substantial association between social intelligence and resilience, with R^2 calculated at 0.576, indicating that 57.6% of the variance in resilience could be explained by the construct- social intelligence. The implications of the study underscore the critical role that a teachers' social intelligence plays in fostering resilience among students, specifically in higher education students. The findings contribute valuable insights into enhancing educational practices, as the results are pointing towards the fact that students in higher education institutes do not perceive that the presence of their teachers and their mentoring skills are able to develop the resilience in these students. Further recommending enhancements in teacher training methodologies that focus on developing social intelligence in them to support students' holistic development in contemporary educational settings.

Keywords: Social Intelligence, Resilience, Higher Educational Institutes, Academicians, Multiple Regression.

1. Introduction

An ensemble of critics, augmented by alarming statistics, argues that a minacious shift of mindset has occurred amongst the young generation. University Students have become increasingly fragile, floundering with everyday stressors, and more likely to experience emotional breakdown over minor hitches and complication. This dwindle in resilience, which is often witnessed in campus is not a rare sight anymore, rather is a drift observed across universities. Attributing their failures and poor grades to the actions of their faculties and university system has grown into a standard approach towards adversities

among the university students. A concerning phenomenon has also emerged on college campuses, where students are frequently using profanity and making derogatory remarks about their fellow students and not sparing even the faculty members, often without apology or regret. The responsibility of the teacher specially in higher education institutes goes beyond the academic assignments. The onus of character building of the youth is in the court of the teachers specially with the age group of students enrolled in higher educational institutes. The increasing cases of violence, involvement in unethical acts, fraud, suicide, low self-esteem and ego, failure to bear exam pressure or any insulting situations like bullying and social isolation or be it

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the inability to cope with the financial hardships, these scenes are frequently witnessed among the college going students. Researches have emphasized in previous studies, the impact of various factors on the resilience of the student. Of prime importance were the factors associated with the parenting style and teacher's support. The challenges faced by the students in this harsh competitive world cannot be circumvented. The strength of the character and their ability to get back to the track despite chain of failures comes from the influence of the teacher's support system. A teacher with higher social intelligence may make the conscious decisions of bridging the social status gap between their students and self. Social intelligence of a teacher prepares the student to face the social challenges with courage and integrity thereby acting as a catalyst in the process of making the student a socially responsible citizen. The research attempt to bring the focus on two aspects, first, are we as a teacher socially intelligent when it comes to dealing with this young generation? Are we aware or trained enough to behave in a socially intelligent way and how these students perceive us in this symbiosis? This may bring the attention of the university and educational system on the need of preparing a socially intelligent faculties, so as to intervene in the system for root level development of the students. Secondly, understanding if socially intelligent teachers have any significant influence on the resilience of their students. The purpose of the study is achieved by measuring the perception of the students towards the social intelligence of their teachers and then analysing the relationship between the social intelligence and the resilience ability of the students using regression analysis.

2. Literature Review

Edward L. Thorndike introduced the term "social intelligence" in 1920, defining it as an individual's ability to comprehend and effectively navigate complex interpersonal relationships. His definition underscores the significance of one's capacity to engage in positive social interactions. While various theorists have proposed differing perspectives on social intelligence, there is a general consensus on two core components: (a) awareness of others needs and (b) the ability to respond and adapt appropriately to diverse social contexts (Kobe et al., 2001). Individuals with high social intelligence typically find it effortless to traverse social situations, easily establishing friendships and connections. They demonstrate heightened emotional sensitivity and a deep awareness of human interactions, often employing tact to excel in various domains. Consequently, social intelligence is increasingly recognized as a vital aspect of personal development within educational environments. While the literature underscores the importance of

cultivating healthy interpersonal relationships, it is evident that today's society is experiencing a decline in social connections. Marlowe (1986) defined social intelligence as a collection of problem-solving abilities that empower individuals to navigate and resolve interpersonal conflicts. This form of intelligence involves understanding one's own emotions as well as those of others and acting accordingly in social situations.

Resilience, as a psychological trait, plays a crucial role in how individuals manage stress, exhibiting a reciprocal relationship with distress tolerance. Research indicates that those with high levels of resilience tend to exhibit greater distress tolerance compared to their counterparts (Nila et al., 2016). Essentially, resilience encompasses the capacity to cope with life's challenges in a constructive manner, facilitating effective adaptation to adverse experiences (Bagh-cheghi & Koohestani, 2021). It not only fosters a positive adjustment to difficult circumstances but is also a fluid concept; successful navigation through life's challenges can lead to increased resilience, thus initiating a cycle of growth and enhanced coping abilities (Koohestani & Baghcheghi, 2021). Resilience is defined as the capacity to recover from setbacks and adapt to new challenges, manifesting in effective stress management, emotional regulation, and problem-solving abilities. Resilient individuals often possess robust support networks and a clear sense of purpose, which enables them to confront adversity with optimism and recover swiftly from difficulties. Ultimately, resilience equips individuals to navigate life's uncertainties, safeguarding their well-being during challenging times. Therefore, the study focuses on the responsibility of the teachers in higher educational institutes teaching and mentoring the young students, to build the resilience of their students through the intervention of their social intelligence.

Studies suggest that social intelligence significantly contributes to enhancing men's distress tolerance, (Simons & Gaher, 2005), a concept closely linked to resilience. Extensive research has revealed a significant relationship between social intelligence and effective stress management, indicating that individuals with high social intelligence possess enhanced skills for coping with stressors and maintaining a balance between academic responsibilities and personal life (Brackett & Katulak, 2006). The present study aims to understand this impact of teacher's social intelligence with student's coping ability under stress through the variable of resilience. Social intelligence has emerged as a key predictor of both stress responses and coping strategies, with greater social intelligence linked to improved stress management capabilities (Dwivedi et al., 2023).

Additionally, Makwana (2023) investigated the connections between social intelligence, spiritual intelligence, and values among 360 college students in Gujarat where the study concluded that there was no substantial correlation between social intelligence and the values held by the students.

Furthermore, Dhamodharan (2021) examined social integration among professional college students, focusing on their social intelligence, value systems, and democratic attitudes. It noted a positive relationship between social intelligence and social values among the subjects. The findings indicated that students who participated in an experimental group showed significant improvements in their understanding of others, their ability to build effective relationships, and their skills in teamwork, social adaptation, empathy, and constructive conflict resolution (Sankhayeva et al. 2021). It was also studied that the university students who have helicopter parents may struggle to develop autonomy and problem-solving skills as a result of which they are accustomed to parental assistance, they may be less resilient when faced with adversity (Shengyao et al., 2024). Albrecht (2004) in his book- 'Social Intelligence Beyond IQ' introduced a detailed model of social intelligence that aligns with Gardner's (1983) theory of multiple intelligences, characterizing social intelligence as "the ability to get along well with others and to foster their cooperation." This model comprises five key dimensions: Situational Awareness, Presence, Authenticity, Clarity, and Empathy (S.P.A.C.E). Echoing the themes from National Curriculum Framework for School Education (2000) lamented the decline of vital social, moral, and spiritual values. It called upon educational institutions to champion and uphold universal values that promote unity and integration, aiding individuals in uncovering their inherent potential. The present study has adopted this model to measure the teacher's social intelligence. The study by (Aiman, 2022) recommended that educators actively work on developing their own social intelligence by exploring its various dimensions and highlighted the importance of instructors fostering characteristics that can, in turn, elevate the social intelligence of their students Results revealed that students' motivation for academic learning is directly influenced by teachers' emotional self-awareness (SA) and social skills (SS) (Rahmana et al., 2024).

2.1 Rationale of the Study:

2.2. Investigating the Imperative of Social Intelligence in Educating Generation Z

In the contemporary higher education landscape, a nuanced comprehension of the social needs and sensitivities of Generation Z students is paramount for educators seeking to implement effective teaching

methodologies with an emphasis on the development of the social and moral character of students.

2.3. The Imperative of Social Intelligence for Educators

To foster meaningful interactions with Generation Z learners, educators must cultivate social intelligence, a critical attribute that facilitates effective communication and engagement. Professors who possess social intelligence can interact with their students in a relatable and respectful manner, thus navigating the distinct challenges faced by this demographic, including mental health issues and academic pressures.

2.4. The Impact of Social Intelligence on Teacher-Student Dynamics

Research has shown that educators with strong social intelligence are better equipped to foster a collaborative and supportive classroom dynamic, leading to enhanced student engagement and learning outcomes (Kobe et al., 2001). By establishing trust and building rapport, professors can create an open atmosphere where students feel comfortable sharing their thoughts and concerns. This sense of community is crucial for Gen Z, as they often seek meaningful connections in their educational journeys (Saxena & Jain, 2013).

2.5. The Benefits of Social Intelligence in Tailoring Support

Educators with socially perceptual abilities are also more effective at recognizing and addressing the diverse emotional and academic needs of their students, thereby offering tailored support that enhances resilience and self-efficacy (Bandura, 1997). This capacity to tailor support enables educators to empower students to succeed, creating a positive and supportive learning environment.

2.6. Research Gap

In today's complex organizational environments, leaders are increasingly required to foster not only high performance but also resilience and self-efficacy among their followers. However, the mechanisms through which a leader's social intelligence influences these critical follower attributes remain poorly understood. Existing literature predominantly addresses leadership styles and their impact on performance, yet it often neglects the role of a leader's ability to navigate social contexts and build interpersonal relationships as a driver of individual psychological capital in followers. Thus, the absence of clarity regarding how social intelligence directly affects resilience presents a substantial gap in both theoretical and practical applications when it comes to the leader-follower dyad in context of educational institutes, in form of teacher-student relationship. Further, the research gap appears when researchers could not find any literature

taking into consideration the role of a teacher's social intelligence on the resilience of the students especially in light of the students belonging to Gen Z. Further, researcher focused on the management students belonging only to the management institutes of Uttarakhand region, which forms the population research gap.

3. Problem Statement

Social intelligence is vital for educators in higher education, especially when engaging Generation Z students, who thrive in interactive and collaborative environments. Teachers with strong social intelligence can foster meaningful connections with diverse learners, enhancing engagement and inclusivity. By empathizing with students, they can identify signs of distress and provide essential support, particularly in the context of growing mental health concerns. Additionally, socially aware educators adapt their teaching methods to accommodate various learning styles, boosting overall student success. Conversely, a lack of social intelligence can lead to disengagement, increased dropout rates, and a disruptive classroom atmosphere. Moreover, inadequate communication may stifle critical dialogue and limit exposure to diverse perspectives. Thus, social intelligence is crucial for creating inclusive and effective learning experiences that cater to the needs of today's challenges an also their ability to stand strong through them.

4. Research/ Conceptual Framework

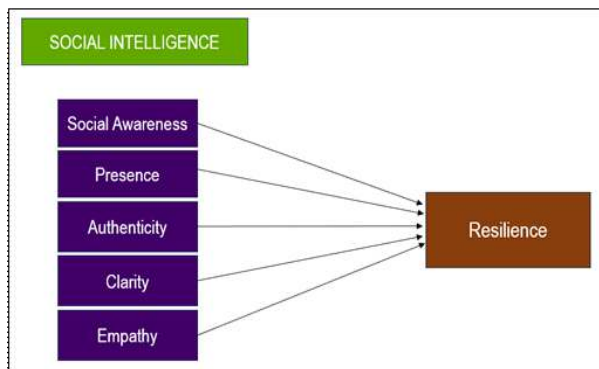


Figure 1: The Conceptual Framework

4.1. Research Questions

This study aims to address the following research questions:

RQ1. How does the students perceive their teacher's social intelligence?

RQ2. How does social intelligence of the teacher affect the Resilience in their students in higher educational institutes?

4.2. Methodology

4.3. Research Objective

1. To analyze the perception of the students of higher educational institutes towards the identified aspects of Social Intelligence of their teachers.

2. To analyze the influence of Social Intelligence of the higher education teachers on the Resilience ability of their students.

4.4. Research Design

The present study employed an exploratory-descriptive research design, wherein the target population consisted of students enrolled in various higher education institutions (HEIs) within the Uttarakhand university system. Although the population of interest is finite in nature, the practical constraints of accessing all potential respondents simultaneously rendered probability-based sampling methods infeasible. Consequently, a non-probability sampling strategy was adopted to facilitate the selection of the sample population.

Specifically, the study utilized convenience and purpose sampling techniques to recruit a sample of 193 students from the HEIs in Uttarakhand. This intentional sampling approach permitted the researcher to target a specific subgroup of the population, namely students from the HEIs, and gather data from participants who volunteered to participate in the study. By leveraging this non-probability sampling strategy, the researcher was able to efficiently collect data from a relatively large and representative sample, thereby enhancing the study's internal validity and generalizability of the findings.

4.5. Participants

The study will recruit a diverse sample of participants comprising students from various higher educational institutions in Uttarakhand, including both government and private colleges/universities. Specifically, the research will target students enrolled in undergraduate, postgraduate, and doctoral programs, thereby capturing a breadth of academic experiences and expertise.

To facilitate data collection, a non-random snowball sampling approach will be employed. This technique involves the initial recruitment of participants, who will then be asked to suggest or identify additional potential participants from their networks. In the present study, participants enrolled in doctoral programs will be requested to provide nominations of their Ph.D. supervisors and co-supervisors, thereby leveraging the social connections and relationships already established within their academic circles. This iterative recruitment process, facilitated by the snowball sampling strategy, will enable the researcher to access a more extensive and

comprehensive sample, particularly from the academic community in Uttarakhand.

4.6. Data Collection

Data collection will be conducted through a comprehensive survey incorporating validated measures for assessing social intelligence and Self-efficacy and Resilience constructs. The survey will include:

- Social Intelligence Scale: The factors of Social Intelligence include Situational awareness (SA), Presence (Pres), Authenticity (Auth), Clarity (Clar), and Empathy (Empa) (Albrecht, 2009).
- Brief Resilience Scale: Questions assessing resilience of the students in tough times is measured using the resilience scale by Smith et al., (2008).

4.7. Questionnaire Design

A structured questionnaire was developed employing a 7-point Likert scale to assess key constructs relevant to the study. Questions were adapted from established

measurement scales focused on Social Intelligence and Resilience, ensuring the reliability and validity of the instrument. The questionnaire was organized into two distinct sections:

Section A collected demographic information pertaining to the student participants, while Section B measured the primary constructs of the study-namely, the Social Intelligence of educators and the Resilience of students. This structured approach not only facilitates systematic data collection but also allows for a comprehensive analysis of the relationships between these constructs within the context of higher education.

4.8. Data Analysis Techniques:

Descriptive statistics, Linear Regression using SPSS 26 were used for analysis of the data so collected.

4.9. Data Analysis and Results

The analytical framework will involve simple linear regression analysis to identify significant predictors among the independent and dependent variables.

Table 1: Item-wise Descriptive Analysis of Perception of the Student on Social Intelligence of their Teachers

Item-wise Descriptive Analysis of Perception of the Student on Social Intelligence of their Teachers						
Descriptive Analysis						
S No.	Items	N	Min	Max	Mean	S. D
1	My teacher treats students according to their personal characteristics.	193	6	7	5.02	0.693
2	My teacher accommodates the aspirations of students in the learning process.	193	4	7	6.21	0.455
3	My teacher uses words according to the student's linguistic capacity.	193	5	7	6.1	0.481
4	My teachers teach based on ethical values that match my personal values.	193	4	6	6.22	0.457
5	My teacher explains each issue in as much detail as possible.	193	4	6	5.32	0.716
6	My teacher uses a persuasive way to convey ideas	193	6	7	6.2	0.483
7	My teacher speaks the truth	193	5	7	5.11	0.744
8	My teacher uses specific intonation while communication with the students	193	4	6	5.03	0.694
9	My teacher appreciates student opinion.	193	5	7	6.03	0.651
10	My teacher pays special attention to students who have difficulty following lessons.	193	4	6	5.01	0.686

The table below is the item-wise description of the mean and standards deviations of the perception of the students.

As it can be inferred from the table above, Table 1, that overall tone of the perception seems to be quite positive. The students perceived their professors/teachers to have high social intelligence.

The results indicate that students are evaluating their

teachers' spiritual intelligence based on their perceptions of various qualities and behaviors. One notable aspect reflected in the mean score of 5.02 is the students' view of their teacher's ability to treat individuals according to their unique characteristics. While this score suggests that many students feel their teacher demonstrates a degree of empathy and sensitivity, the higher standard deviation of 0.693 indicates mixed feelings about this aspect of the

teacher's approach. This variability suggests some students may have experienced deeper connections while others may not, highlighting an opportunity for the teacher to strengthen their spiritual connection and engagement with all students.

In terms of accommodating student aspirations, a high mean score of 6.21 demonstrates that students perceive their teacher as effectively addressing their individual goals and aspirations in the learning process. With a low standard deviation of 0.455, this consensus reflects a strong recognition among students that their teacher values their aspirations, which is a key element of spiritual intelligence. This quality of understanding and support fosters an environment where students feel recognized and empowered, enhancing their overall learning experience.

The students rated their teacher's ability to communicate effectively, with a mean of 6.10 for using language suited to their linguistic capacities. This indicates that students appreciate how the teacher conveys complex ideas, making them accessible and understandable. The low standard deviation (0.481) suggests widespread agreement on this point, highlighting the teacher's skill in fostering meaningful connections through communication-an important aspect of spiritual wisdom.

Additionally, the high mean score of 6.22 related to the alignment of ethical values indicates that students perceive their teacher as having strong moral integrity. This alignment not only builds trust but also reinforces the ethical foundation of the classroom. Such perceptions are crucial for creating a spiritually intelligent educational environment where students feel safe and respected.

However, the results also reveal some areas for improvement. A mean score of 5.32 regarding the depth of explanations suggests that students have mixed feelings about the thoroughness of the teacher's instructional methods. The higher standard deviation of 0.716 highlights variability in students' experiences, indicating that while some find the explanations enriching, others may feel a lack of clarity or depth. Addressing this area could enhance the teacher's capacity to inspire deeper understanding among all students, reflecting a more developed spiritual intelligence.

Students view their teacher as persuasive, with a mean score of 6.20, suggesting they find their teacher capable of motivating and inspiring them. This quality is essential for fostering a transformative learning experience. The ability to communicate ideas compellingly reflects the teacher's potential to lead students toward greater self-awareness and insight, integral components of spiritual intelligence.

On matters of authenticity and truthfulness, the mean score of 5.11 suggests that students are experiencing a degree of uncertainty. The high standard deviation of 0.744 indicates varied perceptions regarding the teacher's sincerity and authenticity. This inconsistency can hinder the trust-building necessary for a spiritually engaged learning environment. For a teacher striving to embody spiritual intelligence, cultivating authenticity is crucial, as it fosters deeper connections with students.

The mean score of 5.03 regarding the teacher's communicative style indicates room for growth in emotional intelligence. While some students perceive the teacher as effective in their intonation and delivery, variability in responses suggests that not all students feel equally connected. Enhancing this aspect of communication could significantly strengthen the teacher's engagement with students, fostering a more emotionally resonant and spiritually capable learning environment.

The students expressed good feelings about their opinions being valued, as indicated by a mean score of 6.03. This perception reflects the teacher's commitment to fostering an inclusive environment, which aligns well with the principles of spiritual intelligence. When students feel their voices are heard and respected, they are more likely to engage fully in the learning process.

However, the mean score of 5.01 regarding the attention paid to struggling students reveals an area of concern. With a standard deviation of 0.686, there is variability in how students perceive the level of support provided to those who find the material challenging. This indicates that while some students may feel adequately attended to, others do not. Improving support for struggling students is vital for fostering a compassionate and inclusive atmosphere, integral to embodying spiritual intelligence.

In summary, students' perceptions of their teacher's spiritual intelligence are generally positive, particularly regarding the teacher's ability to accommodate student aspirations, communicate effectively, and maintain ethical integrity. However, there are clear areas for improvement, particularly in fostering deeper empathy, authenticity, and targeted support for struggling students. By addressing these areas, the teacher can enhance their spiritual intelligence and create an even more nurturing and transformative educational environment that resonates deeply with all students.

Simple linear regression was used to predict if the social intelligence of a teacher significantly predicted/influences the resiliency during tough times in their students.

Table 2: Descriptive Statistics for the variables of the study

Descriptive Statistics			
	Mean	Std. Deviation	N
Resilience	24.7720	3.02285	193
Social Intelligence	48.0933	5.54995	193

The descriptive statistics for a sample of 193 students reveal insightful findings regarding their resilience and perceptions of social intelligence. The average resilience score is approximately 24.77, which indicates that, on the whole, students exhibit a moderate level of resilience. The standard deviation for these resilience scores is 3.02, implying that there is relatively low variability among the scores. As a result, most students' resilience scores are likely to fall within the range of 21.75 to 27.79, illustrating a degree of consistency within this aspect of their psychological profile.

On the other hand, the average score for social intelligence is about 48.09, reflecting the students'

assessment of their educators' social capabilities. However, the standard deviation for social intelligence is considerably higher at 5.55, suggesting that there is greater variability in how students perceive their teachers' social intelligence. Consequently, around 68% of these scores are likely to fall within the range of 42.54 to 53.63, indicating diverse perceptions among respondents.

In summary, the data indicates that students generally possess a reasonable level of resilience, but perceptions of their teachers' social intelligence vary significantly, pointing to a broader spectrum of opinions among the students regarding this particular trait of their teachers.

Table 3: Correlations Between Social Intelligence of the Teacher and Resilience of the Student

Correlations			
		Resilience	Social Intelligence
Pearson Correlation	Resilience	1.000	0.759
	Social Intelligence	0.759	1.000
Sig. (1-tailed)	Resilience		0.001
	Social Intelligence	0.001	
N	Resilience	193	193
	Social Intelligence	193	193

The table elucidates the results of a Pearson correlation analysis investigating the relationship between the spiritual intelligence of educators and the resilience of their students within a cohort of 193 participants. The correlation coefficient of 0.759 between the spiritual intelligence of teachers and the resilience of their students suggests a robust positive association. This substantial correlation indicates that as the spiritual intelligence of teachers increases, there is a concomitant rise in the resilience levels exhibited by their students. The coefficient further implies that approximately 57.5% of the variance in student resilience can be explained by variations in the spiritual intelligence of teachers, as indicated by the square of the correlation coefficient (0.759^2).

In assessing the statistical significance of this relationship, the p-value of 0.001 is particularly noteworthy. This value signifies a highly significant correlation at the conventional alpha level of 0.05, indicating that the likelihood of observing such a correlation due to random

chance is exceedingly low, capped at a mere 0.1%. Thus, one can confidently assert that the relationship delineated between teachers' spiritual intelligence and student resilience is not only statistically significant but also of substantive practical importance.

The analysis draws from a robust sample size of 193 for both variables, enhancing the reliability and generalizability of the findings. The relatively large sample size serves to bolster the validity of the correlation observed, positioning the current study's conclusions within a more credible framework.

In totality, these findings provide compelling evidence of a strong association between the spiritual intelligence of educators and the resilience of their students. This correlation underscores the potential influence of educators' spiritual attributes as salient factors in cultivating resilience within student populations. These results invite a reconsideration of instructional framework and teacher training methodologies, positing that the

augmentation of spiritual intelligence among educators could engender significant enhancements in students' resilience capacities. The interplay between these variables confirms the critical importance of addressing

the emotional and spiritual dimensions within educational contexts, thereby contributing valuable insights to the ongoing discourse surrounding the holistic development of students in contemporary educational settings.

Table 4: Model Fit Assessment

Model Summary ^b			
Model	R	R Square	Adjusted R Square
1	.759 ^a	0.576	0.573
a. Predictors: (Constant), Social Intelligence			
b. Dependent Variable: Resilience			

The regression model summary delineates the outcomes of a multiple regression analysis, elucidating the predictive paradigm between social intelligence and resilience, with the latter serving as the dependent variable. The correlation coefficient, denoted as R, is reported to be 0.759, thereby indicating a robust linear relationship between the predictor variable, social intelligence, and the outcome variable, resilience. This R value is suggestive of a pronounced associative connection between these two constructs, underscoring the substantive role of social intelligence as a predictor of resilience within the studied population.

The coefficient of determination, denoted as R², is calculated to be 0.576, which implies that a substantial 57.6% of the variance in resilience can be explicated by the predictor variable, social intelligence. This finding is indicative of a considerable explanatory potency, highlighting the significant contribution of social intelligence to the understanding of variations in resilience outcomes. The robust R² value serves to underscore the theoretical and practical salience of social intelligence as a determinant of resilience, thereby lending credence to the proposition that interventions targeting the enhancement of social intelligence may yield concomitant improvements in resilience.

The adjusted R² value, reported as 0.573, provides a nuanced assessment of the model's goodness of fit, taking into account the number of predictors incorporated into the analysis. The trifling discrepancy between the adjusted R² and R² values suggests that the model remains robust and stable, uninfluenced by the spectre of overfitting. This finding serves to buttress the validity and reliability of the analytical framework, thereby providing a compelling rationale for the adoption of social intelligence as a pivotal predictor of resilience in future research endeavours.

In a broader methodological context, the outcomes of this regression analysis underscore the paramount importance of social intelligence as a predictor of resilience, thereby contributing to a burgeoning body of research that seeks to elucidate the complex interrelationships between cognitive, emotional, and social variables. The findings of this study have significant implications for the development of evidence-based interventions aimed at fostering resilience, and highlight the need for a more nuanced understanding of the role of social intelligence in modulating resilience outcomes.

Table 5: Analysis of Variance Report

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	121.703	1	121.703	4.922	.003 ^b
	Residual	4722.266	191	24.724		
	Total	4843.969	192			
a. Dependent Variable: Resilience						
b. Predictors: (Constant), Social Intelligence						

The analysis of variance (ANOVA) table offers insightful findings regarding the relationship between the social intelligence of teachers in higher education institutions in Uttarakhand and the resilience of their students. In this regression framework, resilience is designated as the dependent variable, while the social intelligence of educators serves as the predictor. The regression sum of squares is recorded at 121.703, suggesting that the social intelligence of teachers explains a significant portion of the variance in students' resilience. Conversely, the residual sum of squares is noted at 4722.266, indicating the amount of variance in student resilience that remains unaccounted for by the model, thereby highlighting the multifaceted nature of resilience and potential factors beyond teacher influence.

The total sum of squares, aggregating both explained and unexplained variances, is calculated at 4843.969, which underscores the overall variability present in the data set. The degrees of freedom associated with the regression is 1, reflecting the single predictor of teachers' social intelligence, while the residual degrees of freedom stands at 191, resulting in a total of 192. Mean square values

derived from these calculations yield a regression mean square of 121.703 and a residual mean square of approximately 24.724. The F statistic, at 4.922, provides a robust indicator of the model's ability to explain resilience beyond chance factors.

Importantly, the significance level of the F statistic is reported at 0.003, signifying a statistically significant relationship between the social intelligence of teachers and the resilience of their students. This p-value is considerably lower than the standard alpha level of 0.05, reinforcing the conclusion that teachers' social intelligence plays a vital role in enhancing student resilience.

In summary, the ANOVA results affirm the critical impact of teachers' social intelligence on the resilience of students in higher education institutions in Uttarakhand. These findings not only enhance the understanding of this pivotal relationship but also provide invaluable insights for future research and educational practices aimed at fostering resilience among students through the development of teachers' social intelligence competencies.

Table 6: Coefficients of Correlation Between the Variables

Coefficients ^a								
Model	Unstandardized Coefficient			Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
				Beta			Lower Bound	Upper Bound
1	(Constant)	19.700	2.314		8.515	0.000	15.137	24.264
	Social Intelligence	1.105	0.048	0.759	2.219	0.008	1.012	1.199

The coefficients table elucidates the significant relationship between teachers' social intelligence and student resilience. The constant term, with an unstandardized coefficient of 19.700, indicates that the predicted resilience score is approximately 19.700 when social intelligence is absent, establishing a baseline level of resilience.

The unstandardized coefficient for social intelligence is 1.105, suggesting that each unit increase in teachers' social intelligence correlates with an increase of approximately 1.105 units in student resilience, assuming all other factors remain constant. This finding underscores the positive and impactful role of social intelligence in fostering resilience in students. The standardized coefficient (Beta) of 0.759 further illustrates the strong influence of social intelligence, positioning it as a critical variable within the model.

The t-value of 2.219 indicates that the coefficient for social intelligence is significantly different from zero, while the significance level (p-value) of 0.008—well below the conventional threshold of 0.05—supports the conclusion of a statistically significant relationship. Furthermore, the 95% confidence interval for the unstandardized coefficient, ranging from 1.012 to 1.199, does not encompass zero, thereby reinforcing the assertion that social intelligence exerts a meaningful effect on resilience.

In summary, the findings highlight the importance of enhancing teachers' social intelligence as a pivotal factor in promoting student resilience, suggesting avenues for targeted professional development and educational interventions.

5. Discussion

The current study examines the relationship between teachers' social intelligence and students' resilience within higher education institutions in Uttarakhand, offering valuable insights into effective educational practices and areas for improvement. The findings contribute to our understanding of how educators can positively influence student well-being and resilience, which is critical in the context of increasing academic demands and pressures in higher education.

The descriptive statistics indicate that students generally exhibit a moderate level of resilience, with an average score of approximately 24.77. This level of resilience suggests that students have developed some coping mechanisms for dealing with challenges, but there is room for improvement. In contrast, the assessment of teachers' social intelligence reveals greater variability in student perceptions, with an average score of 48.09. This discrepancy highlights the need for educators to enhance their relational skills and adapt their teaching practices to meet the diverse needs of their students.

The correlation analysis demonstrates a robust positive association between spiritual intelligence in educators and student resilience, with a correlation coefficient of 0.759. This finding supports the notion that teachers' personal attributes, particularly their spiritual intelligence, play a significant role in shaping their students' psychological well-being. The statistical significance of this correlation ($p = 0.001$) underscores its reliability and emphasizes the practical importance of fostering spiritual intelligence within teaching environments.

Furthermore, the regression analysis reveals that social intelligence is a substantial predictor of student resilience, accounting for 57.6% of the variance. The significant effect of social intelligence (with each unit increase correlating to a 1.105 unit increase in student resilience) highlights the potential for targeted interventions to enhance student resilience by developing teachers' social intelligence. This finding has important implications for teacher training and educational policy, as it suggests that investing in programs that promote social intelligence can have a positive impact on student outcomes.

The analysis of variance (ANOVA) confirms a statistically significant relationship between teachers' social intelligence and student resilience ($p = 0.003$). This underscores the critical role of social intelligence in fostering resilience and suggests that educational institutions should prioritize the development of these competencies in their educators.

6. Implications of the Study

The implications of this study are multifaceted and far-reaching:

- 1. Teacher Training and Development:** Educational institutions should invest in professional development programs that focus on enhancing teachers' social and spiritual intelligence. This could include workshops, mentoring programs, and coaching sessions that help educators develop their interpersonal skills, empathy, and authentic communication.
- 2. Holistic Approach to Student Development:** The study highlights the need for a comprehensive approach to student development, integrating social and emotional learning (SEL) into the curriculum. By fostering a supportive learning environment that encourages open expression of aspirations and challenges, institutions can promote resilience and overall student well-being.
- 3. Differentiated Instruction:** The variability in student perceptions regarding teacher authenticity and support suggests that educators should adopt differentiated approaches tailored to individual student needs. This could involve recognizing and addressing diverse perspectives, providing personalized feedback, and using technology to enhance student-teacher interactions.
- 4. Student Feedback Mechanisms:** Educational leaders should establish regular feedback mechanisms where students can express their experiences and perceptions regarding their teachers' social intelligence. This continuous assessment can inform training programs and ensure that they address the evolving needs of both students and educators.
- 5. Policy and Administrative Support:** The findings of this study suggest that educational policies should prioritize the development of social intelligence in educators. This could involve revising teacher evaluation criteria to include assessments of social intelligence, providing resources for professional development, and recognizing and rewarding educators who demonstrate high levels of social intelligence.

7. Conclusion

In summary, this research investigated students' perceptions of their teachers' social intelligence and its effect on resilience within higher education institutions in Uttarakhand. Through an exploratory-descriptive design and a survey of 193 students, the findings indicated that

while teachers were perceived to demonstrate high social intelligence-especially in accommodating student aspirations and effective communication-there remains room for improvement in areas like empathy and supporting struggling students.

A significant positive correlation was found between teachers' spiritual intelligence and student resilience ($r = 0.759$), suggesting that heightened spiritual intelligence in educators is associated with increased resilience among students. The study also revealed that social intelligence accounts for 57.6% of the variance in students' resilience, emphasizing its important role in this dynamic. Overall, these results underscore the critical influence of teachers' spiritual intelligence on fostering student resilience, offering valuable insights for enhancing educational practices aimed at holistic student development. Also, the need for improvement in areas like emotional support or empathy highlights the need to develop socially aware and socially intelligent teachers who can't connect with the students without any affinity of status difference between them and their students. Also, the personalised attention of the teachers for their student is missing because of the imbalance in the teacher student ratio, which needs to be paid attention to as well.

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Towards Sustainable Decision-Making: Life Cycle Assessment and the Decoding of Environmental Footprints

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ABSTRACT

In a connected world of sustainability, the 2030 agenda for Sustainable Development formulates 17 Sustainable Development Goals (SDGs) as a call to action. The products, silica gel packs, and paraffin-based candles will be analyzed with a perspective of responsible consumption towards climate action and clean water and sanitation; all these journeys from creation to disposal will be investigated concerning compliance with SDGs. Silica gel, used as a desiccant, and paraffin wax candles from petroleum sources undergo pollution due to energy consumption and waste management.

Although silica gel presents advantages such as recyclability and biodegradability, paraffin candles are associated with potential hazards including fire risks and the release of toxic emissions. The increasing demand in the market for these products stems from heightened awareness regarding the environmental ramifications of utilizing non-sustainable alternatives. Promoting recycling initiatives, advocating for biodegradable products, and fostering environmental consciousness across all societal strata contribute to advancing a more sustainable future and the realization of global objectives; however, it is essential to ensure that this trajectory is characterized by greater environmental sensitivity and, consequently, responsibility, thereby representing a significant advancement for the planet and future generations. Therefore, this manuscript meticulously elucidates the environmental implications and sustainable alternatives by examining the life cycles of two distinct products.

Keywords: Paraffin, Silica gel, Sustainable products, Environmental Impact.

1. Introduction

Life Cycle Assessment (LCA) is a critical tool for evaluating the environmental sustainability of products, from raw material extraction to end-of-life disposal or recycling. This review focuses on the application of LCA to two commonly used materials: silica gel and paraffin wax. By analysing their environmental impacts across their entire life cycles, this study aims to provide insights into their sustainability and identify opportunities for improvement.

Our paramount concern in contemporary society pertains to the management of waste. We are increasingly constrained in our capabilities regarding the treatment and secure disposal of diverse waste types, resulting in significant environmental degradation and public health issues. The waste that has accumulated encompasses not only non-biodegradable materials (e.g., plastics, electronic waste, and solid waste) but also biodegradable waste, thereby rendering the planet uninhabitable and

leading to resource scarcity (Tyagi et al., 2017). In a progressively interconnected and resource-limited global landscape, the quest for sustainability has emerged as a critical imperative for the development of future economic, environmental, and social systems. The United Nations' 2030 Agenda for Sustainable Development, which promotes 17 Sustainable Development Goals (SDGs), acts as a universal call to action aimed at confronting global challenges such as poverty, inequality, environmental deterioration, and climate change. In an era characterized by heightened environmental consciousness, the necessity to elucidate a product's lifecycle from creation to disposal has surfaced as essential for promoting global sustainability. This understanding has profound implications for ecological, social, and economic outcomes, thereby enabling a comprehensive assessment of its environmental impact. The objective of this expedition was to examine, through the lens of the SDGs with particular emphasis on

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responsible consumption and production (SDG 12), climate action (SDG 13), and clean water and sanitation (SDG 6), the integration of sustainable methodologies in product design, manufacturing, and disposal practices (Sachs *et al.*, 2024).

Sustainability studies represent a critical domain of inquiry, addressing paramount concerns pertaining to water, land, and atmospheric pollution. The petroleum sector assumes a pivotal role in the management of pollution across various levels. Furthermore, petroleum-related activities exacerbate ecological challenges for flora, fauna, and insect populations. A meticulous examination of the life cycle of silica gel packets and paraffin-based conventional candles, encompassing their production through to their disposal, facilitates a discourse on the extent to which these two products correspond with the Sustainable Development Goals (SDGs) and engender a beneficial impact on the global community. These two products have been selected due to their substantial contributions to energy consumption, the extraction of natural resources, and the complexities involved in waste management. Through a comparative evaluation of the diverse alternatives that provide more sustainable modalities of production, consumption, and waste management, we delineate actionable strategies that may address the escalating environmental challenges. It is only by undertaking a comprehensive exploration of the entire lifecycle of these ostensibly inconspicuous products that we can initiate meaningful advancements toward a future wherein sustainability is integral to production and consumption, thereby advancing the world closer to fulfilling the global objectives delineated by the SDGs.

Silica is one such compound that possesses the ability to absorb moisture which improves the water vapor barrier properties of carbohydrate and protein-based food packaging materials. (Tyagi *et al.*, 2017) Silica gel packs are small packets of silica gel, a type of silicon dioxide (SiO_2), that absorbs moisture. They are highly porous beads that can absorb moisture from the surrounding environment, making them useful as desiccants.

Paraffin is a flammable, waxy substance obtained from wood, coal, or petroleum (Suaria *et al.*, 2018). Paraffin-based candles are candles made from paraffin wax; a hydrocarbon derived from petroleum refining. This wax is solid at room temperature and melts when heated, providing a stable and efficient fuel source for candles.

2. History of Products

The historical narrative surrounding silica gel and paraffin wax elucidates substantial contributions from numerous innovators in their respective domains. Silica gel, predominantly recognized for its hygroscopic attributes,

has undergone significant transformation through progressions in organosilicon chemistry, whereas paraffin wax possesses a distinguished legacy in the realm of medical applications. The subsequent sections comprehensively outline the pivotal individuals and advancements linked to these materials.

2.1 Pioneers of Invention

The beginnings of silica gel are linked to the endeavours of Charles Friedel and James Mason Crafts, who made significant advancements in organosilicon chemistry, though the specific creators of silica gel are not well-documented (Muller, 1965). Silica gel primarily functions in moisture control, and its production techniques have progressively advanced, as demonstrated by modern devices designed for enhanced manufacturing efficiency (Bong, 2004).

Robert Gersuny, an Austrian surgeon, was the first to utilize paraffin in medical uses in 1899, initially applying mineral oil (Vaseline) for soft tissue enhancement (Glicenstein, 2007). After Gersuny's work, the application of paraffin wax broadened into numerous cosmetic and medical practices, even though later issues developed from its application (Glicenstein, 2007). While the development of silica gel is based on chemical innovations, the history of paraffin wax centers on its medical uses and the ensuing complications. This difference emphasizes the varied paths these materials have taken in the fields of science and industry.

2.2 Methodologies of Products Production:

The production of silica gel and paraffin wax involves distinct methodologies and applications, reflecting their unique properties and uses in various industries. Silica gel is primarily produced through sol-gel processes, while paraffin wax production focuses on enhancing thermal properties for energy storage. The following sections detail the production processes and characteristics of each material.

● Silica Gel Production

Processes: Without disregarding the abundant presence of silica gel in the absence of moisture, silica gel is produced via certain chemical reactions that transform silica sand into an adsorbent substance (Katoueizadeh *et al.*, 2020). The whole procedure initiates with the reaction of silica sand, SiO_2 , and sodium carbonate, Na_2CO_3 , at an elevated temperature of approximately 1200°C resulting in sodium silicate Na_2SiO_3 , the resultant silica gel is subsequently treated through a reaction with sulfuric acid, H_2SO_4 , or hydrochloric acid, HCl , yielding silicon dioxide precipitate in a gelatinous state (Katoueizadeh *et al.*, 2020). The silica acquired in a gel-like state is purified to eliminate any existing impurities and dehydrated under

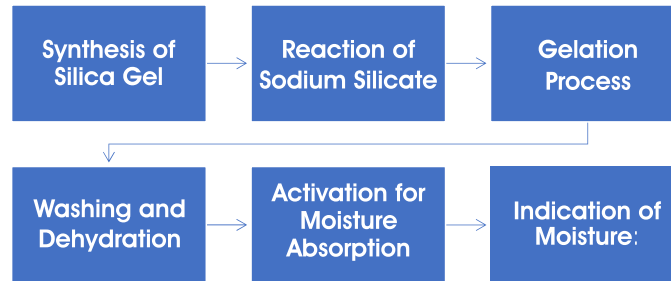


Fig 1. Different Processes of Silica Gel Production

controlled conditions, producing beads or granules of silica gel. Subjecting the silica gel to additional heating enhances its surface area and thus becomes a highly effective adsorbent for moisture. A colorimetric moisture-indicator contains cobalt chloride CoCl_2 , which alters its color from blue when dry to pink when hydrated. Due to health issues, methyl violet is being utilized as a colorimetric indicating agent for moisture instead of CoCl_2 . It displays a color change from orange when dried to green when hydrated (Katouezadeh et al., 2020).

Preparation Methods: Silica gel is synthesized by adjusting parameters such as solution concentration, pH, and drying temperature, which influence its particle size and internal structure (Zaprzanowa & Trendafilowa, 1975).

- Chemical Composition: The use of metal silicates and organosilicon compounds in gel formation is crucial, with specific concentrations (1-50 wt% SiO_2) being optimal for desired properties (Rikio & Sueo, 1981).
- Specialized Applications: Variants of silica gel, such as those designed for oil removal, involve soaking and washing processes to enhance their adsorption capabilities (Ciriminna, et al., 2013).

2.3 Paraffin Wax Production

- Thermal Properties Enhancement: The incorporation of silica nanoparticles into paraffin wax significantly improves its crystallinity and thermal efficiency, making it suitable for phase change materials (PCMs) (Abdeali et al., 2024).
- Structural Modifications: Adjusting the pore structure of silica aerogels can optimize the melting and solidification temperatures of paraffin wax, enhancing its performance in thermal energy storage applications (He et al., 2024).

While silica gel is primarily valued for its adsorption properties and versatility in chromatography, paraffin wax is increasingly recognized for its role in energy storage systems. This contrast highlights the diverse applications and production techniques tailored to the specific functional requirements of each material.

3. Journey & Disposal of Products



Fig. 2 Silica Gel Packs (source: discovermagazine.com)

3.1 Silica Gel

3.1.1 Types

- Type A-They are clear pellets, pore diameter-2.5nm, drying, and moisture-proof properties, and can be used as catalyst carriers and adsorbents.
- Type B- They are translucent white pellets, pore diameter-4.5-7nm, liquid adsorbents, drier and perfume carriers, cat litters.
- Type C- They are translucent, micro-pored structure, raw material for preparation of silica gel cat litter.
- Silica Alumina GEL- light yellow, chemically unstable, insoluble.
- Stabilizing silica gel-nanocrystalline micro-porous solid powder, non-toxic, flame-resisting, (Singh et al., 2014).

3.1.2 Usage of Silica Gel

Silica gel is well established in the market due to its numerous domestic and industrial applications. Its significance in our lives is not fully recognized until now -

- Moisture Control: This silica absorbs moisture in large quantities. The moisture caused by humidity in packaging, electronics, and pharmaceuticals is mitigated through the use of silica gel (Priyadarshi and Naik, 2024).
- Preservation of Food: Silica gel enhances the shelf life of dry foods, spices, and snacks by maintaining

their dryness (Vareda et al., 2022).

- **Electronic Protection:** It creates a moisture and condensation-free environment that could harm sensitive electronics, cameras, and gadgets (Zhang et al., 2024).
- **Pharmaceutical Storage:** It keeps medicines and vitamins dry, thereby ensuring both their efficacy and shelf life (Priyadarshi and Naik, 2024).
- **DNA Extraction:** Silica gel polymers are utilized to extract DNA using organic solvents (Zybin, et al., 2021).
- **Document and Photo Preservation:** It prevents the degradation of valuable papers, photographs, and archival materials.
- **Shoe and Leather Protection:** It protects shoes and leather stored in bags from mould growth and moisture.
- **Dehumidification During Shipping:** It stops moisture trapped within shipping containers from affecting the humidity-sensitive materials placed inside.
- **Prevention of Metal Corrosion:** It assists in keeping metal components, tools, and machinery rust-free by keeping them as dry as possible from damp moisture.

3.1.3 Disposal Method

Even though silica gel is non-toxic and chemically inert, there are significant environmental issues associated with the end-of-life phase for products created from silica gel. Almost all the silica gel sachets found in product packaging are utilized once before being discarded. Because they cannot burn or biodegrade, silica gel can persist in landfills for thousands of years without breaking down.

- **Landfill:** The main method of disposal remains landfill, where waste continues to accumulate. Although silica gel does not emit any hazardous substances, it is a lasting waste that remains in the waste stream (Liu et al., 2010).
- **Incineration:** In certain instances, silica gel is incinerated. Naturally, this is an energy-consuming process and results in the production of CO₂. Silica gel is highly recyclable as it can be processed in numerous applications at temperatures between 120°C and 150°C. However, large-scale recycling of silica gel has not yet been fully realized. The challenges associated with silica gel disposal indicate the need for improved practices concerning better reuse systems and the development of biodegradable desiccants.

3.2 Paraffin-Based Candle

3.2.1 Types

- Jar candles are popular for interior decoration and can be scented or unscented.
- Pillar candles have a longer burn time and do not require a holder.
- Taper candles are elegant and used for formal occasions or dinner settings.
- Votive candles are light in weight and burn their entire length.
- Tealight candles are small and inexpensive, perfect for aromatherapy.
- Floating candles float on water and create a soft mood. Scented candles emit fragrance when lit and come in various shapes (Negi et al., 2024).

3.2.2 Usage of Candles

Paraffin wax candles have more than just one objective because, in an instant when light cuts off, they can offer a lighting source, add to home décor, and even build the atmosphere. (Derudi et al., 2014). They are widely used in aromatherapy to help one unwind for scents, or where there is a massive use during ceremonies and rituals. At times, they can also be an alternate source of light whenever the main source power is turned off during blackouts.

3.2.3 End of life of disposal of Paraffin Candle

Once a candle is extinguished, small wax remains at the bottom of the container or holder. Most people do nothing more than discard such residual wax; it ends up in the landfill. Since paraffin is a petroleum-derived product, it does not break down with natural decomposition processes and may remain in the environment for hundreds of years.

4. Environmental Toxicity

The prolonged impacts of silica gel and paraffin wax exposure on human health and the environment indicate notable health hazards, especially concerning silica exposure. Long-term consumption of silica gel has been recorded, resulting in numerous health problems, whereas paraffin wax injections have been linked to systemic issues. The upcoming sections elaborate on these effects.

4.1 Health Effects of Silica Gel Exposure

- Chronic consumption of silica gel may result in symptoms such as muscle pain, dizziness, and tingling, although certain cases indicate that symptoms may resolve with time (Naser and Niyangoda, 2014).
- Workplace exposure to crystalline silica is associated with serious respiratory illnesses,

including silicosis, which continues to be common despite existing safety measures (Raymond and Wintermeyer, 2006) (Cocco, 2003).

- Prolonged exposure can also lead to autoimmune conditions, as demonstrated by research revealing a high prevalence of connective tissue diseases in workers exposed to silica (Sánchez-Román et al., 1993).

4.2 Health Effects of Paraffin Wax Exposure

- Complications arising from paraffin wax injections encompass induration, discomfort, and systemic effects like malaise and arthralgia (Kubota et al., 1984).
- Extended follow-up reveals that total recovery is uncommon for individuals experiencing systemic symptoms, indicating potential chronic health consequences (Kubota et al., 1984).

Although exposure to silica gel and paraffin wax presents considerable health hazards, some contend that improvements in workplace safety and medical monitoring might lessen these impacts gradually. Nonetheless, the enduring nature of associated diseases underscores the necessity for continuous research and preventative strategies.

Case Studies

- A typical case surfaced regarding choking on a cylindrical dietary capsule that contained desiccant, which raised alarms about public safety. From 1995 to 2002, there were 26 reported cases of corrosive ingestion in children under the age of five. One incident included the swallowing of a silica gel packet, known for its potent sorbent characteristics. Although prompt treatment is essential, rural regions encounter difficulties in handling health results, as gastric emptying may help but does not consistently avert airway blockage. Therefore, silica gel products are not universally safe as portrayed in (Lassiter et al., 2020).
- A 66-year-old female patient was admitted to the hospital to evaluate interstitial lung disease. She had lived in a shrine that frequently had intense paraffin vapours from burning candles, almost all of the time. Chest HRCT showed 'crazy paving' patterns accompanied by ground-glass opacities and thickening of the septa. A histopathological analysis was conducted on the lung tissue obtained during surgery to confirm the diagnosis of lipoid pneumonia. It resolved on its own and was caused by the vapours emitted while she was at a shrine filled with burning candle paraffin wax. This was the first and only reported instance of lipoid pneumonia

resulting from exposure to paraffin vapours in the literature (Katsumi et al., 2016).

5. Sustainable Solutions and Recommendations

The environmentally sustainable alternative to silica gel packets encompasses natural clay desiccants and rice, both of which are biodegradable and demonstrate remarkable moisture absorption capabilities. Activated charcoal and bamboo charcoal desiccants are renewable resources that can be reused, thereby ensuring prolonged moisture control. Biodegradable desiccants derived from cornstarch and hemp fibres serve as exemplary instances of natural solutions. All of these alternatives exert minimal to no detrimental environmental impact, rendering them optimal for sustainable packaging and storage solutions (Micro-Pak, n.d.)

Beeswax and soy wax candles represent additional sustainable alternatives. Beeswax is a natural and renewable by-product derived from the process of honey production. Conversely, soy wax candles are synthesized from soybeans, are biodegradable, and are characterized by their eco-friendliness. Both types of candles exhibit cleaner combustion, generate reduced soot, and release fewer toxins, thereby representing a more environmentally safe choice (Rezaei et al., 2002).

- At the Government Level: Promote the establishment of recycling initiatives and create incentives for the utilization of biodegradable desiccants or comparable alternatives. At the Societal Level: Provide education to families and businesses concerning appropriate disposal methods and usage.
- At the Individual Level: Encourage the repurposing of materials for personal applications, such as in electronics, or facilitate donations to charitable organizations.
- At the International Level: Promote collaborative global endeavors focused on sustainable alternatives and recycling initiatives.

Table 1: Environmental Impact of Using 100 million 5 Grams Sachets of Each Desiccant (source: Micro-Pak)

	Silica Gel	Bentonite clay
Chemical Inputs (in metric Tonnes)	950	0
Freshwater used in production (Liters)	10,000,000	0
Plastic Packaging	47 metrics Tonnes=2,350,000 One-liter plastic bottles	0 (plastic-free packaging)

Note: If we use bentonite clay, then 1 million litres of water have been saved.

Table 2: Environmental Impact of Using 1 million Candles

	Paraffin based Candles	Vegetable Oil Candles	Beeswax Candles	Soy Wax Candle
Chemical Inputs (in metric Tonnes)	100	90	80	90
Carbon footprint	Higher	Lower	Lower	Lower
Plastic Packaging (number of 1-liter plastic bottles)	50000	30000	10000	20000

Note: If we do not use paraffin candles then almost 30,000 plastic 1-liter water bottles would not be used

6. Conclusion

This research has underscored the critical importance of ensuring the adoption of sustainable practices throughout the entirety of their life cycle. Silica gel packets, which are constituted of silicon dioxide, demonstrate efficacy in their designated function; however, their non-biodegradable nature leads to their accumulation in landfill sites. Paraffin candles, which are sourced from petroleum, incorporate pollutants that are detrimental to ecological health and require significant energy expenditure during their production. In order to alleviate these adverse impacts, manufacturers may explore the development of biodegradable substitutes, while consumers are encouraged to repurpose silica gel and select candles that are environmentally sustainable. Promoting responsible consumption and eco-design will be congruent with the Sustainable Development Goals set forth by the United Nations and will contribute to the realization of a more sustainable future. Although these alternatives exhibit considerable promise, obstacles related to cost and scalability persist. Additional investigation is imperative to enhance these materials for extensive utilization in thermal management systems.

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